

# RESTRUCTURING UKRAINE'S ECONOMY THROUGH EU ACQUIS IMPLEMENTATION: A MULTI-DIMENSIONAL COMPETITIVENESS FRAMEWORK

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**Abstract.** This paper examines how Ukraine's economic restructuring can be guided strategically through the implementation of EU legislation, using a multi-dimensional competitiveness framework. This is because formal legislative alignment with EU legislation has not resulted in full functional convergence with the EU's economic model. The primary *purpose* of the study is to develop and implement a multi-dimensional competitiveness framework that links the implementation of EU legislation to the restructuring of Ukraine's economy. This framework is designed to systematically align Ukraine's institutional reforms, structural modernisation and innovation-driven transformation with the demands of the EU Single Market. To this end, the study will construct a five-dimensional competitiveness index to support acquis-driven economic restructuring. The *methodology* is firmly rooted in the JRC-OECD Handbook on Composite Indicators. The research employs a structured procedure that begins with the compilation of a harmonised dataset from exclusive international sources, including Eurostat, the World Bank and the OECD. A key step in the methodology is normalising all heterogeneous indicators onto a comparable 0–100 scale using a min–max transformation based on normative ranges derived from the EU-27 and Central and Eastern European comparator countries. The empirical *results* provide a clear, quantifiable assessment. The pilot calculation reveals that Ukraine's composite IGCS score is 40.8 points, compared to 70.9 points for the EU-27. This indicates a significant convergence gap of 42.5%. A detailed dimensional analysis reveals the structure of this gap. Ukraine demonstrates relative strength in macroeconomic resilience and innovation, driven by a specialised IT export sector. However, these strengths are offset by profound weaknesses. The institutional dimension reveals a significant discrepancy between the high level of implementation of formal acquis and the weak enforcement of the rule of law. These findings have substantial *practical implications* for policymakers in Ukraine and the EU. They highlight the need for institutional reform to shift focus from legislative transposition to enhancing judicial independence and regulatory enforcement, treating this as a critical macro-priority. Innovation policy must also extend beyond the IT sector in order to address systemic underinvestment in R&D. Most importantly, the green transition must form the core of reconstruction strategies to avoid future competitiveness cliffs. The study's *originality and value* lie in its novel synthesis of a tailored competitiveness index for a post-conflict accession economy, its combination of theoretical convergence concepts with empirical measurement, and its provision of a replicable, evidence-based framework for guiding modernisation and integration policies. This framework fills a critical gap in the existing literature and provides an evidence-based foundation for restructuring Ukraine's economy in line with EU Single Market requirements.

**Keywords:** EU acquis communautaire, competitive convergence, institutional reform, economic restructuring, innovation ecosystems, global competitiveness, Ukraine.

**JEL Classification:** F15, O38, O43, P27

## 1. Introduction

Ukraine's progress towards EU membership means that traditional sector-based development models are no longer sufficient to ensure long-term competitiveness and macroeconomic resilience. Previous analytical

work has shown that Ukraine's competitive potential is influenced by the interplay of institutional maturity, structural modernisation, technological capacity and exposure to global security challenges. However, despite measurable progress in aligning national legislation

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with the EU *acquis communautaire*, a persistent *institutional and structural asymmetry remains*. Formal harmonisation has not yet resulted in functional convergence on the scale required for Ukraine to adopt the EU's economic model. This asymmetry is central to the challenge of Ukraine's economic restructuring in the context of full EU membership.

The article proposes an integrated competitive convergence mechanism to address asymmetry, synthesising prior research on institutional effects, structural reserves, competitiveness criteria and global shocks to create a unified methodological and conceptual framework for empirical verification. This study has two objectives: to construct a coherent analytical model that aligns Ukraine's five major dimensions of global competitiveness with *acquis-driven reforms*, and to lay the empirical groundwork for a comprehensive quantitative assessment of competitiveness convergence. The study introduces the methodological framework for calculating the Index of Global Competitiveness Strength (IGCS) and integrates it with the multi-level structure of competitive convergence. It also outlines the procedures for empirical operationalisation. This framework is explicitly designed to guide restructuring priorities under EU accession conditions and directly reflects the article's overarching focus on restructuring the Ukrainian economy through EU-aligned policies. Thus, the article serves as the culmination of a multi-stage research sequence, defining the baseline mechanism for Ukraine's economic restructuring under EU membership conditions.

## 2. Theoretical and Methodological Foundations

### 2.1. Literature Review

Recent literature on Ukraine's EU-integrated competitiveness is divided into two interconnected strands. The first emphasises institutional convergence via *acquis alignment*. Darvas et al. (2024) demonstrate that accelerating the approximation of the rule of law, anti-corruption measures and governance could stimulate post-war reconstruction and potentially increase EU-Ukraine trade by 40–140% by 2040, while keeping EU fiscal costs within manageable limits. A second line of research analyses the sectoral and trade-related channels through which EU integration affects competitive performance. Akhvlediani and Movchan (2024) draw on Eurostat and World Bank datasets to identify structural advantages for Ukraine in agriculture, energy, logistics, and digital services. These advantages are conditional on institutional harmonisation and compliance with EU production standards. Movchan and Pindyuk (2024) provide complementary evidence by applying revealed comparative advantage (RCA) indices and global

value chain (GVC) metrics to demonstrate emerging competitiveness in agri-food exports, ICT services, and critical raw materials. However, they also highlight persistent technological underperformance.

Another body of literature emphasises structural and institutional constraints. Bendarzsevszkij (2025) analyses the demographic, energy and fiscal implications of accession for the EU. Meanwhile, Stefanishyna et al. (2024) document a rise in *acquis implementation* to 81%, arguing that institutional adaptation is becoming an increasingly important source of competitive strength. Lunova (2022) reviews international composite indices, including the Global Competitiveness Index, the Global Innovation Index, and the IMD rankings, and identifies persistent weaknesses in institutional quality, infrastructure, and the investment climate that hinder convergence dynamics.

A fourth research strand examines regional disparities and sectoral resilience. Babets and Zhabynets (2022) emphasise the significance of SMEs, production relocation, and regional re-industrialisation in the context of wartime disruptions. Meanwhile, Antoniuk and Anapriiuk (2023) advocate integrating innovation, social, and green policy domains as key components of sustainable competitiveness. Nazarchuk et al. (2023) analyse national branding as a means of strengthening competitive identity. Meanwhile, Novosad and Panchenko (2024) emphasise the pivotal role of the IT sector in fostering economic resilience and facilitating digital convergence with the EU.

A fifth approach conceptualises competitiveness as a multidimensional construct. Canatay et al. (2025) use multilayer regression and composite index modelling to analyse 140 economies and demonstrate that integrating macroeconomic, institutional, innovation, social and environmental factors is necessary to ensure sustainable competitiveness in transition economies. Meanwhile, Zadoya et al. (2024) identified human capital, institutional stability, and technological readiness as the dominant factors shaping Ukraine's competitive performance between 2018 and 2023. Ginevičius et al. (2023) critique the methodological limitations of the WEF's Global Competitiveness Index, providing empirical evidence that institutional quality and innovation performance have the greatest explanatory power. Meanwhile, Medeiros et al. (2019) reinforce the systemic nature of competitiveness, demonstrating through DEA and Malmquist analysis that improvements in innovation and infrastructure can significantly increase the efficiency with which resources are used.

Sector-specific studies have identified bottlenecks: Volosnykova et al. (2022) emphasise wartime vulnerabilities in R&D, institutions, and logistics; Khatser and Mikhailik (2024) document transport losses and advocate digital logistics/PPP solutions; Umantsiv et al. (2025) stress state-business-university

collaboration for IT under the EU Ukraine Facility; and Shahini and Shtal (2023) note agroholdings' stable exports and EU adaptation. A final strand of enquiry explores economic convergence and the capacity of transition economies to "catch up" under EU regulatory regimes. As demonstrated by Šiljak and Nielsen (2025), the presence of weak institutions and structural imbalances can give rise to a phenomenon of "growth without development" in candidate economies. László (2025) provides documentation of declining  $\beta$ -convergence in CEE following the global financial crisis, with institutional variables accounting for almost one-third of cross-country growth variation. Horbali and Khindyak (2020) confirm the existence of persistent gaps between Ukraine and EU member states with regard to innovation, productivity and institutional indicators. EU policy documents, including the Copenhagen criteria, the revised enlargement methodology, and the Digital Decade programme (European Commission, 2024), further codify the structural, institutional, and digital requirements for candidate states. These documents effectively define the benchmark for future competitiveness within the Single Market.

Despite the substantial body of research, existing studies remain fragmented. Most analyse individual dimensions – macroeconomic, institutional, innovation-based, or sectoral – without offering an integrated empirical framework capable of synthesising all five dimensions of competitiveness, aligning them explicitly with *acquis communautaire* requirements, determining statistically validated weights, and measuring Ukraine's competitive convergence trajectory relative to the EU-27 empirically. The study addresses these gaps by providing the first empirical validation of a five-dimensional Index of Global Competitiveness Strength for Ukraine, and by linking this index to a broader mechanism of *acquis*-driven competitive convergence. This mechanism is capable of supporting evidence-based economic restructuring through *acquis* implementation.

## 2.2. Conceptual and Analytical Framework

National competitiveness emerges from simultaneous transformations across the macroeconomic, institutional, technological, social and environmental domains. These form an integrated system in which institutions drive structural efficiency and innovation amplifies productivity. Collectively, these form the backbone of the economic restructuring process. The model synthesises these elements to mirror EU convergence logic. At the macroeconomic level, a country's competitiveness is determined by its post-shock recovery trajectory, fiscal and monetary stability, investment capacity, the ability to reallocate between sectors, and the resilience of production in the real

economy. These factors shape the economy's ability to sustain growth under conditions of war, reconstruction and external volatility. The second foundational layer is institutional alignment, which encompasses the quality of the rule of law, the capacity of public administration, regulatory governance, the protection of property rights, and the transposition, implementation and enforcement of the *acquis communautaire*. The speed and quality of institutional convergence have a direct influence on market integration and the credibility of reform commitments.

The innovation and technology dimension reflects the structure of the national R&D system, technological readiness, digital infrastructure, the adoption of advanced technologies, and firms' absorptive capacity. Evidence from CEE economies shows that innovation ecosystems are the main channel through which institutional improvements lead to increased productivity. The social dimension incorporates human capital development, demographic sustainability, labour productivity, educational attainment, and workforce adaptability – factors that determine the economy's long-term capacity to sustain growth and absorb structural shocks. The environmental dimension encompasses the deployment of renewable energy, decarbonisation pathways, resource efficiency, and the integration of the circular economy. This aligns Ukraine's policy trajectory with the European Green Deal and the Carbon Border Adjustment Mechanism.

*Acquis* implementation acts as a system-wide transmitter, aligning regulatory, technological, environmental and social standards with those of the EU Single Market in order to synchronise reforms. The model posits that institutional upgrades reduce friction, boost investment efficiency and disseminate technologies. Innovation enhances green and digital transformations, while social sustainability governs their scale and persistence. Environmental adaptation aligns production with EU industrial and climate priorities and functions as the central lever of Ukraine's structural economic transformation towards the EU model.

In order to operationalise the conceptual logic, the study employs a structured, five-dimensional competitiveness assessment system. This system provides the theoretical basis for the empirical index presented in Section 4, offering a consistent framework through which to evaluate Ukraine's convergence trajectory with the EU-27. Rather than assuming linearity, the model incorporates the interdependence of institutional reforms, structural modernisation and sectoral dynamics. These factors collectively shape the economy's capacity to generate stable competitive advantages, as well as its ability to restructure production, institutions and factor allocation in accordance with EU Single Market standards during the post-war and pre-accession periods.

### 2.3. Methodology

The methodological framework is based on the JRC–OECD Handbook on Composite Indicators (2022) and incorporates elements of the Reformed European Model (Aiginger, 2006), the OLI paradigm (Dunning, 1980), and the competitiveness determinants identified in the Global Competitiveness Report (World Economic Forum, 2025c). The aim is to convert heterogeneous indicators from the macroeconomic, institutional, innovation, social and environmental dimensions into a consistent numerical representation of Ukraine's alignment with the EU-27. The indicators are first normalised to 0–100 via min-max.

$$N_i = 100 * \frac{(X_i - X_{min})}{(X_{max} - X_{min})} \quad (1)$$

$X_i$  is the raw value for Ukraine, with  $X_{min}/X_{max}$  from EU-27 and CEE benchmarks. This aligns with Eurostat (2025) and OECD (2024) standards, providing a relative position for Ukraine. Dimensions are aggregated via arithmetic means, yielding five scores in accordance with the balanced logic of the Reformed European Model: (2),

$$N_{dimension} = \left(\frac{1}{k}\right) * \sum N_i \quad (2)$$

where  $k$  is indicators per dimension. This ensures transparency and prevents dominance by a single component. Weights are obtained through the Analytic Hierarchy Process (Saaty, 1980). The following weights were obtained through expert judgements from twenty-five specialists in macroeconomics, institutional reform and EU integration: macroeconomic (0.25); institutional (0.25); innovation (0.20); social (0.15); environmental (0.15). The weights reflect the importance of macro-institutional stability and innovation's strategic role in long-term productivity. Consistency is verified through the AHP consistency ratio ( $\leq 0.1$ ). The Index of Global Competitiveness Strength (IGCS) is computed as:

$$IGCS = w_1 N_{macro} + w_2 N_{institutional} + w_3 N_{innovation} + w_4 N_{social} + w_5 N_{environmental} \quad (3).$$

This operationalises the multidimensional competitiveness framework, which supports acquis-driven economic restructuring by linking structural modernisation to acquis implementation, institutional upgrading, and the long-term productivity determinants identified in the EU and OECD frameworks. The empirical validation protocol is designed sequentially to ensure internal coherence and robustness. A complete normalised indicator matrix is created for the period 2018–2024, forming the basis for calculating dimensional scores and the IGCS. Benchmarking is performed against two comparative baselines – U-27 alone and EU-27 combined with CEE states—to account for divergent convergence

trajectories. The coherence of the index is evaluated by examining the statistical sociations between the IGCS and its structural determinants. These determinants include institutional quality (European Commission and Cabinet of Ministers of Ukraine, 2024), innovation capability (OECD, 2024), and environmental alignment with the European Green Deal (IEA, 2024). The robustness of the index is further evaluated through sensitivity analysis, which tests its stability under weight perturbations, alternative normalisation procedures, and modifications to comparator groups. This ensures reliability in conditions of post-war volatility, data incompleteness, and structural asymmetry between Ukraine and the EU.

### 3. Data and Empirical Setup

This study's empirical setup operationalises the IGCS framework developed in Section 2 by constructing a harmonised, methodologically coherent dataset. This dataset enables a multidimensional assessment of Ukraine's competitive convergence with the EU-27. The data architecture, indicator system and benchmarking structure are fully aligned with international statistical standards to ensure the comparability, transparency and reproducibility of the empirical results presented in Section 4. The dataset also provides an empirical basis for evaluating restructuring priorities during the implementation of the acquis.

The empirical base uses recognized sources for continuity, comparability, and transparency: Eurostat for macroeconomic/structural indicators (e.g., GDP growth, PPP per capita, energy metrics); OECD (2024a) for innovation (e.g., R&D expenditure); World Governance Indicators for institutions (rule of law, effectiveness); UNDP (2023) and national data for social (HDI, tertiary education); ITU (2025) for digital/IT; IEA (2024)/Eurostat (2025) for environmental (renewables, intensity); and EC (2024)/CMU (2024) for acquis/Green Deal/CBAM alignment. The indicator set reflects the five-dimensional structure of the IGCS framework, covering macroeconomic performance, institutional quality, innovation capacity, social resilience, and environmental sustainability. Each indicator is defined using standardised units, consistent measurement logic, and a unique primary source. Table 1 provides a consolidated overview of all the variables included in the empirical model, setting out clear definitions, units of measurement and source attribution. Numerical values have been deliberately omitted at this stage and will be incorporated during the empirical implementation in Section 4.

Following the definition of the indicators, the dataset is structured to implement the normalisation and aggregation procedures described earlier. As the IGCS model requires a uniform evaluation scale for heterogeneous variables, all indicators are transformed

Table 1

**Indicators, Definitions, Units and Sources**

Dimension	Indicator	Definition	Unit	Source
Macroeconomic	Real GDP growth	Annual percentage change in real GDP	%	Eurostat (2025)
	GDP per capita (PPP)	GDP per capita (PPP) relative to EU-27 average	% of EU level	Eurostat (2025)
Institutional	Acquis implementation rate	Degree of transposition and enforcement of EU acquis	%	European Commission (2024); Cabinet of Ministers of Ukraine (2024)
	Rule of Law Index	Institutional governance quality	Rank / Index	WGI
Innovation	R&D expenditure	Gross domestic R&D spending relative to GDP	% of GDP	OECD (2024a)
	IT services export share	Share of ICT services in total service exports	%	ITU (2025); national statistics
Social	Human Development Index	Composite index of human capital development	0–1	UNDP (2023)
	STEM education share	Tertiary students enrolled in STEM fields	%	UNDP; national statistics
Environmental	Renewable energy share	Share of renewables in final energy consumption	%	Eurostat (2025); IEA (2024)
	Green Deal / CBAM readiness	Regulatory alignment with EU climate acquis	0–100 (coded)	European Commission (2024); Cabinet of Ministers of Ukraine (2024)

Source: compiled by the author

using the min–max normalisation function. The normalisation parameters – minimum and maximum values – will be determined after the full empirical spreadsheet has been constructed. The comparator values for Central and Eastern Europe will be taken from the OECD (2024b) for Estonia and the OECD (2024c) for Romania. This reflects the fact that the comparator group is aligned with the established EU convergence literature from a methodological perspective.

Benchmark selection follows the established practice of competitive convergence analysis, employing two reference groups: the EU-27 average and a focused comparator group consisting of Poland, Romania, Lithuania and Croatia. This dual benchmark enables differentiation between absolute convergence relative to the EU and relative convergence within the post-transition cohort. Section 4 will present the benchmarking matrix summarising Ukraine's relative position across the indicator set. Dimensional scores will be computed using the arithmetic averaging principle outlined in Section 2.3. The final IGCS index will then be constructed as a weighted sum of these scores. All resulting values, including the normalised matrix, the dimensional scores and the overall IGCS, will be reported in Section 4. Overall, the dataset and empirical setup provide a coherent and replicable foundation for implementing the IGCS model. Integrating harmonised international datasets, consistent definitions, and a structured benchmarking methodology ensures that the empirical results accurately reflect the competitive convergence dynamics shaping Ukraine's trajectory towards EU integration.

#### 4. Empirical Results: IGCS Evidence Base

The empirical evidence base for the Index of Global Competitiveness Strength (IGCS) brings together macroeconomic, institutional, innovation, demographic, environmental, sectoral and risk-adjusted indicators to create a unified, multidimensional dataset. All variables are derived from standardised international statistical sources, official Ukrainian and EU documents, and reconstructed demographic datasets. The structure ensures full methodological transparency, enabling the IGCS model to trace the interaction between structural factors, post-shock recovery dynamics, and long-term convergence capacity. Empirical asymmetries reveal the areas of Ukraine's economy that require targeted restructuring to meet benchmarks for acquis-aligned competitiveness.

A cross-dimensional comparison of Ukraine and the EU-27 is summarised in Table 2. This reflects a combination of factors, including a strong short-term rebound, persistent institutional and income gaps, distinctive digital export specialisation, and a delayed green transition.

Table 2 shows that Ukraine's competitiveness trajectory is shaped by a combination of post-shock economic resilience and systemic institutional, innovative and environmental constraints. These asymmetries justify the multidimensional formulation of the IGCS, which combines macroeconomic, institutional, human capital and green transition factors into one structural system.

Macroeconomic fundamentals form the basis of the first block of the empirical evidence. Table 3 considers

Table 2

**Five-Dimensional Competitiveness Indicators (Ukraine vs EU-27)**

Dimension	Indicator	Ukraine (2023–2024)	EU-27	Interpretation	Sources
Macroeconomic	Real GDP growth	5.5% (2023)	≈2%	Recovery from –28.8% collapse in 2022; above regional trend	World Bank (2025a)
	GDP per capita (PPP, % of EU avg)	29.7% (2024)	100%	Structural income/productivity gap	World Bank (2025a, 2025b)
Institutional	Acquis implementation	75–80%	100%	Strongest in trade/customs; slowest in judiciary/environment	EC (2024); CMU (2024)
	Rule of law (WGI)	37.7 percentile	≈78.2	Persistent governance deficit	WGI (2023)
Innovation	R&D (% of GDP)	0.3%	≈3%	Chronic underinvestment, especially in business R&D	OECD (2024a)
	IT share in services exports	37% (~6.4 bn USD)	≈20%	Strong digital specialisation	DOU (2024); Umantsiv et al. (2025)
Social	HDI	0.779	≈0.898	Pronounced welfare gap, demographic stresses	UNDP (2023)
Environmental	Renewables share	9.7%	≈32%	Delayed transition relative to EU Green Deal benchmarks	IEA (2024); OECD (2024c)

growth dynamics, income convergence, and the shift in trade towards the EU. Notably, the 2024 trade indicators reveal an absolute increase in exports destined for the EU, as well as a marginal decline in relative market share, driven by diversification into non-EU markets. The persistent 70-point income gap relative to the EU average contextualises short-term recovery within the limitations of long-term convergence.

The data confirm that Ukraine has a highly open economy whose trade architecture is structurally Europeanised. The temporary decline in the share of EU

exports in 2024 does not indicate de-Europeanisation; absolute export volumes to the EU increased by 6%. While diversification to other partners, particularly outside the EU customs area, has reduced the relative share, it is important for econometric modelling to prevent the misinterpretation of relative ratios as contractions in real flows.

Institutional indicators transform qualitative governance features into quantifiable metrics that are relevant for convergence. They directly influence the institutional weights of the IGCS and indirectly impact investment, innovation and regulatory alignment.

Table 3

**Macroeconomic and Trade Indicators**

Indicator	Definition	Ukraine	Comparator / Context	Sources
Real GDP growth	Annual real growth	–28.8% (2022); 5.5% (2023); 2.9% (2024 est.)	Recovery above regional average	World Bank (2025a)
GDP per capita (PPP)	Relative income position	29.7% of EU-27 average (2024)	100% = EU-27	World Bank (2025a, 2025b)
Export openness	Exports (% of GDP)	≈39%	45–55% typical small EU economies	World Bank (2025b)
EU share of exports	Goods exports to EU	64.6% (2023); 59.5% (2024)	≈45–50% in CEE	CMU (2024); World Bank (2025b)
EU share of imports	Goods imports from EU	49–50% (2023); 50.4% (2024)	Sustained increase	CMU (2024)
EU share in trade turnover	EU share in total trade	59% (2023); 53.8% (2024)	Structurally above pre-war levels	CMU (2024)

Table 4

**Institutional Indicators**

Indicator	Ukraine	EU-27 / Benchmark	Notes	Sources
Acquis implementation	75–80%	100%	High alignment in trade/customs; weak judiciary enforcement	EC (2024); CMU (2024)
Rule of law (WGI)	37.7 percentile (2023)	≈78.2	Enforcement remains key barrier	WGI (2023)
Sectoral regulatory maturity	~65/100	–	Higher in digital/trade, lower in energy/environment	CMU (2024)

The discrepancy between formal alignment and effective enforcement is one of the structural constraints identified by the IGCS. This discrepancy affects both the absorption of short-term reforms and the long-term convergence potential.

Innovation and digital-sector indicators make up the third part of the IGCS evidence base. Table 5 reveals an obvious imbalance: low R&D expenditure is coupled with high IT export performance and robust digital proficiency.

It suggests that Ukraine’s digital competitiveness is driven by a small but influential IT services sector, while its performance in systemic innovation remains limited. The IGCS model reflects this by giving different weights to the innovation variables.

The demographic dimension incorporates the reconstructed migration dataset from sources such as

the UNHCR, Eurostat, SEIS and NBU. The scale and structure of war-induced migration create demographic imbalances that can have a significant impact on long-term competitiveness. Table 6 summarises the demographic indicators.

The demographic indicators reveal structurally asymmetric pressures. While Ukraine is experiencing long-term labour-force contraction and accelerated ageing, the EU is benefiting from an influx of young, educated workers. These patterns are reflected in the IGCS scenario simulations.

Environmental indicators measure progress towards the EU Green Deal and CBAM alignment. Table 7 summarises these environmental metrics.

The environmental gap has been incorporated into the IGCS in order to reflect both investment needs and transition risks.

Table 5  
**Innovation and Digital Indicators**

Indicator	Ukraine	EU-27 / CEE Benchmark	Notes	Sources
R&D intensity	0.3% of GDP	≈3% EU	Structural underinvestment	OECD (2024a)
Digital development index	0.632	0.7–0.8	Gradual convergence	ITU (2025)
IT share of services exports	37–37.4%	≈20%	Distinct specialisation	DOU (2024); Umantsiv et al. (2025)
Digital skills – basic	93%	80–90%	Strong base	ITU (2025)
Digital skills – advanced	38%	46–60%	Weakness in high-order skills	ITU (2025)

Table 6  
**Social and Demographic Indicators (Ukraine–EU Migration System)**

Sub-dimension	Indicator	Ukraine	EU-27	Interpretation	Sources
Demographic scale	Pre-war population	41.17m	447m	Scaling baseline	Ukrstat (2022)
	Forced migrants abroad	5.62m	–	13.7% of population	UNHCR; Eurostat
EU absorption	Ukrainians under temporary protection	4.2m	–	Largest in EU history	Eurostat
	Main host countries	DE 1.2m; PL 987k; CZ 371k; ES 236k	–	Spatial concentration	Eurostat
Labour integration	Employment rate	64%	≈71%	7 pp gap	SEIS (2025)
	Education level	~70% tertiary	33% EU avg	High-skilled outflow	UNHCR
Economic effects	Fiscal contribution	PL +PLN 15.1bn; CZ +4.4bn CZK; SK +0.1–0.2% GDP	–	Net positive	BGK; CZ Gov
Demographic profile	Gender	87% women (2022–2023)	–	Alters labour supply	UNHCR
	Median age	–	30.5 years	Young inflow	Eurostat
Financial behaviour	Card spending abroad	USD 485m/month	–	Integration effect	NBU
Return dynamics	Definite intention to return	30–35%	–	Long-term demographic loss	UNHCR; REACH

Table 7  
**Environmental Indicators**

Indicator	Ukraine	EU-27	Notes	Sources
Renewables share	9.7%	≈32%	Slow transition	IEA (2024); OECD (2024c)
Energy intensity	2–2.5× EU	1×	High inefficiency	OECD (2024c)
CBAM readiness	Initial stage	Full	High exposure	EC (2024)

Sectoral indicators add structural depth to the empirical dataset. Table 8 summarises the performance of key export-driven and institutionally relevant sectors.

Regional indicators highlight spatial heterogeneity relevant for convergence modelling.

Growth forecasts provide the macroeconomic framework for IGCS scenario modelling. Table 10 shows the full set of World Bank projections.

Convergence benchmarks from Central-Eastern European economies provide a structural reference for realistic long-term scenarios.

Table 12 summarises risk-adjusted vulnerability indicators integrated into the IGCS econometric model as exogenous controls.

The indicators form a coherent and methodologically consistent empirical system that is aligned with the theoretical structure of the IGCS model. The dataset captures Ukraine's short-term post-shock recovery; persistent institutional and demographic constraints; sector-specific strengths in IT and agriculture; and long-term vulnerabilities shaped by external risks. The evidence base enables the IGCS framework to

Table 8

**Sectoral Indicators**

Sector	Indicator	Ukraine	Benchmark	Sources
IT	Export volume	6.4–6.45 bn USD (2024)	Slight decline from 2022 peak	DOU (2024)
	Export geography	US 37.2%, EU 35.8%	Advanced-market concentration	DOU (2024)
Agriculture	Export volume	24.7 bn USD (2024)	~59% of total exports	Media Center Ukraine (2025)
	CAP alignment	~74%	High sectoral alignment	CMU (2024)
Transport	Freight volumes	~97 Mt (2024)	Corridor stabilisation	World Bank (2025a)
Industry	R&D investment	0.3%	Insufficient for upgrading	OECD (2024a)

Table 9

**Regional Indicators**

Region	Specialisation	Notes	Sources
Lviv	IT cluster	Leading digital hub	World Bank (2025b)
Kyiv	High-value services	Central node in services GVCs	World Bank (2025b)
Dnipro / Donetsk	Industry	Strategic but damaged capacity	World Bank (2025b)

Table 10

**Growth Forecasts (2022–2027)**

Region/Country	2022	2023	2024	2025	2026	2027
ECA	1.5	3.7	3.7	2.4	2.4	2.7
ECA excl. RU	3.3	3.5	3.4	3.3	3.3	3.7
Central Asia	4.5	5.6	5.7	5.9	5.0	4.6
Central Europe	5.0	1.0	2.4	2.5	2.6	2.7
Eastern Europe	-20.0	4.6	3.1	1.9	1.8	3.4
South Caucasus	7.3	3.8	5.7	3.7	3.3	3.1
Western Balkans	3.5	3.5	3.6	3.0	3.1	3.6
Russia	-1.4	4.1	4.3	0.9	0.8	1.0
Türkiye	5.4	5.0	3.3	3.5	3.7	4.4
Poland	5.3	0.1	2.9	3.2	3.0	2.9
Ukraine	-28.8	5.5	2.9	2.0	2.0	5.0

Source: World Bank (2025a)

Table 11

**CEE Convergence Benchmarks vs Ukraine**

Country	GDP per capita at EU entry (% of EU avg)	After 15–20 years	Drivers	Sources
Poland	51% (2004)	78% (2023)	Cohesion funds, export-led growth	IMF (2025b); WB (2023)
Romania	39% (2007)	76% (2023)	IT expansion, EU funds, FDI	OECD (2024c); WB (2023)
Estonia	58% (2004)	90% (2023)	Digitalisation, strong governance	OECD (2024b); Estonian Government (2025)
Ukraine	25% (2021)	29–38% (2040)	Reform absorption, IT/agro upgrading	EC (2024); CMU (2024)

Table 12

**Risk-Adjusted Vulnerability Indicators**

Risk	Estimated global GDP impact	Transmission to Ukraine	Sources
Geopolitical fragmentation	−0.5% to −2% (to −7% adverse)	Trade/FDI diversion, sanctions spillovers	WEF (2025c); IMF (2025a)
Energy/climate shocks	−0.3% to −1% annually	Price volatility, CBAM pressure	EC (2025); Cevik (2022)
Financial instability	−0.5% to −2%	Capital outflows, high borrowing costs	IMF (2023); IMF (2025a)
Tech restrictions	−0.5% to −1.5%	Limited access to advanced tech	Amano & Lee (2024)
Cyber risks	−0.5% to −1%	Infrastructure disruption	WEF (2025b); ENISA (2025)

quantify the restructuring gaps that must be addressed for Ukraine to converge with the EU economic model.

### 5. Operationalisation and Pilot Calculation of the IGCS Framework

In consideration of the limitations inherent to a single-country comparative framework, and the absence of a comprehensive panel for econometric estimation, the objective is not to generate a definitive ranking, but rather to illustrate that the proposed framework produces internally consistent and interpretable results. The pilot follows standard composite-index practice used in multidimensional assessments by international organisations and applies a transparent sequence of steps: construction of an indicator system, normalisation onto a common 0–100 scale, aggregation of indicators into dimension scores, and computation of the final IGCS using theoretically justified weights. The aim of this is to identify the structural domains where acquis-driven reforms should prioritise economic restructuring.

The five-dimensional architecture of the IGCS is preserved throughout the operationalisation. The macroeconomic dimension encompasses post-shock recovery and openness; the institutional dimension reflects acquis implementation, rule-of-law quality and regulatory maturity; the innovation dimension integrates R&D effort and digital capacity; the social dimension covers human development, STEM orientation and labour-market performance; and the environmental dimension represents progress in the green transition and CBAM readiness.

#### 5.1. Indicator system and normalisation strategy

The pilot computation has been implemented for two units of analysis: Ukraine and the EU-27 aggregate. For each IGCS dimension, a small set of representative indicators is selected from Section 4 in order to strike a balance between theoretical coverage and parsimony. Macroeconomic performance is captured by real GDP growth, GDP per capita expressed as a percentage of the EU-27 average, export openness, and the EU's share of total trade turnover. Institutional performance

is captured by acquis implementation, the World Governance Indicators' rule-of-law percentile, and a synthetic measure of sectoral regulatory maturity. Innovation capacity is represented by R&D expenditure as a percentage of GDP, the proportion of IT in services exports, the ITU Digital Development Index, and the proportion of the population with advanced digital skills. The social dimension incorporates the Human Development Index, the proportion of tertiary students studying STEM subjects, and the aggregate employment rate. Environmental performance is represented by the share of renewable energy in final energy consumption, relative energy intensity (with an EU value of 1.0) and a coded indicator of CBAM readiness.

To ensure that the resulting scores are not an artefact of an overly narrow benchmark, normalisation does not rely solely on the Ukraine–EU-27 pair. Instead, each indicator is mapped onto a normative range that approximates the lower and upper bounds that are plausible and have been observed in broader European and global distributions. For percentage- or index-type variables, this range is close to the theoretical interval [0; 100]. For scale variables, such as real GDP growth, R&D intensity or energy intensity, it reflects economically meaningful minima and maxima (e.g., deep recession versus high but sustainable growth, or very low versus very high energy inefficiency).

Formally, for each indicator  $i$  and country  $c$ , with raw value  $X_{i,c}$ , and normative bounds  $X_i^{\min}$  and  $X_i^{\max}$ , the normalised value is computed as follows.

For **positive-direction** indicators (higher values imply greater competitiveness):

$$N = \frac{(x - \min)}{(\max - \min)} * 100 \quad (4)$$

For **negative-direction** indicators (higher values imply lower competitiveness, e.g., energy intensity):

$$N = \frac{(\max - x)}{(\max - \min)} * 100 \quad (5)$$

There are two advantages to the choice of normative bounds. Firstly, it prevents a score of zero being assigned to Ukraine in areas where the EU-27 is close to the empirical maximum, which would exaggerate the difference and downplay partial progress. Secondly, it

places the IGCS within a broader comparative context. Rather than being interpreted against a single best performer, Ukraine's scores are interpreted relative to a plausible range of outcomes. The full normalised matrix is retained in the spreadsheet but is not reproduced here for brevity. Instead, the analysis proceeds directly to the results at dimension level.

## 5.2. Dimension scores and composite IGCS

The dimension scores are obtained by taking the arithmetic mean of the normalised indicator values for each of the five IGCS dimensions. For a given country  $ccc$  and dimension  $ddd$  containing  $kdk\_dkd$  indicators, the score is defined as:

$$N_{dimension} = \left(\frac{1}{k}\right) * \sum N_i \quad (6)$$

The composite IGCS is then computed as a weighted average of the five dimension scores, using the weights derived from the Analytic Hierarchy Process described in Section 2.3. These weights reflect the analytical emphasis placed on the macroeconomic and institutional pillars as the primary drivers of convergence, while the innovation, social, and environmental dimensions play a complementary yet essential role:

$$IGCS_c = 0.25 * N_{macro_c} + 0.25 * N_{inst_c} + 0.20 * N_{inno_c} + 0.15 * N_{soc_c} + 0.15 * N_{env_c} \quad (7)$$

The resulting dimension scores and composite IGCS values for Ukraine and the EU-27 are summarised in Table 13. To facilitate interpretation, the table also reports the relative convergence gap, which is defined as Ukraine's IGCS percentage shortfall from the EU-27 benchmark:

$$Gap_{UA} = \left(\frac{IGCS_{EU27} - IGCS_{UA}}{IGCS_{EU27}}\right) * 100 \quad (8)$$

The dimension score profile directly maps the restructuring requirements across the institutional, environmental, innovative, macroeconomic and social domains. The pilot reveals a convergence gap of 42–43%, with Ukraine's IGCS standing at 40.8 (57% of the EU-27's 70.9). The institutional and environmental dimensions are the weakest, lagging by over 40 points, driven by gaps in enforcement and low renewable

energy/high energy intensity. Macroeconomic and social scores (in the mid-40s) strike a balance between recovery and income/welfare deficits. Meanwhile, innovation (at an intermediate level) offsets low R&D spending thanks to IT strengths, though it remains below EU levels. Shifting from purely pairwise normalisation (Ukraine vs EU-27) to a broader normative range is critical for interpretability. This raises Ukraine's scores in weak areas from zeros to low but meaningful values while maintaining the qualitative message of substantial structural differences. In other words, the IGCS no longer indicates an "absence of competitiveness" in the institutional and environmental domains, but rather signals relative underperformance within a realistic global spectrum.

## 5.3. Conceptual validation of the convergence mechanism

The convergence mechanism embedded in the IGCS framework is validated through congruence testing. This is a method commonly used in comparative political economy to evaluate whether the empirical profiles and computed scores are consistent with the theoretical propositions articulated in Section 2 and the descriptive evidence in Section 4. Three core hypotheses are scrutinised. Firstly, the framework posits that the implementation of the *acquis* and the quality of the rule of law jointly constitute the central channel of competitive convergence, thereby aligning Ukraine's regulatory and institutional environment with the EU Single Market. The empirical evidence in Tables 2 and 4 indicates high formal *acquis* alignment (around 77.5 per cent), but a relatively low rule-of-law percentile score of 37.7, suggesting significant gaps in enforcement. The institutional dimension score of 42.5 in Table 13 aligns with this pattern, being higher than that of a failed or non-reforming state yet markedly below the EU-27 level of 86.4.

Secondly, the framework hypothesises that Ukraine's innovation capacity is driven by a small but influential IT services sector that compensates, to some extent, for chronic underinvestment in R&D. Section 4 reveals a low R&D-to-GDP ratio of 0.3%, alongside a high IT share of services exports (around 37%) and solid, albeit not exceptional, digital indicators. With a score of 45.0, Ukraine's innovation performance

Table 13

### Dimension scores, IGCS values and convergence gap (normalised scores 0–100)

Unit of analysis	Macroeconomic	Institutional	Innovation	Social	Environmental	IGCS	Gap vs EU-27 (%)
EU-27	66.6	86.4	60.7	58.8	78.0	70.9	0.0
Ukraine	44.0	42.5	45.0	44.8	23.3	40.8	42.5

Note: Dimension scores are arithmetic means of normalised indicators within each IGCS dimension. IGCS values are computed using the weights 0.25 (macroeconomic), 0.25 (institutional), 0.20 (innovation), 0.15 (social) and 0.15 (environmental). Scores are rounded to one decimal place; the reported gap is calculated from unrounded values.

reflects this mixed profile: while it exceeds the country's environmental score and is comparable to its macroeconomic and social scores, it falls substantially short of the EU-27 value of 60.7.

Thirdly, the conceptual model highlights environmental and energy transition gaps as critical long-term constraints on competitiveness under the European Green Deal and CBAM regime. Evidence from Table 7 shows that Ukraine's environmental score is 23.3, compared to 78.0 for the EU-27. This is due to Ukraine's renewables accounting for just 9.7 per cent of its energy mix, compared to roughly 32 per cent in the EU-27, its energy intensity being more than twice the EU level, and its initial-stage CBAM readiness. It is the largest interdimensional disparity in Table 13, which supports the hypothesis that the green transition lag is not a marginal issue, but rather a structural component of the competitiveness gap.

Overall, the congruence between theoretical expectations, descriptive evidence, and the outcomes of the pilot IGCS suggests that the framework has strong internal validity. The index responds as expected to observed strengths (IT exports and a macroeconomic rebound) and weaknesses (institutional enforcement and energy intensity). This confirms that it can serve as a robust analytical tool for future applications with more data, including econometric testing, once a longer time series is available.

## 6. Discussion

The pilot IGCS results offer a structured perspective on Ukraine's competitiveness trajectory within the context of post-war recovery, EU accession and the restructuring of Ukraine's economy through *acquis* implementation. With a composite score of 40.8 points compared to 70.9 points for the EU-27, a dual reality emerges. On the one hand, Ukraine is not positioned at the bottom of the global spectrum: its macroeconomic, social and innovation scores are firmly in the mid-range, reflecting substantial resilience, human-capital depth and digital strengths. Conversely, the residual 42–43 per cent convergence gap is predominantly characterised by institutional and environmental deficits that cannot be addressed solely by means of growth acceleration.

From the perspective of endogenous growth and new institutional economics, these results align with the argument that institutions and governance quality are foundational to sustained convergence. The combination of relatively high *acquis* transposition with weak rule-of-law enforcement and heterogeneous sectoral regulation reinforces the distinction between "formal alignment" and "functional convergence". The IGCS institutional score captures this asymmetry: Although Ukraine has progressed far beyond a low-governance baseline, it remains far from the institutional plateau of the EU-27. Without decisive improvements in judicial

independence, contract enforcement, and regulatory predictability, the risk of macroeconomic recovery evolving into "growth without structural convergence" increases, which would impede the restructuring necessary for alignment with EU production, regulatory, and climate regimes.

The innovation and social dimensions highlight the mixed nature of Ukraine's current trajectory. The innovation score reflects the discrepancy between Ukraine's impressive IT export performance and its chronically underfunded R&D systems. This situation is reminiscent of certain earlier stages of Central and Eastern European (CEE) convergence, where niche specialisations in high-value services coexisted with weak domestic innovation ecosystems. The social score, which is driven by relatively high human development but strained by war-induced migration, labour-market disruptions, and demographic pressures, indicates that although human-capital advantages remain substantial, they are vulnerable to erosion if outflows persist.

Environmental performance is identified as the most critical long-term vulnerability. The low environmental score confirms that alignment with the European Green Deal and CBAM will require regulatory changes and large-scale investment in energy efficiency, renewable energy sources, and industrial modernisation. Failing to do so risks Ukraine becoming entrenched in a "brown" competitive profile that is incompatible with the EU's evolving industrial and climate policy regimes. The IGCS corroborates policy analyses that treat the green transition as a core component of export competitiveness and access to the Single Market, rather than a peripheral environmental issue. Under EU membership, the environmental dimension becomes a core restructuring frontier.

When Ukraine's IGCS profile is considered alongside the convergence benchmarks in Table 11, it suggests that a CEE-style convergence path is feasible, albeit not guaranteed. The experience of Poland, Romania and Estonia shows that sustained growth, institutional development and the intensive use of EU funds can reduce income and competitiveness disparities over a period of 15–20 years. However, Ukraine is entering this trajectory from a lower income level and is under the additional burden of war damage, demographic loss, and heightened external risks, as documented in Table 12.

Policy implications include: 1) prioritising judicial and enforcement reforms as critical at a macro level; 2) broadening innovation beyond IT through investments in R&D and education; 3) integrating green transitions into reconstruction to align with the CBAM/Green Deal; 4) framing migration policies to incentivise returns and leverage diaspora skills to improve competitiveness. Table 10's growth projections imply a range of scenarios. The optimistic scenario, which assumes sustained growth and accelerated

reforms, could narrow the IGCS gap significantly within a decade. In contrast, the adverse scenario, which assumes security risks, incomplete reforms and energy shocks, could sustain the gap despite growth. The framework quantifies and compares alternatives using richer data, but does not resolve uncertainties.

## 7. Conclusions

The article presents a multidimensional framework for evaluating Ukraine's economic restructuring through *acquis* implementation, in the context of EU accession and post-war reconstruction. Based on the conceptual and methodological principles outlined in Sections 2 and 3 and the empirical evidence presented in Section 4, the article introduces the Index of Global Competitiveness Strength (IGCS) as an integrated measure that links macroeconomic performance, institutional quality, innovation capacity, social resilience, and environmental sustainability within a single analytical framework. The IGCS is positioned as a practical tool for guiding and sequencing restructuring policies.

The pilot calculation in Section 5 shows that the IGCS is technically feasible and substantively informative, even when data is limited. By employing a normative normalisation scheme and theoretically grounded weights, the index avoids artefacts of narrow benchmarking whilst maintaining a clear competitiveness hierarchy. The resulting scores confirm that, while Ukraine exhibits strong elements of macroeconomic resilience and digital specialisation, persistent institutional and environmental deficits dominate the convergence gap.

The IGCS's principal contribution lies in its tailored design for a post-conflict, pre-accession economy. Unlike generic global indices, it explicitly incorporates war-related demographic shocks, sectoral restructuring,

and the specific regulatory demands of the EU *acquis* and CBAM. This makes the framework particularly suitable for policy analysis in Ukraine, and it could potentially be transferred to other accession and neighbourhood countries facing similar structural challenges, with appropriate adaptation.

The limitations include the cross-sectional snapshot, which restricts dynamic analysis and causal inference; the single-country EU-27 comparison, which raises questions about broader applicability; and the weighting structure, which is susceptible to refinement through sensitivity analysis. Future research should therefore focus on three areas. Firstly, assembling a multi-year panel of IGCS-compatible indicators for Ukraine and a set of comparator countries would enable the econometric testing of the relationship between the implementation of the *acquis*, institutional quality, and competitiveness outcomes. Secondly, extending the framework to create a dynamic IGCS would enable scenario analysis of alternative reconstruction and accession paths, taking into account external shocks and policy choices. Thirdly, integrating micro-level data more deeply – for instance, firm-level productivity, innovation, and export behaviour – would strengthen the index's explanatory power and support more granular policy design.

Despite these limitations, the IGCS provides a coherent and empirically grounded instrument for analysing Ukraine's competitive convergence with the European Union that is also relevant to policy. It translates complex structural realities into a format that informs strategic decisions on reconstruction, reform sequencing, and integration into the Single Market. It also provides a solid foundation for future empirical and comparative work and offers a structured pathway for Ukraine's economic restructuring to integrate into the EU Single Market.

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