

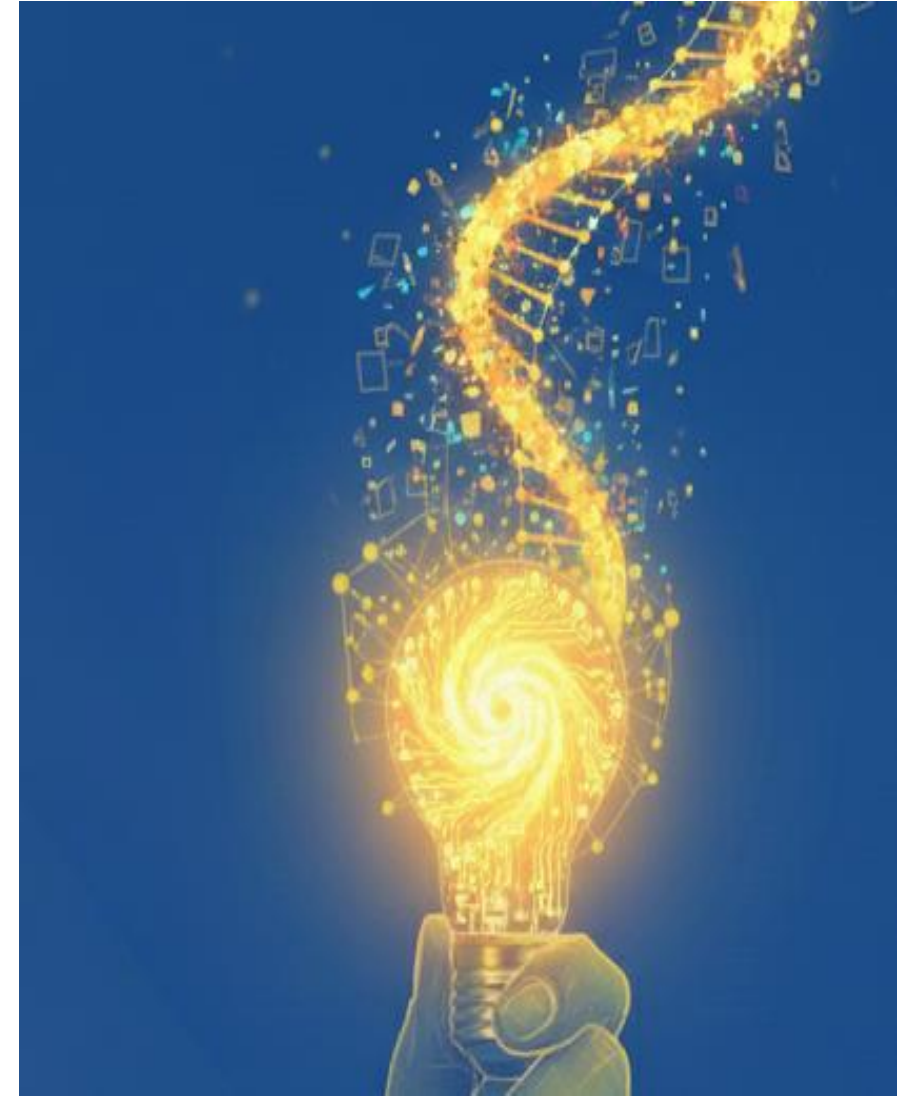
# Innovation

*Strengthening Ukraine's innovation ecosystem to accelerate innovation-driven productivity growth*

## Ukraine Economy of the Future

June 2026

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# SUMMARY MESSAGES (1/2)

## 1. Innovation-driven productivity is critical for the economy of the future

- For faster growth and EU income convergence, **Ukraine needs to increase its productivity.** Its total factor productivity (TFP) growth would have to increase from 1.3% pre-war average to 5% in the high growth-reform scenario which would enable Ukraine to reach 25% of average EU GDP per capita income levels (the level of Poland pre-EU accession) in 15 years.
- Innovation is a key driver of productivity**, and the productivity gap between innovative and non-innovative firms is larger in middle-income countries compared to high-income ones.

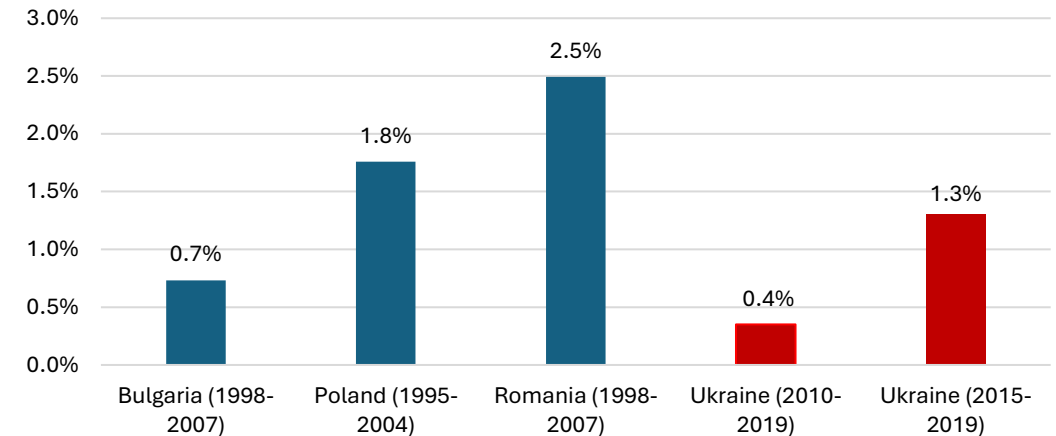
## 2. Innovation involves reaching and pushing the production/technological frontier

- Innovation encompasses both adoption (reaching frontier) and new product/process innovation (pushing the frontier forward).
- Whether a country is able to move to the PPF and later push it out depends on the strength of its innovation ecosystem:** fundamentals, organizational capabilities, knowledge supply/creation and enablers. The ecosystem in turn is shaped by government policies.

## 3. Ukraine's innovation performance exhibits a dual character.

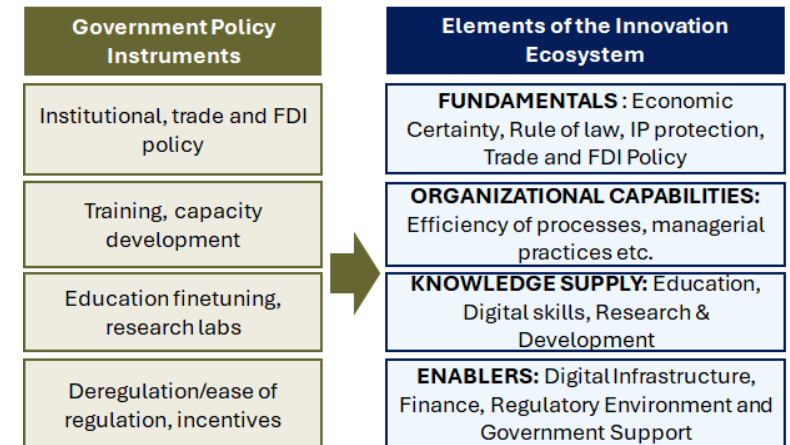
- Systemically, it remains weak (at ~29% of EU average) and behind other regional peers.** A small, globally connected IT sector coexists with a large base of SMEs and large enterprises that lag behind even in digitalization.
- At the same time, **wartime necessity and urgency** and **exceptional sector-specific factors** has catalyzed islands of “frontier” innovation in **Govtech, FinTech (digital payments) and Defense tech** that innovate and iterate rapidly. These successes have often been enabled by **targeted, ad hoc government policies/interventions**, including temporarily lighter regulation, that have led to rapid innovation but may be at odds with EU acquis alignment required for accession and difficult to sustain post war.

Average TFP Growth in the 10 years before EU accession



Source: Penn World Tables 10

## Innovation Ecosystem Elements



World Bank analysis

# SUMMARY MESSAGES (2/2)

**4. To make these successes replicable across the broader economy, the Government needs to make systemic improvements to the innovation ecosystem:**

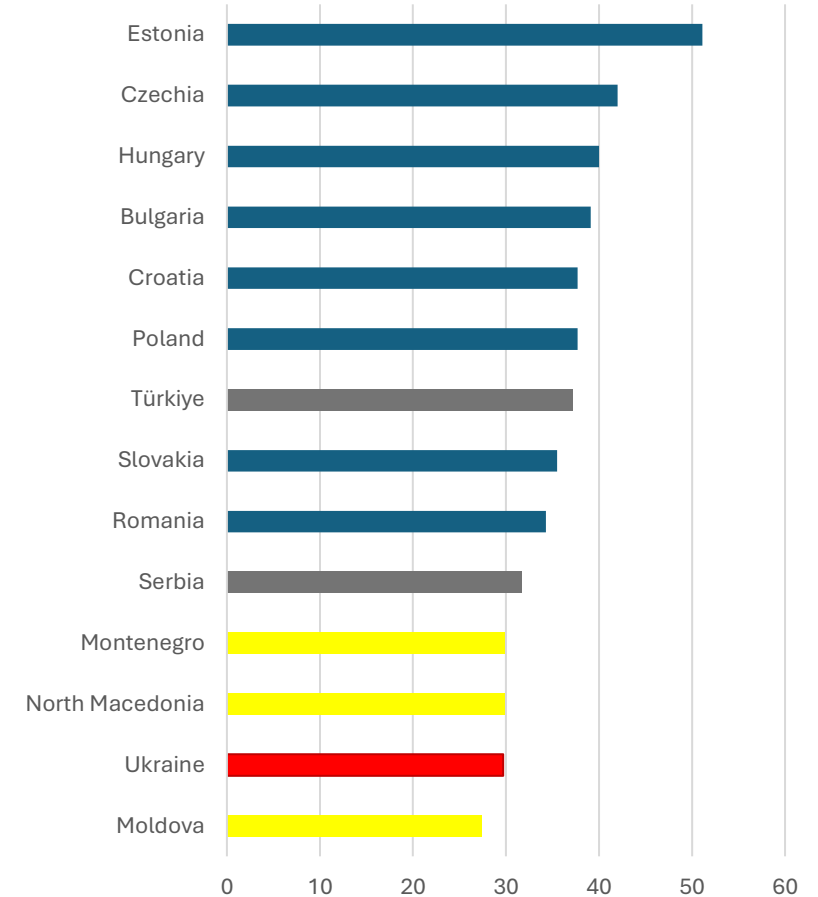
- (i) Strengthen the fundamentals** to lower risks for investments in innovation (anticorruption, rule of law and the intellectual property rights protection, FDI strategy);
- (ii) Enhance knowledge creation** (improve STEM learning outcomes, strengthen university research-firm linkages, improve quality of public R&D expenditures, foster international scientific linkages, and maintain a strong digital skills base);
- (iii) Improve the “enablers” of digital infrastructure, innovation finance, innovation-specific regulations and state support** (address cybersecurity risks and gaps in connectivity, facilitate access to start-up capital, VC funds and growth capital, and target government support to scalable innovative firms).

*Estonia is a regional example of how it has risen to the EU’s top innovation tier due to deliberate policy choices in R&D, higher education, and digital transformation.*

**5. Strengthening the innovation ecosystem will enable firms to take advantage of new opportunities for rapid innovation during reconstruction and EU accession.** Reconstruction will create new urgencies, demand-side drivers and opportunities for ‘ad hoc’ support (e.g., reconstruction-related public procurement). Alignment with the EU Acquis will bring standards that can help drive innovation (especially technology adoption).

6. The objective of accelerating innovation should be reflected consistently across the range of government strategies, including **the new FDI and industrial strategies** being developed by the GoU with WBG assistance, as well as the **WINWIN innovation** and the national **Digital Infrastructure and AI strategies**. FDI and industrial policy instruments should be designed to promote knowledge transfer, technology adoption and innovation.

**Global Innovation Index 2025 for CEE countries and EU candidates (incl. suspended), score**



Source: World Intellectual Property Organization  
Note: The timeliest available data is used. Most indicators assessed on 2022-2023 data.

# CAVEATS AND AREAS FOR FURTHER ANALYSIS



## DATA CAVEATS

**Innovation, both for new products and adoption of existing technologies, is not fully reflected in state statistics and even by targeted surveys.** For instance, while not all SMEs have a traditional website, many of them may have social media landing pages that fully substitute the functionality, yet are often not covered in survey questions. Lack of new patents also does not necessarily mean lack of new product/process innovation.

**Firms' organizational capabilities, while being an important factor in private sector innovation ability, are difficult to measure and even the proxies used for their assessments (share of professional managers, education level of top management etc.) are not available for Ukraine over the last years.** Thus, this element of the Innovation ecosystem is not analyzed in-depth.



## FUTURE ANALYTICAL WORK

- 1. Innovation promotion as part of the Industrial Strategy, including industrial innovation specifically (subject to data availability).**
- 2. Additional analysis to separate policy recommendations for innovation as creation v. innovation as adoption.**
- 3. Separate analysis for national v. regional innovation ecosystems (subject to data availability).**
- 4. Deeper and broader analysis of global examples of policies that successfully helped foster innovation.**

# OUTLINE

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1

**The innovation imperative:** *Innovation-driven productivity improvements will be key to sustaining high growth*

2

**Where Ukraine stands today:**

- 2.1 *Case studies of Ukraine's success: GovTech, FinTech, DefenseTech*
- 2.2 *Benchmarking and duality of Ukraine's innovation activity*

3

**Ukraine's Innovation Ecosystem – strengths and gaps:**

- 3.1. *Fundamentals required to lower long-term risks*
- 3.2. *Knowledge creation as a critical innovation input*
- 3.3. *Innovation-specific enablers and incentives*

4

**What would it take for Ukraine?** *An emerging policy agenda to strengthen the Innovation Ecosystem, drawing from global/regional lessons (the case of Estonia)*

1

# The Innovation Imperative

Innovation-driven productivity improvements will be key to sustaining high growth

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# Innovation covers more than only new products and processes; adoption of existing technologies that improve competitiveness are also treated as innovation



## INNOVATION

Technologies or practices deployed and then diffused in a new context:

**! What is not used is not an innovation**

**! These are not necessarily new technologies globally**

## EXAMPLES OF INNOVATION

NEW BUSINESS MODELS

PATENTS / INTELLECTUAL PROPERTY  
GENERATION

NEW AND IMPROVED PRODUCTS AND  
SERVICES

PROCESS INNOVATION

NEW / IMPROVED MANAGERIAL  
PRACTICES

# Both adoption and creation of new technologies are crucial for middle-income countries to increase productivity ...

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## The World Bank World Development Report (WDR 2024):

- **Three key stages for development:**

- i) **investment** [for low-income countries]

- ii) **adoption** of existing technologies and business practices [for lower- and upper-middle-income countries]

- iii) **creation of new technologies** to push global frontiers [for lower- and upper-middle-income countries]

**Innovation is a key driver of productivity**, and the productivity gap between innovative and non-innovative firms is even larger in middle-income countries compared to high-income ones.

# ... which is key for faster growth and EU convergence for Ukraine.

## Ukraine's previous growth is insufficient for rapid EU convergence:

- Ukraine's GDP p.c. growth (2016-2021, constant USD): **2.5% p.a.**
- EU's GDP p.c. growth (2016-2021, constant USD): **1.5% p.a.**
- Ukraine's GDP p.c. in 2024: **12.5% of EU average**
- **Reaching 25% of average EU GDP per capita (Poland in 2004) would take more than 30 years**

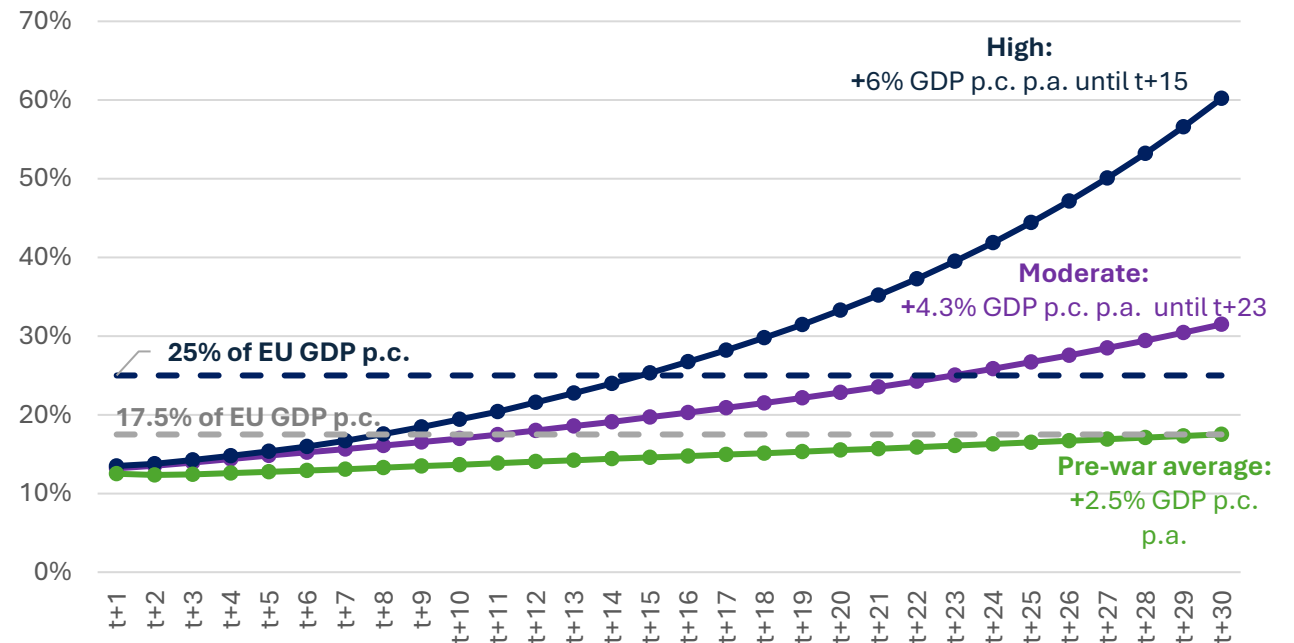
## Faster convergence (23 years with moderate and 15 years with high reform effort) requires a *strong* improvement in growth drivers

- **Significantly faster TFP growth:** From 1.3% pre-war average to 3.3% (more than 2x) in the moderate-reform scenario and 5% (more than 3x) in the high-reform scenario
- **Conducive labor dynamics: Positive net migration** (1.7 million in the moderate-reform, 3.3 million in the high-reform scenario), **lower unemployment, increased labor force participation, and improved demographic dynamics.**
- **Significant increase in investment (particularly private)** from 16% of GDP (pre-war average) to 19% in the moderate-reform scenario and 24% in the high-reform scenario (consistent with reconstruction needs).

## Average growth rates from t+1 to t+15 in constant USD:

- **Pre-war:** GDP grows **1.9%** p.a., GDP per capita grows **2.5%** p.a.
- **Moderate scenario:** GDP grows **3.9%** p.a., GDP per capita grows **4.3%** p.a.
- **High scenario:** GDP grows **6.0%** p.a., GDP per capita grows **6.0%** p.a.

## Ukraine's GDP per capita under different growth scenarios (% of EU's average GDP per capita)



Note: The growth figures are in constant USD and assume 5% deflator growth and 5% depreciation per year  
Source: WB team calculations

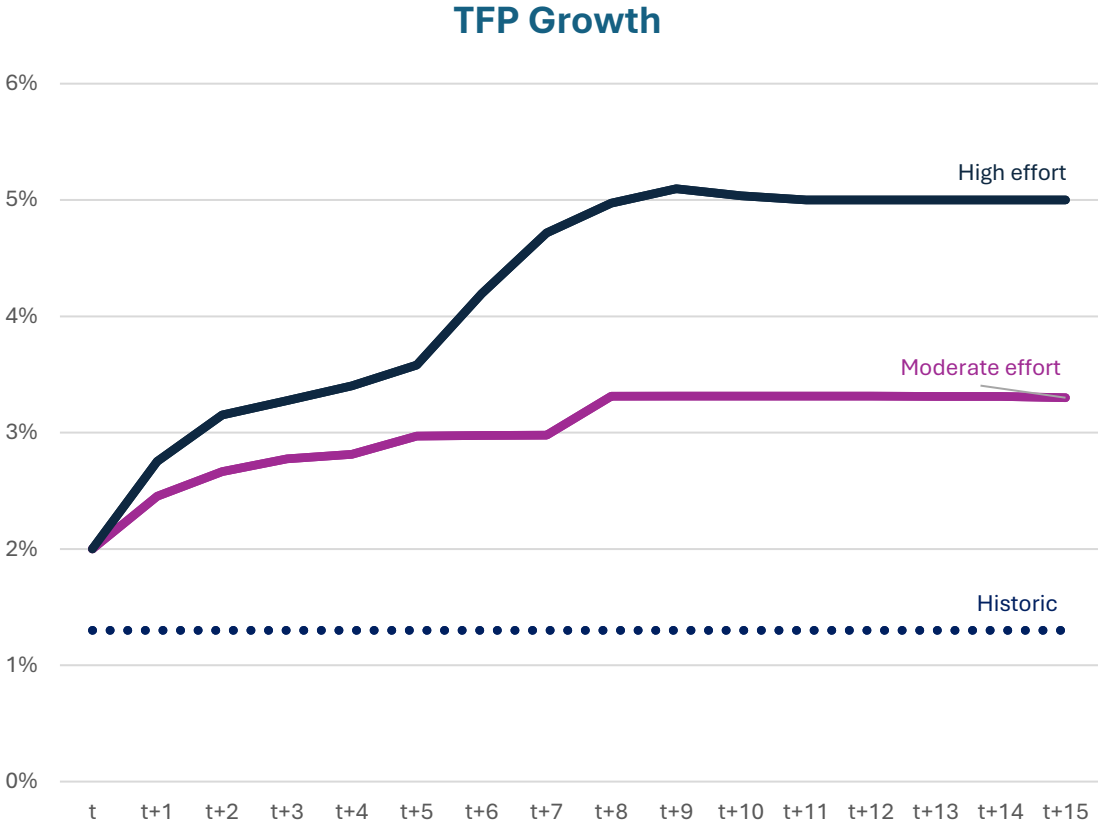
# Faster convergence requires more than doubling total factor productivity (TFP)

TFP growth measures how efficiently Ukraine uses labor and physical capital in generating economic output (GDP).

**Historic/pre-war growth scenario:** Average 2015-2019 growth in TFP: 1.3%

**Moderate growth-reform effort scenario:** TFP growth of 2.5% in t+1, then gradual increase to a steady state of 3.3% by t+8, approximately doubling of recent pre-war TFP growth to lowest EU peer (Romania)

**High growth-reform effort scenario :** Initial rapid catch-up TFP growth to 2.8% in t+1 and more than 3% in t+2, then gradual increase to a steady state of 5% by t+8, more than tripling of recent pre-war TFP growth to Baltic levels peers (Estonia, slightly higher than Latvia and Lithuania)



Source: WB team calculations

# Why innovation matters even more in the current global context and for Ukraine?

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## Global technological trends

- The digitalization wave, advances in AI, and faster progress across multiple fields are creating new opportunities and reducing barriers to entry (especially for innovative ICT solutions).

## Geopolitics/defense need

- Being in a military confrontation with a country that has seven times the population, the key advantage to rely on is technological superiority.

## Investment constraints

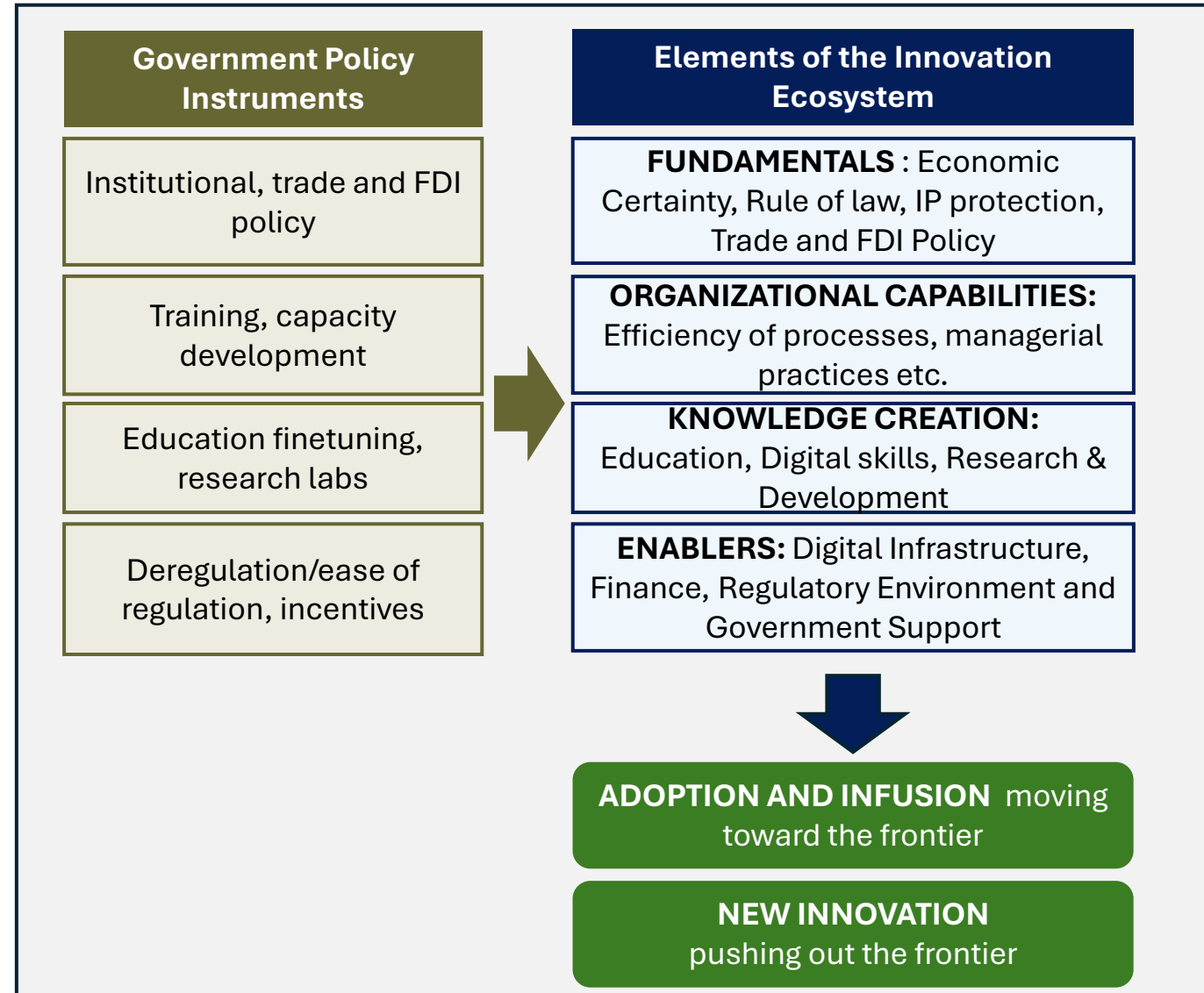
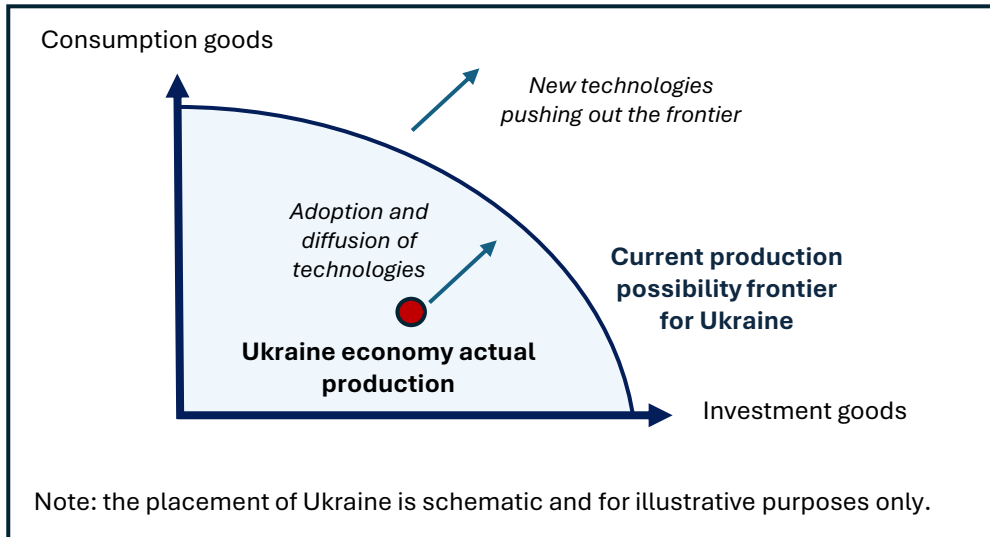
- Financing constraints could limit investments/physical capital accumulation during recovery and reconstruction so that innovation-driven productivity is also needed as a growth driver.

## Labor challenges

- Ukraine's aging population and wartime factors (refugees, internally displaced people (IDPs) and mobilization) has created acute labor shortages. These labor supply challenges will persist post-war, so innovation-driven productivity is critically needed as a growth driver.

# The strength of Ukraine's *Innovation Ecosystem* will determine how much it can move towards the production-possibility frontier and go beyond

- A country's position in terms of productivity levels can be illustrated by its **position on the production-possibility frontier (PPF)** - see below. **Adoption** of existing technology can help move the country toward the PPF, while **new** technologies can help push the PPF out further.
- **Whether a country is able to move to the PPF and later push it out depends on the strength of its innovation ecosystem:** fundamentals, organizational capabilities, knowledge supply and enablers. This ecosystem in turn is greatly shaped by government policies.
- **Achieving frontier status is not the finish line** – staying there requires sustained investment and sound government policies.



## 2 Where Ukraine stands today

2.1 Case studies of Ukraine's success: GovTech, FinTech, DefenseTech

2.2 Benchmarking and duality of Ukraine's innovation activity

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# Govtech (1/2): Ukraine has become a high performer in Govtech since 2019

## What Ukraine did

### Built a comprehensive Diia ecosystem:

- Diia App: 23M+ users, 28 digital documents, 30+ services.
- Diia Web Portal: 130+ digital government services.
- Diia.Business: 130+ SME tools
- Diia.Education: 2.4M+Users for digital skills.
- Diia.City: Legal/tax regime attracting 1,560+ tech companies.
- Diia.Engine: Low-code open-source platform for rapid service deployment.

Established a national **Chief Digital Technology Officer (CDTO) network** ensuring coordinated, citizen-centric delivery.

### Shifted to wartime digital resilience:

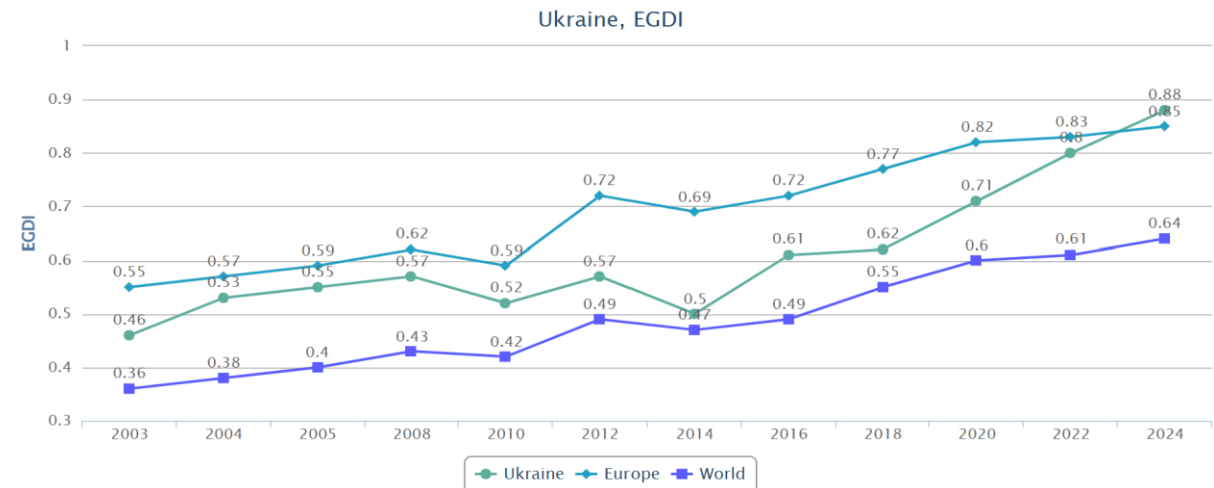
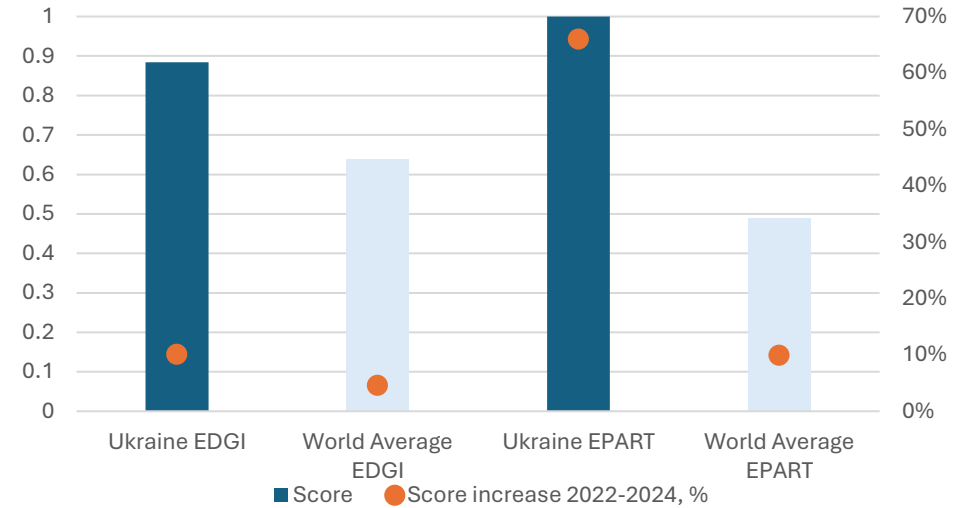
- eAssistance: Financial aid to millions of displaced.
- eVorog: Secure reporting of enemy movements.
- eRecovery: Digital housing repair & compensation.
- eMarriage: Remote marriage service (TIME Best Invention 2024).

**Strong strategic foundations & iterative processes:** Digital Agenda, National AI Strategy, Win-Win Strategy.

**Strengthened Digital Public Infrastructure:** Trembita\* interoperability, cloud, cybersecurity, CDTO Campus.

\*System which ensures the interaction and secure data exchange between state registers and information systems

## Ukraine's performance in E-Government Development and E-Participation Indices



Source: <https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/180-Ukraine>

# Govtech (2/2): Frontier-pushing innovation becoming possible due to whole-government approach and strong demand for efficiency and digitalization

## Factors enabling technology adoption and innovation

### FUNDAMENTALS

Macroeconomic stabilization in 2016-2019

Digitalization as part of state anticorruption policy

**State monopoly:** Virtually non-existent risks related to IP protection and antitrust

### ORGANIZATIONAL CAPABILITIES & KNOWLEDGE CREATION

Strong IT specialists base in the economy

Continuous engagement with IT businesses, trainings, hackathons

### ENABLERS

Donor financial support enabling employment of top IT specialists

Active state-enabled expansion of 4G in 2019-2021

Regulation continuously finetuned to promote adoption

Whole-government involvement (CDTOs, Law to recognize digital ID), new innovation-oriented team

Strong demand for efficiency and digital documents (especially amid COVID-19) and state services

Ecosystem endowment

State policies

Exogenous factors

## Outcomes

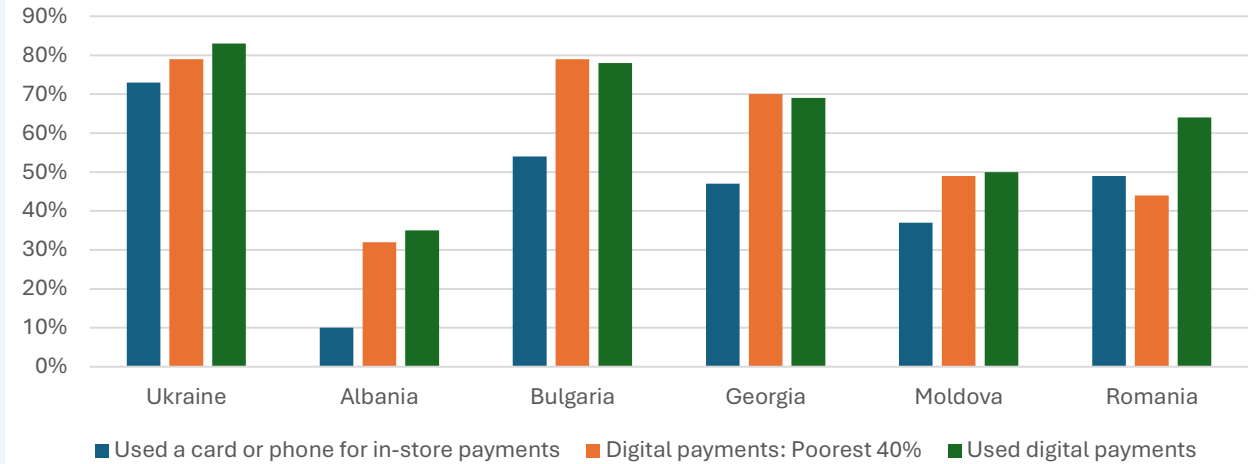
- **E-Gov Development Index (82th to 30th in 2024);** #1 globally in E-Participation; #5 in Online Services.
- Among top Eastern European performers in e-government readiness.
- **23M+ active users of Diia services, >150 services available.**
- Ministry of Digital Transformation: Since 2020 “Diia” delivered an **economic and anti-corruption benefits totaling UAH 184 bn:** time savings, fiscal effects due to online public administration, savings on bribes to receive support and services etc.



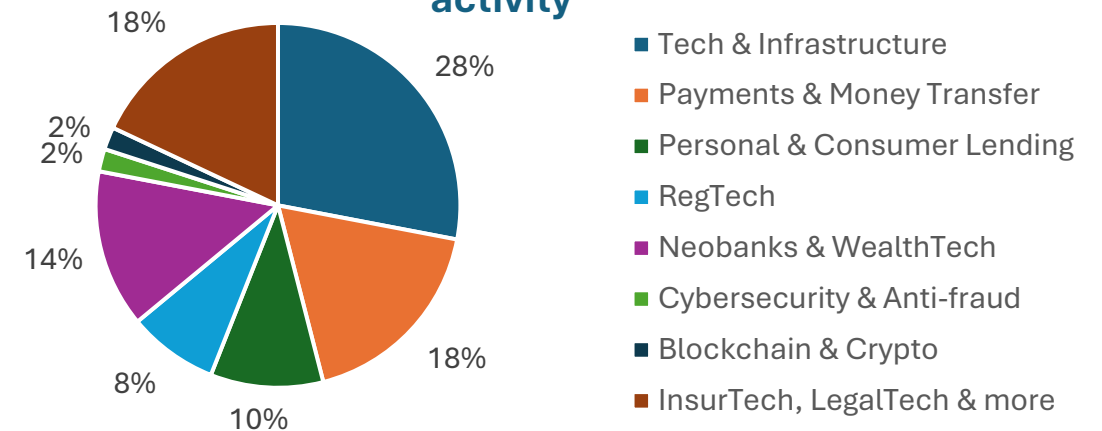
# Digital finance (1/2): Ukraine has made important steps toward developing cashless economy, with higher digitalization of payments than in comparable economies

- **Ukraine has achieved high cashless and contactless payments adoption.** COVID and then the war accelerated the shift away from cash, but the underlying infrastructure to enable this shift was built over the prior years.
- **Strong banking and financial sector foundations:** Reforms undertaken since 2014 ensured the creation and maintenance of an independent and strong central bank, as well as a stable financial sector, with **EU accession** providing the legislative and regulatory guidance for further development.
- Most **Ukrainian fintech firms are concentrated in 3 areas:** technological infrastructure, money transfer and consumer lending.
- The NBU has made **substantial regulatory strides** related to digital finance:
  - ✓ Open banking legal framework adopted, aligned with EU's revised Payment Service Directive (PSD2);
  - ✓ e-KYC and
  - ✓ Regulatory sandbox launched and operational.
- The NBU's **award-winning BankID system** passed a preliminary EU-compliance assessment, enabling remote identity verification across financial services. This system builds upon the broader Diia ecosystem.

Selected Digital Financial Services indicators



Fintech Ecosystem Overview 2025, # of firms by area of activity



Source: <https://digitalfinance.worldbank.org/country>, Ukraine Fintech Catalog 2025, Ukraine Fintech Association (UAFIC), 2025

# Digital finance (2/2): The success that scaled due to extensive institutional and market reforms, as well as strong consumer demand

## Factors enabling technology adoption and innovation

In late 2000s-early 2010s the market started developing organically with little oversight and intervention from the Regulator. Some of the key participants to date (e.g. EasyPay) were created in those years.

**Macrofinancial stabilization** in 2016-2019

**Successful prosecutions of past violations in banking sector**

**Strong Regulator (National Bank of Ukraine) and high market entry barriers** ensure only compliant firms on the market

**Strong STEM and Economics graduates base** in the economy

**Continuous engagement of the Regulator** with banks, universities

After the **clean up of the financial sector 2014-2016** the remaining players showed strong performance and adopted international managerial practices

**Projects funded inhouse**, primarily using ample profits in the sector

**Active state-enabled expansion of 4G** in 2019-2021

**Regulations and infrastructure related to Diia**

Strong **demand** for efficiency and digital payments (especially amid COVID-19)

Ecosystem endowment

State policies

Exogenous factors

## Outcomes

- **Account ownership stands at 88%** according to World Bank FINDEX.
- **94.6% of card transactions cashless in 2024.**
- **95% of POS transactions contactless/NFC.**
- Around **260 fintech companies** now operate in Ukraine, with 7 new entrants in 2024 despite the war.
- **Total Fintech market value is estimated at \$1.5 billion**, employing approximately 17,400 employees.



Source: [Ukraine Fintech Catalog 2025](#), Ukraine Fintech Association (UAFIC), 2025; “[Operations with Payment Cards in 2025](#)”, NBU, 2026

# Defense tech (1/2): Defense & dual use has shown how Ukraine can get to the frontier of innovation

## 1. The full-scale invasion led to a massive scale-up of defense local production

- On-budget defense spending > 30–35% of GDP (60-70\$ bn).
- Ammunition, drones, medical services and technologies are key expenditures.
- Rapid localization: ~70%+ of procurement is now sourced domestically, including drones and ammunition.

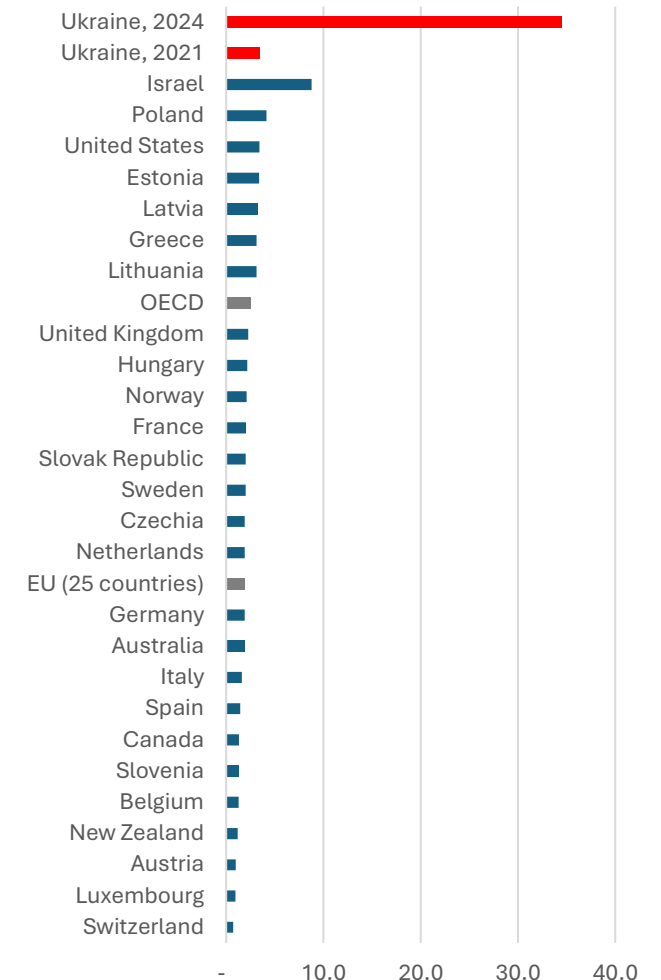
## 2. Strong demand and state support created a strong innovation pull

- Initial conditions were not ideal: limited historical R&D funding, a fragmented ecosystem, low pre-war industrial capacity (~\$1bn), and weak IP protection.
- However, **wartime demand and urgency**, large-scale defense procurement and many skilled civilians who wanted to contribute to the war effort created a strong innovation pull.

**3. A highly agile and competitive ecosystem was created through government programs and a lighter regulatory environment** with simplified testing and battlefield admission procedures. There are now hundreds of startups, engineers, and manufacturing teams. These are closely linked with the military to **enable fast feedback loops** (design → battlefield testing → deployment) that leads to upgrading of technologies.

- **Brave1** - a coordination platform providing organizational, informational and financial support to **early-stage private companies** developing innovative defense technologies (1,500 developers and 3,600 defense-tech solutions, facilitation of over \$85 million in private investment);
- **DOT** - defense procurement agency, established as part of **procurement reform** to separate policymaking from purchasing functions and equipped with a developed internal anti-corruption and compliance infrastructure; **DOT-Chain Defence** is a **digital procurement platform** enabling military units to directly order defense products from manufacturers.

## Military Expenditure in OECD and EU compared to Ukraine, % of GDP



Source: WB WDI, for 2024, here are only on-budget expenditures for Ukraine  
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# Defense tech (2/2): Innovation was driven by large stable public demand, government policies to create a highly competitive ecosystem and strong human capital

## Factors enabling technology adoption and innovation

## Outcomes

### FUNDAMENTALS

**Stable large public demand** – predictable government purchases provided market signals and scale for domestic producers

**Typical IP issues have not materialized yet**, as strong emphasis put on diffusion

**Corruption risks exist**, but the GoU has been addressing them through **reforms** of the **military public procurement system** and regulatory simplification

### KNOWLEDGE CREATION & ORGANIZATIONAL CAPABILITIES

Strong historical **STEM base** – large pool of technical graduate, engineers, IT specialists

**Knowledge exchange across the ecosystem** – collaboration between military units, engineers, startups, international partners and manufacturers.

### ENABLERS

**Brave 1 coordinated support to early-stage private companies** and **DOT-Chain digital procurement systems** mitigated against procurement bottlenecks.

**Simplified licensing and regulatory flexibility** enabled rapid entry of new firms, prototyping and deployment.

Ecosystem endowment

State policies

Exogenous factors

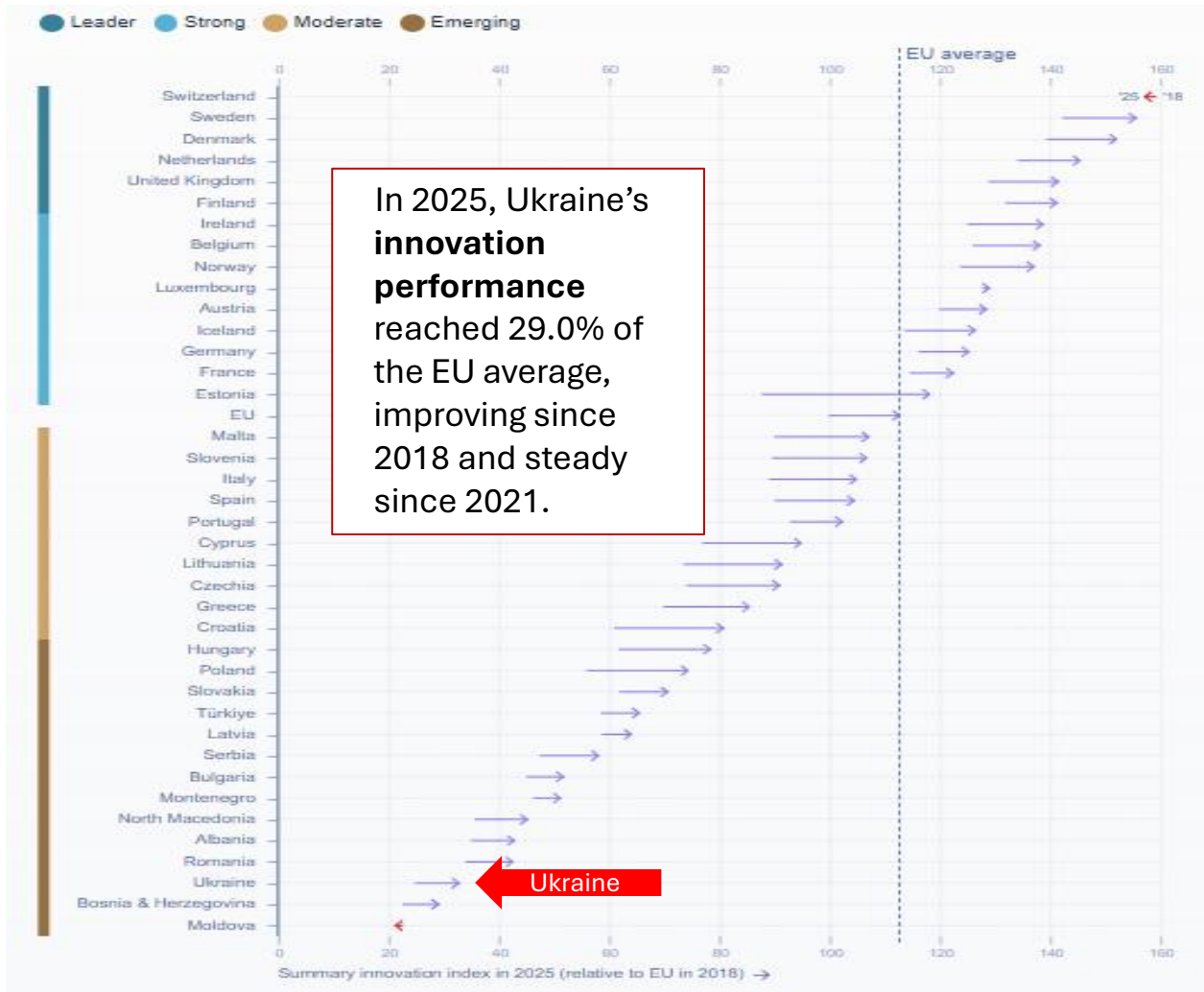
- **Ukraine has become a global leader** in drone warfare and battlefield innovation
- The **local defense tech market** reached ~\$6.8bn in 2025, with rapid growth in the drone sector.
- Not all capacity is being utilized. Total **domestic industry potential output** is now estimated at \$35–40bn, with significant **export potential** in cutting-edge solutions.
- **Product innovation complemented by new managerial approaches** in military units rely on data-driven decision-making and technologies.
- **Multiple high-quality integrated technological solutions** have been developed and can be potentially exported.

**BRAVE<sup>1</sup>**  
MARKET

**DOT**

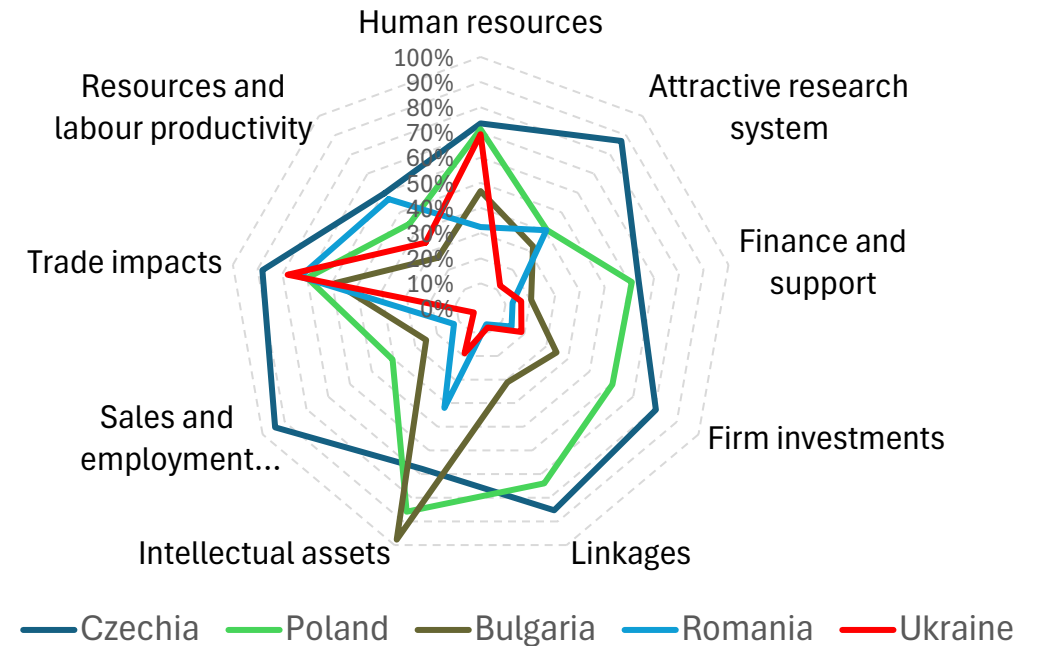
# However, various composite indices show that Ukraine currently lags all EU and many non-EU peers in terms of aggregate innovation performance

European Innovation Scorecard, 2025



Source: European Commission

European Innovation Scorecard, 2025  
Innovation Index Score by Pillar, Selected CEE economies (Indexed to the EU average = 100%)



According to the European Innovation Scoreboard, Ukraine demonstrates relatively strong performance in Human Resources and Trade Impacts, while lagging significantly in areas such as the Research System, Finance and Support, Firm Investments, Linkages, and Intellectual Assets compared to peers.

Source: European Innovation Scoreboard 2025, World Bank analysis

# Despite some prominent successes, Ukrainian SMEs generally struggle with digitalization and wider adoption of technologies, as well as product innovation

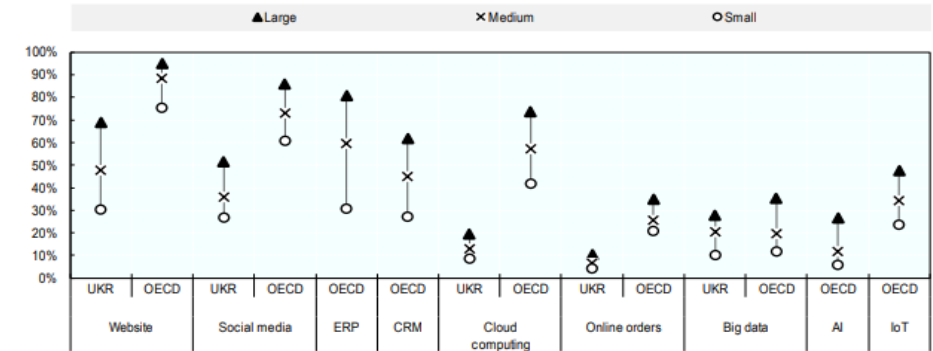
- **Pre-war headline evidence pointed to uneven firm capabilities:** only 24% of firms offered formal training to their full-time employees, and digitalization lagged, especially among SMEs (30% of small firms had websites\* vs. 70% of large ones).
- In the years leading up to the invasion, Ukraine’s digital economy and exports were expanding, largely due to provision of **IT outsourcing services** – although number of product firms is comparable to that of outsourcing.
- **The war has spurred some digital adaptation,** as 41% of surviving firms adopted digital platforms, and online sales now account for 10% of retail, but most SMEs still struggle with incomplete digitalization and limited technology absorption.
- **Majority of firms did not innovate:** 33.4% of firms introduced an innovative product or service, while just 13.7% adopted process innovations.
- **A salient duality exists in Ukraine: a vibrant, globally connected IT sector** (45%+ of IT firms collaborate internationally) **coexists with a broad base of SMEs that remain far from the technology frontier.**

\* This however might not be a good representation of the level of digitalization of SMEs. For instance, many small businesses prefer to have social media accounts as their business landing pages rather than pay for developing and maintaining a traditional website.

Source: WBES (2019), World Bank (2023) Ukraine: Firms through the war; OECD (2024) – “Enhancing Resilience by Boosting Digital Business Transformation in Ukraine”; UNDP (2024) - Assessment of the Impact of the War on Micro-, Small-, and Medium-sized Enterprises in Ukraine“, SSSU. Code of Economy 2025.

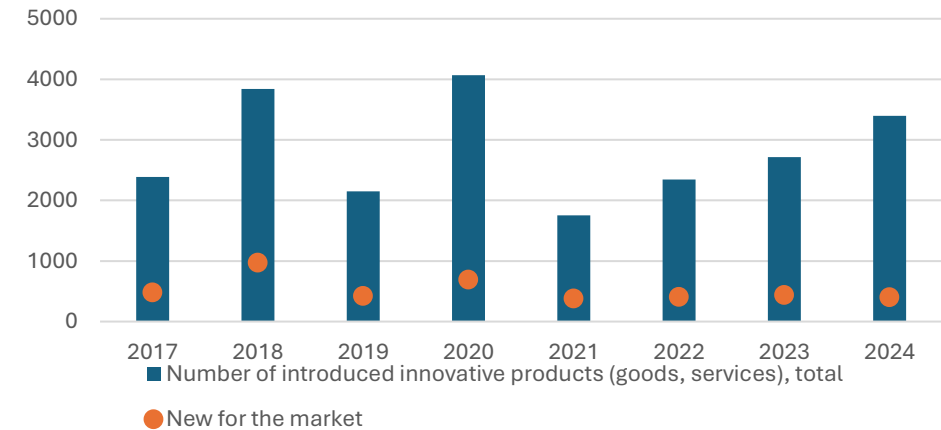
## Diffusion rates of digital technologies, by enterprise size class

Percentage of enterprises using the technology, 2022 or latest year available



Note: Data not available for Ukraine on use of ERP and CRM systems, as well as AI and IoT. Data refer to enterprises with 10 persons employed or more. 2022 data for social media, cloud computing, and online sales for Ukraine; 2021 for websites and big data for Ukraine. 2021 data for OECD values. Adapted from OECD (2021), The Digital Transformation of SMEs. Source: OECD ICT Access and Usage by Businesses Database, Ukrstat.

## Number of introduced innovative products (goods, services)\*

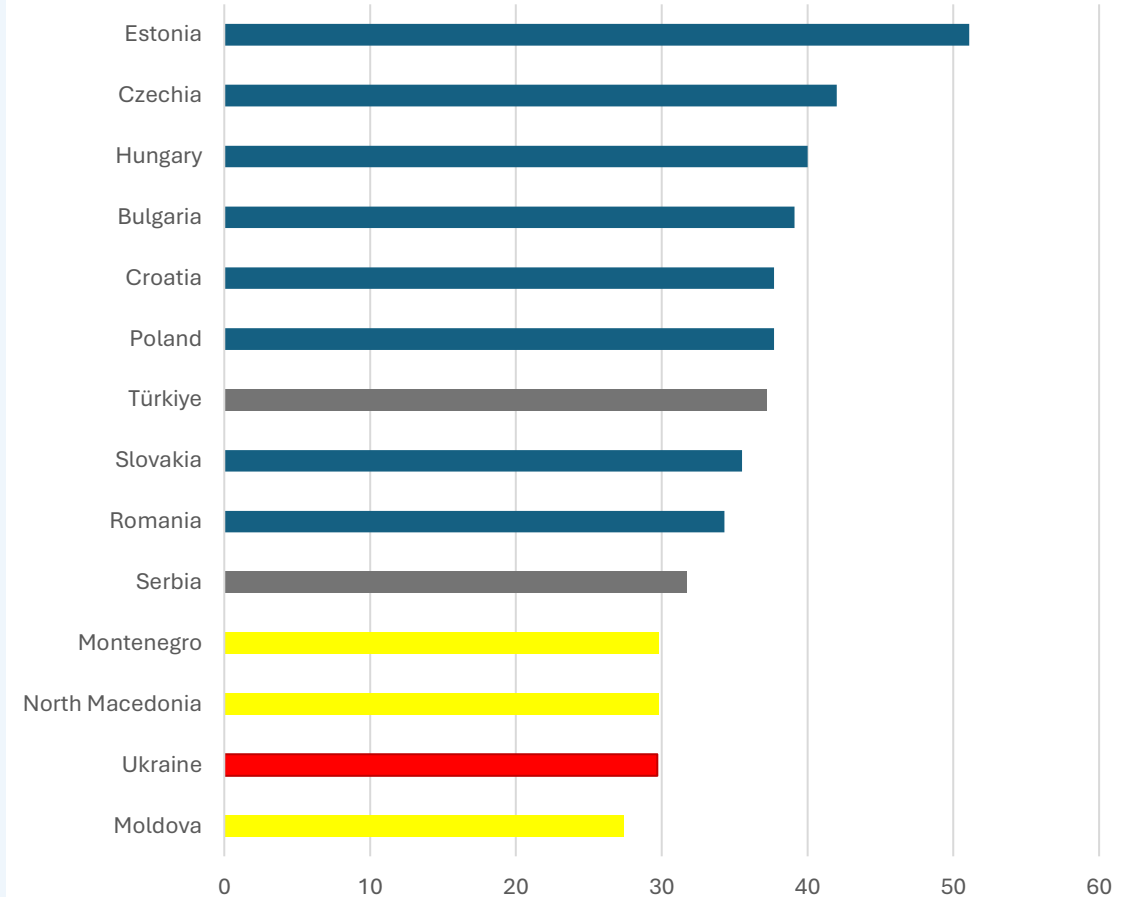


\* Legal entities engaged in industrial activity, with an average number of employees of 50 persons and more. Source: SSSU.

# Summary: Ukraine's unique dual innovation system

- Ukraine's innovation performance exhibits a **dual character: systemically, it remains weak and lower than other regional peers.** It is marked by low R&D expenditure (3 times lower than in Poland as % of GDP), fragile firm – research linkages (proxied by low levels of joint business-academia publishing), and limited patent activity (33% of EU average).
- At the same time, **wartime necessity, strong knowledge endowment in specific sectors (such as IT) and supportive exogenous factors** (e.g. COVID-19 pushed demand for digital payments) **have catalyzed “islands” of cutting-edge innovation in gov-tech, digital payments and defense tech** that innovate and iterate rapidly.
- These islands of innovation has often been enabled by **lighter regulation and adhoc government policies and programs that have led to rapid innovation in the short run but may be at odds with EU acquis alignment** required for accession and may be **difficult to sustain post war** (such as large-scale military procurement and eased regulatory environment in defense sector).
- To make these **successes replicable across the broader economy, the Government needs to make systemic improvements to the “innovation ecosystem.”**

Global Innovation Index 2025 for CEE countries and EU candidates (incl. suspended), score



Source: World Intellectual Property Organization

Note: The timeliest available data is used. Most indicators assessed on 2022-2023 data.

# 3

## Ukraine's Innovation Ecosystem – strengths and gaps

3.1. Fundamentals required to lower long-term risks

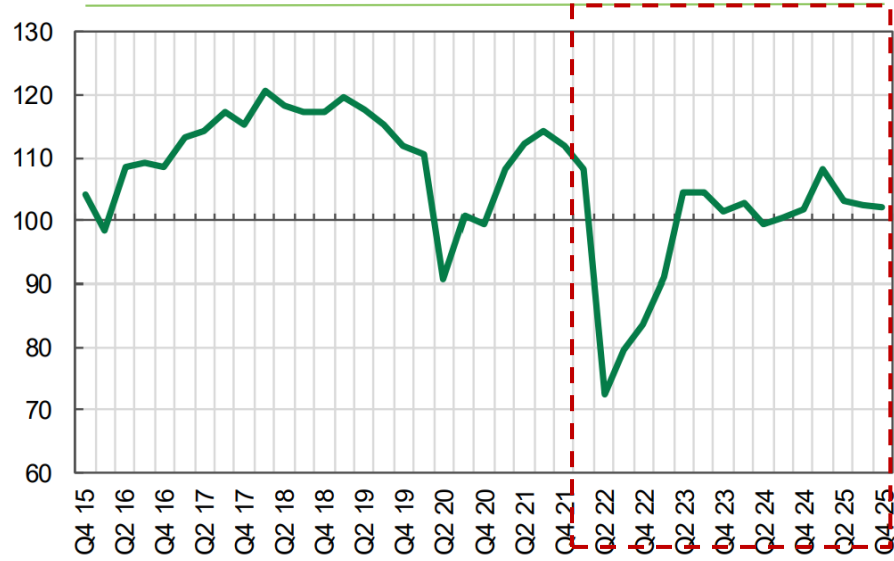
3.2. Knowledge creation as a critical innovation input

3.3. Innovation-specific enablers and incentives

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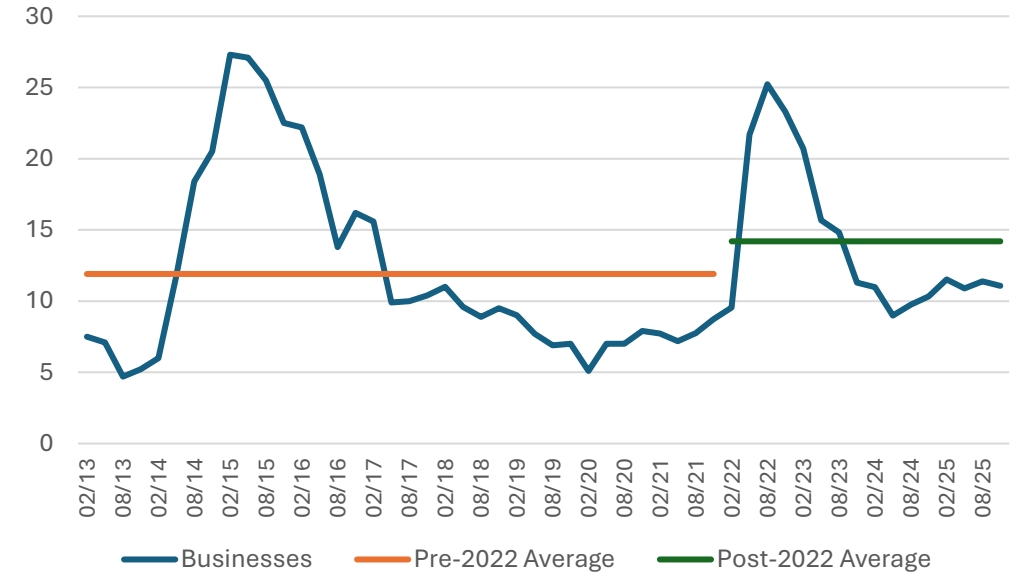
# Fundamentals (1/4): The wartime economy and uncertainty discounts future returns and thereby undermines incentives to invest, including for innovation

### Business outlook index for next 12 months, %



Source: NBU estimates on the basis of survey data

### Inflation expectation by businesses



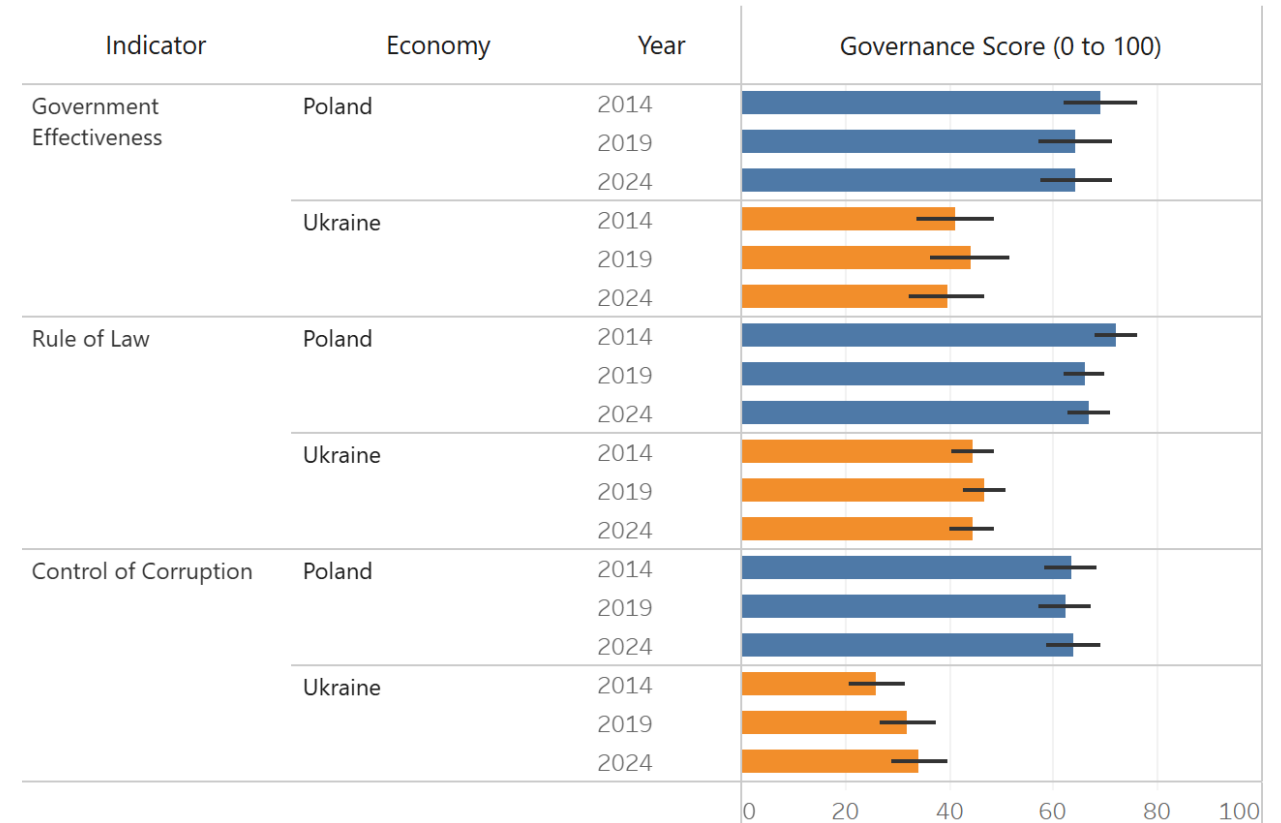
Source: NBU

- **Aggregate uncertainty** continues to define the business environment, amplifying planning uncertainty, shortening investment horizons, and pushing firms toward low-capex, quick-payback projects. Business outlook remains volatile, likely leading to avoidance of systemic investments in personnel and physical capital.
- **Inflation** has been volatile historically and inflation expectations have increased since 2022, which increases the discount rate and uncertainty and reduces returns to innovation.
- Large wartime fiscal deficits **narrow fiscal space for public investments, including for R&D**, while a **current account deficit and related depreciation pressures** and capital controls weighs on foreign investors' investment decisions.

# Fundamentals (2/4): Negative views of corruption, rule of law and investor protection situation in Ukraine increases investors' perceived risks

- In Ukraine, **corruption** is viewed as the leading obstacle to doing business, undermining trust, raising transaction costs, and deterring compliance and full formalization by firms. Businesses identify corruption and **weak judiciary** as 2 out of the top 3 factors discouraging investments (European Business Association, 2025).
- **The rule of law and government effectiveness are perceived as weak**, primarily due to institutional gaps (Ukraine's Worldwide Governance Indicators percentile rank was about 38, indicating a sizable performance gap vis a vis CEE economies).
- **Even after court proceedings are completed, enforcement may take a long time and is not guaranteed.** According to Ministry of Justice of Ukraine, the total amount of arrears arising from court decisions currently pending enforcement exceeded UAH 1 trillion (~USD 24 billion) in 2025.

## Key Worldwide Governance Indicators for Ukraine and Poland



Source: Worldwide Governance Indicators by WBG.  
<https://www.worldbank.org/en/publication/worldwide-governance-indicators>

Note: 90% confidence interval is shown as a thin black line.

# Fundamentals (3/4): The intellectual property rights protection frameworks remain fragmented, uneven, and not complying with best standards

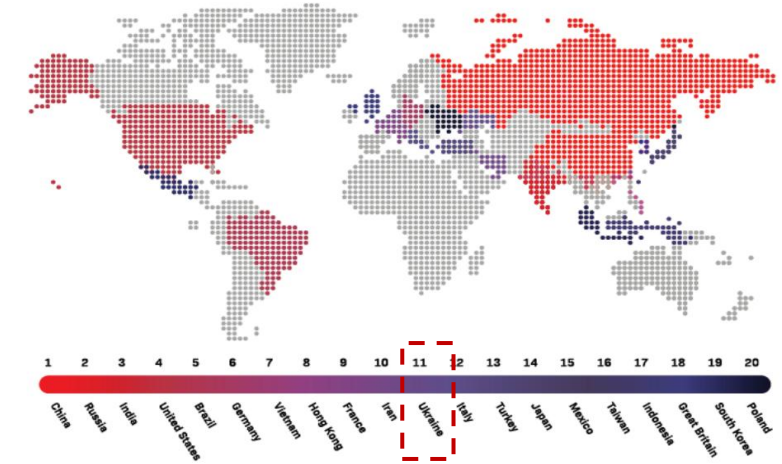
- While pirating may enable some initial diffusion of frontier technology, **lack of formal licensing** prevents establishing direct ties with technology originator and related synergies, and thus causes **foregoing potential knowledge transfers**.
- Ukraine **has often been listed on the Priority Watch List in the U.S.** - compiled for nations having the most significant, unresolved issues regarding IP protection, enforcement, and market access.
- Ukraine started **integrating with the EU Intellectual Property Network's Tools and Common Practices** (including data integration on national trademarks). However, **critical legislative gaps with the EU acquis remain**.
- **Counterfeit** goods for sale in Ukraine estimated at **UAH 126-140 bn** in 2024.

## Intellectual property activity has remained low since 2022:

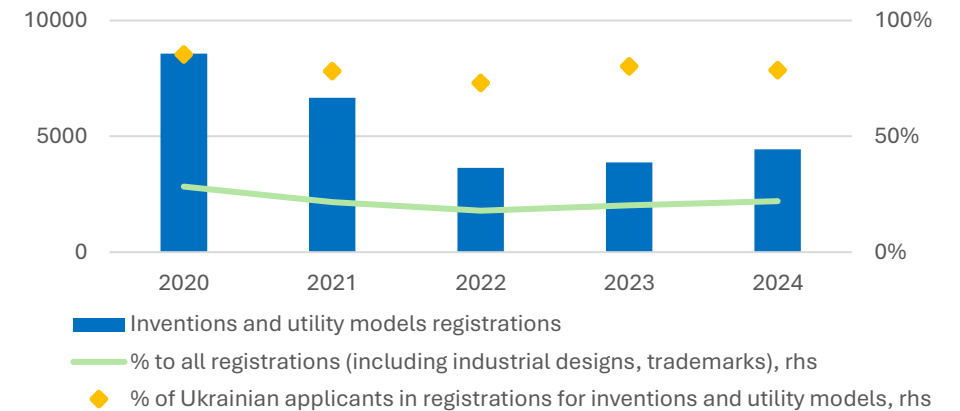
- Innovation-related registrations showed only a modest increase from 2022, with trademarks constituting  $\frac{3}{4}$  of all registrations.
- Invention registration in particular is driven primarily by foreign applicants.
- Ukraine's performance for "patent applications within the Patent Cooperation Treaty" in the European Innovation Scoreboard 2025 was only at **33.3% of the EU average level**, likely reflecting limited interest in filing for IP recognition.

Source: <https://www.revenera.com/blog/software-monetization/software-piracy-stat-watch/>  
[https://nipo.gov.ua/wp-content/uploads/2025/03/IP\\_ofis\\_dashboard\\_2024-web.pdf](https://nipo.gov.ua/wp-content/uploads/2025/03/IP_ofis_dashboard_2024-web.pdf)

## Top 20 software license misuse and piracy hotspots



## Intellectual Property\* activity



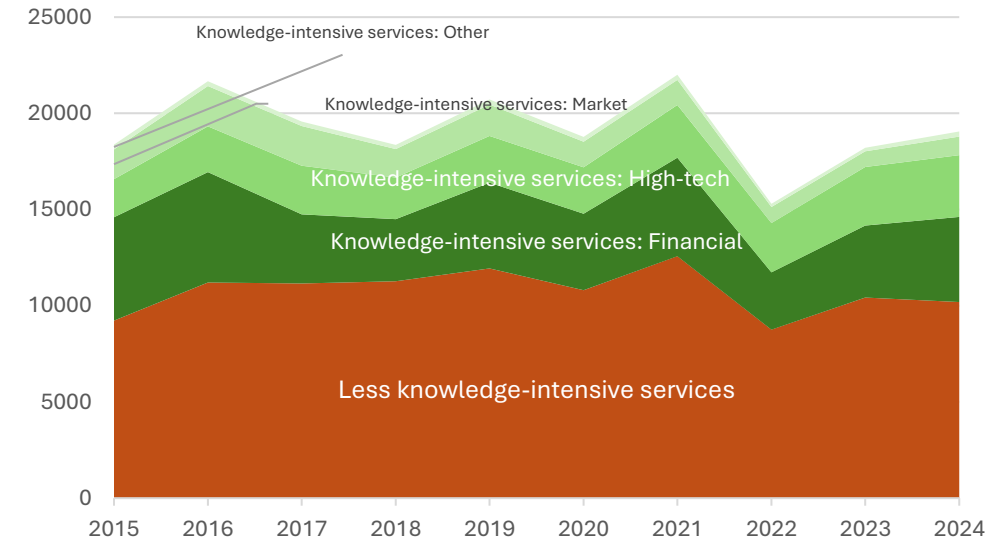
Note: \*Inventions (patents) – new technical solutions;  
Utility models (“petty” patents) – improved technical solutions.  
Industrial designs and trademarks primarily reflect design and branding, not core innovation.

# Fundamentals (4/4): An effective FDI strategy and targeted investment promotion are needed to attract higher-quality FDI and strengthen technology spillovers

- FDI and integration into global value chains remain critical for capital, technology transfer, and productivity gains.
- Ukraine's FDI stock, at around 30% of GDP, is about 10 pps below peers, with inflows still subdued and largely driven by reinvested earnings. The war has further curtailed new FDI despite some announced projects by multinational companies.
- The EU is the dominant source of FDI, supporting deeper integration, but this has not yet translated into stronger gains in export complexity or high-tech intensity.
- Sectoral patterns point to only a gradual shift toward knowledge-intensive activities: low- and medium-low-tech manufacturing still account for the largest share of FDI stock, while around half of services FDI is in knowledge-intensive segments, particularly high-tech and finance, which have continued to expand during the war.
- The Government is developing a new FDI strategy to grow and diversify FDI by 2030.
- More effective investment policy and targeted promotion are needed to attract higher-quality FDI, strengthen technology spillovers, and support upgrading within domestic supply chains.

Source: European Innovation Scoreboard 2025 (EIS2025), WB ("Ukraine: Firms through the War", Nov. 2023)

### Ukraine Cumulative Services FDI Stock by Knowledge Intensity (US\$ millions)



### Role of FDIs for knowledge transfer in Poland

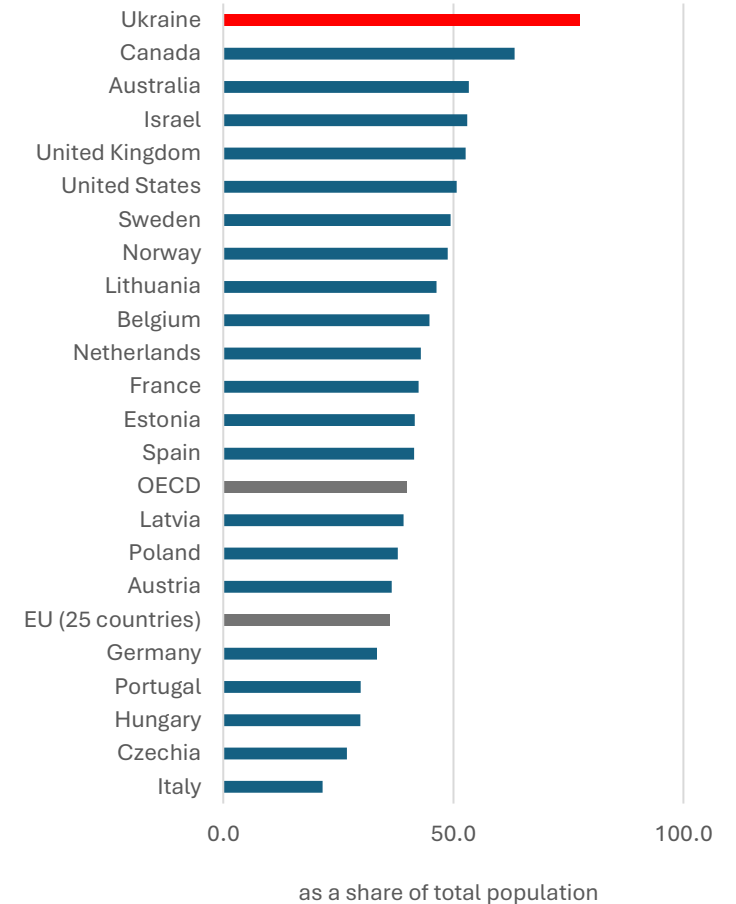
- Foreign MNEs source 68% of their intermediate inputs locally, contributing thereby to the development of the local SME sector, including their technological upgrade.
- Foreign MNEs act as key suppliers for local firms (i.e., forward linkages), providing access to new or higher-quality inputs and enabling knowledge and technology diffusion.

Source: OECD *Strengthening FDI and SME Linkages in Poland*

# Knowledge creation (1/4): Ukraine has high levels of formal educational attainment, but STEM learning outcomes are declining

- **High educational attainment:** Ukraine has a highly educated population with strong tertiary participation (up to 78%).
- **Declining STEM learning outcomes:**
  - **School learning outcomes in mathematics and science are declining**, as are basic literacy skills. PISA results: mathematics 453→441, science 469→450, reading 466→428 (2018–2022), **below OECD average**.
  - **Only six** of Ukraine’s roughly 300 higher education institutions are ranked among the world’s top 1,000 universities in the QS World University Rankings 2023.
- **Reforms have been undertaken in recent years in the education sector but are not yet finished:**
  - **Major education reforms since 2017:** The New Ukrainian School reform is a system-wide school reform, transforming general secondary education to a competency-based, student-centered model.
  - From 2027, the reform envisages a **shift to specialized tracks, enabling students to choose fields of study and gain deeper, more targeted knowledge (e.g in STEM)** to better prepare for higher education or the labor market.
  - **Reforms in professional education** (launched in 2025) increased vocational education institutions’ autonomy and strengthened links with businesses.
  - **Higher education reforms have focused on greater university autonomy and accountability, performance-based financing, consolidation and modernization of HEIs**, stronger labour market relevance, and digital transformation of sector governance, including through the World Bank-supported UIHERP project.

## Tertiary education attainment in OECD and EU compared to Ukraine



Source: OECD, 2023  
For Ukraine - State Statistical Service, 2021

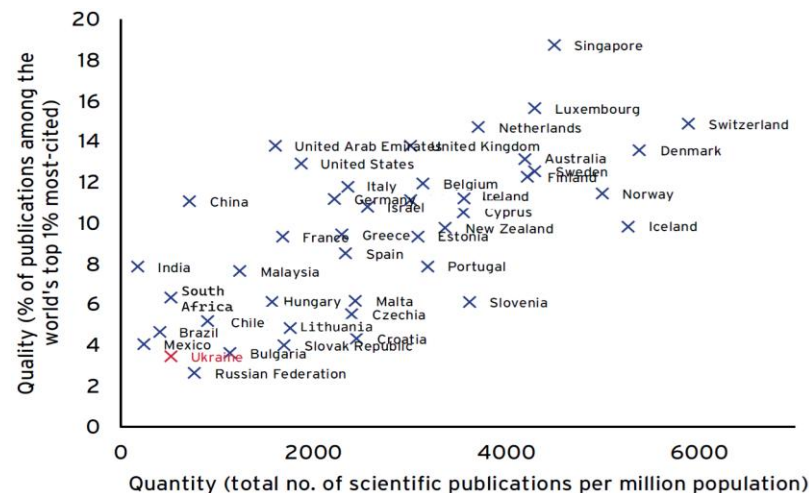
# Knowledge creation (2/4): Low levels of R&D and weak linkages between academia and industry are among factors which lead to low scientific research

**Ukraine's scientific research is far behind leading global research centers, and even regional peers.** Ukraine's scientific research ranks **low in both quantity** (~600–700 publications per million population) **and quality** (~3.5% in the world's top 1% most-cited), significantly underperforming Central and Eastern European peers on both metrics.

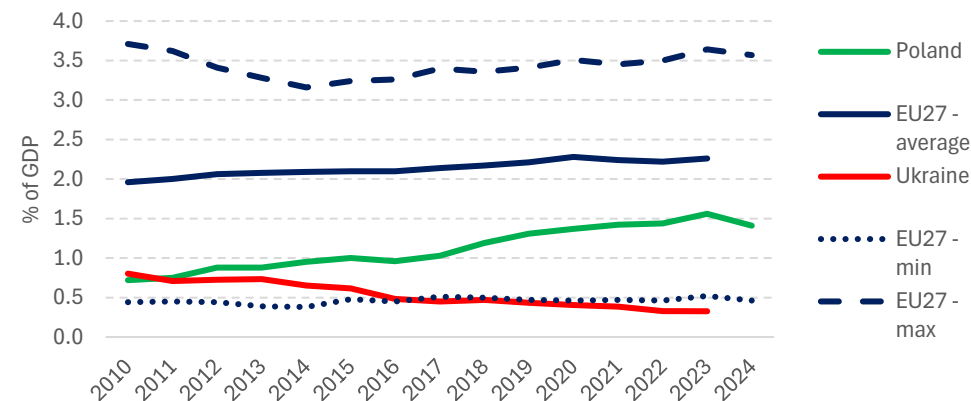
## Factors:

- **Low and declining R&D intensity:** R&D spending fell from 0.8% of GDP in 2010 to 0.33% in 2023 - low by international standards.
- **National Academy of Sciences of Ukraine (NASU) and specialized academies,** despite being largely disconnected from higher education, absorb the **bulk of public R&D expenditure through non-competitive allocation.**
- **Mismatch between where R&D is undertaken and where R&D capabilities sit.** Universities employ most PhD holders, but enterprises account for most R&D spending (~85%). Universities require further investment in capex, R&D and human capital, to become internationally competitive.
- By end-2022, ~10% of researchers had left Ukraine due to war.
- **Academia-industry collaboration in publications** remains low, only at 13.8% of the EU average level of collaboration, according to the European Innovation Scoreboard.
- **Innovation policymaking** in Ukraine was **fragmented across multiple ministries and agencies, with no unified science, technology and innovation framework.** The **WINWIN strategy** aims to improve coordination.

Scientific papers per million population and % of publications among the top 10% most cited



R&D expenditure – Ukraine, Poland and EU27

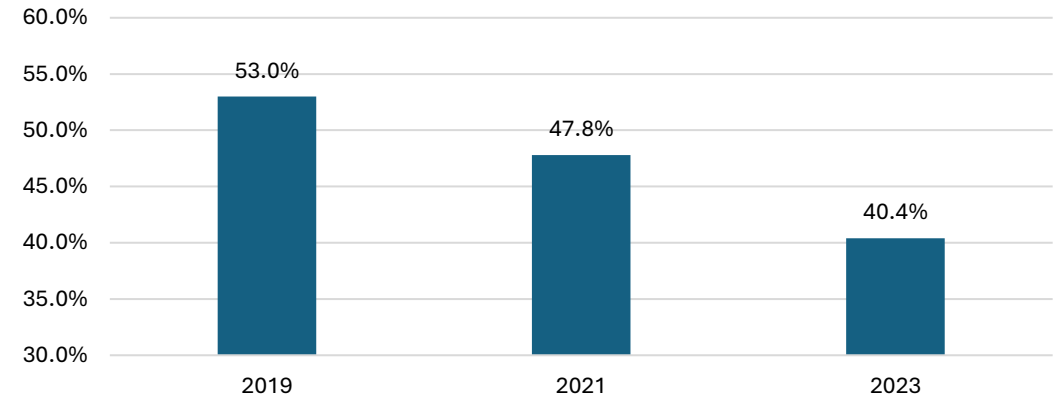


Source: „Innovation for economic resilience: strengthening Ukraine's human capital and science sector”, CEPR, Eurostat, WB Team analysis

# Knowledge creation (3/4): Ukraine has a solid digital skill base due to national digital learning initiatives. Now technology is being used to strengthen education delivery

- **Rapid improvement in digital skills**
  - By 2023, the share of adults with below-basic skills declined to 40.4% (–12.6 pp vs. 2019), while 38% reached advanced levels (+12.5 pp).
  - This progress followed a 2019 assessment showing 53% below basic and 15% with no skills. This notable gap led to the development of **targeted digital education initiatives**.
- **The Government scaled digital skills through a structured national approach**
  - In 2021, Ukraine **integrated digital literacy into state policy** by adopting the Concept for Developing Digital Competences, based on the European DigComp 2.2 framework.
  - A strategic target is to **expand participation in lifelong learning, particularly in digital adult learning and reskilling, to up to 60% of adults by 2030**.
  - With its **emerging National AI strategy** and policy initiatives, **Ukraine aims to rank among the world's top three countries in AI integration** and implementation by 2030.

Ukraine: adults with below-basic digital skills



Source: The Ministry of Digital Transformation

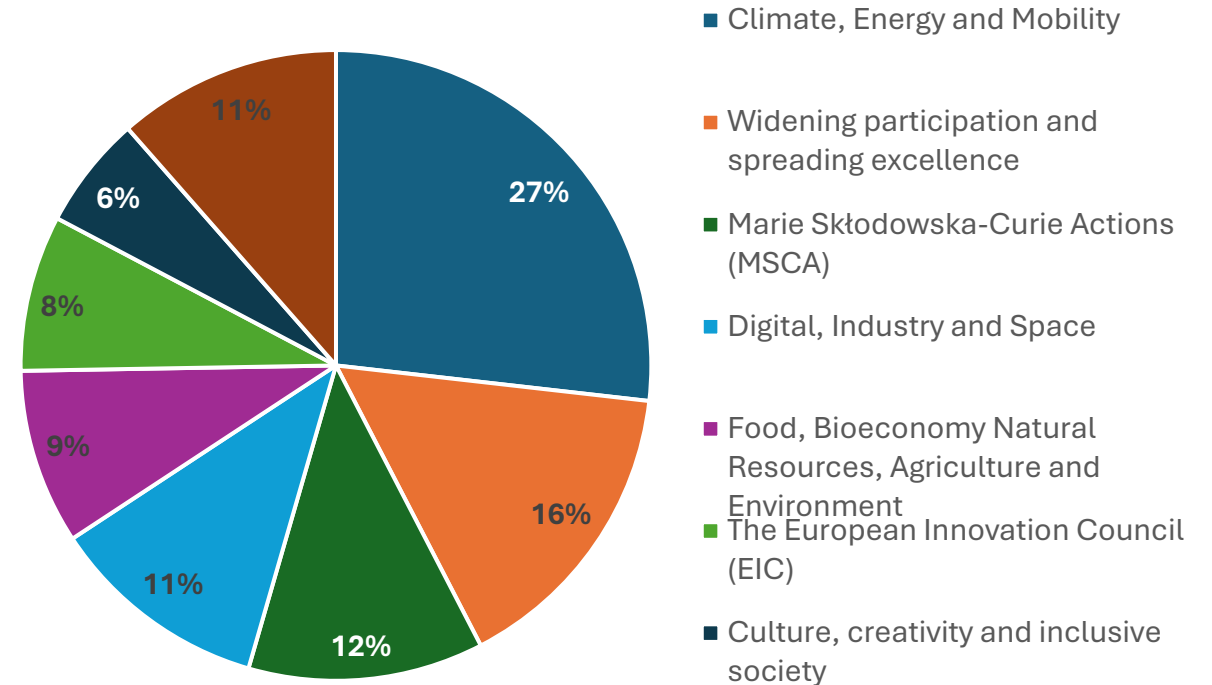
- **Technology is being used to strengthen education delivery**
  - **Diia.Education (2020)** reached **1M+ users by 2021** introducing courses on psychological resilience, cyber hygiene, and safety. Support extended to teachers, students, veterans, and IDPs.
  - **AIKOM (Automated information complex of educational management)** created a unified education data system, allowing authorities to collect, store, and process official education data and to enable **evidence-based policymaking**.
  - **Mriia (application for students/parents/teachers)** - a state digital education ecosystem integrating all elements of the learning process, **introduced personalized learning** and piloted AI tutoring as a scalable model.

# Knowledge creation (4/4): Ukraine can leverage EU-funded programs to expand R&D financing

## Horizon Europe as a Test of Excellence

- Ukrainian research institutions and companies can participate in Horizon Europe and compete for EU funding for R&D and innovation projects
  - Funding is highly competitive and often requires collaboration within international consortia
  - Successful projects serve as a strong proxy for scientific and innovation excellence
- Participants from Ukraine have been successful in 239 project applications and net contribution from the EU budget to these participating entities in Ukraine totals at EUR 63.5 million.
  - Success under thematic priorities such as climate, energy and mobility and digital, industry and space demonstrates Ukraine's areas of strength.
  - At the same time Estonia had 605 successful project applications resulting of net contribution from EU at EUR 304 millions.
  - Estonia has a clear advantage due to its longer experience with Horizon programs, more developed collaboration networks, and higher average capacity among participating institutions.

## Net EU Contribution to Ukraine by Thematic Priority (Horizon Europe)



Source: [https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe\\_en](https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en)

# Enablers (1/3): Ukraine has maintained high levels of broadband connectivity during the war - albeit with regional gaps - but cybersecurity risks are significant

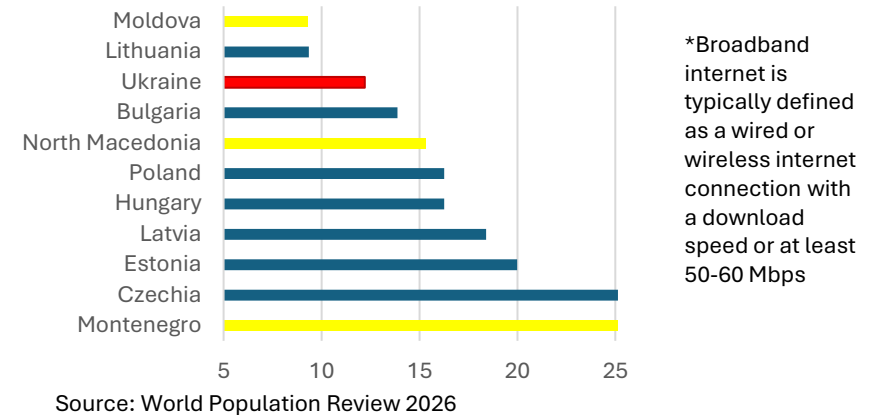
## STRENGTHS

- **88–91% of fixed broadband subscriptions already on fiber**; fixed broadband and fiber penetration rising steadily.
- **One of the lowest prices for broadband internet in Europe.**
- Mobile network coverage is widespread: **4G covers 95.6% of population.**
- **The Government has developed a National Broadband Development Strategy** to expand fiber and 4G/5G.
- Cooperation between state and business maintained 88% of mobile base station coverage despite 60,000+ km fiber destroyed.
- **Deployment of satellites** (Starlink, OneWeb) has ensured backup connectivity.

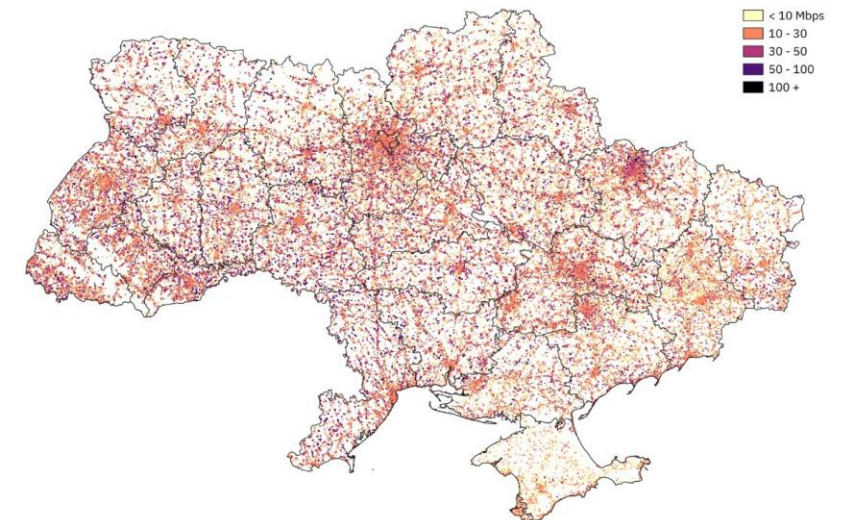
## CHALLENGES

- **790+ broadband uncovered zones**, especially in rural and conflict-affected areas. 26% of homes with fiber available (~2.9 million households) are not connected due to adoption/affordability challenges.
- While 4G is widely available in Ukraine, **many EU countries have already deployed 5G networks**, making substantial investment necessary to close the gap.
- Ukrainian customers rank in **top-5 most frequently impacted by cyber attacks**. **Cybersecurity legislation that is unaligned with the EU Acquis** facilitates this. The Government sees issue as critical, as reflected in WINWIN Innovation Strategy.
- Telecom operators have only **limited resilience** with **10–72 hours mandatory backup-power autonomy** and high related operating costs.

## Broadband Cost per Month, USD

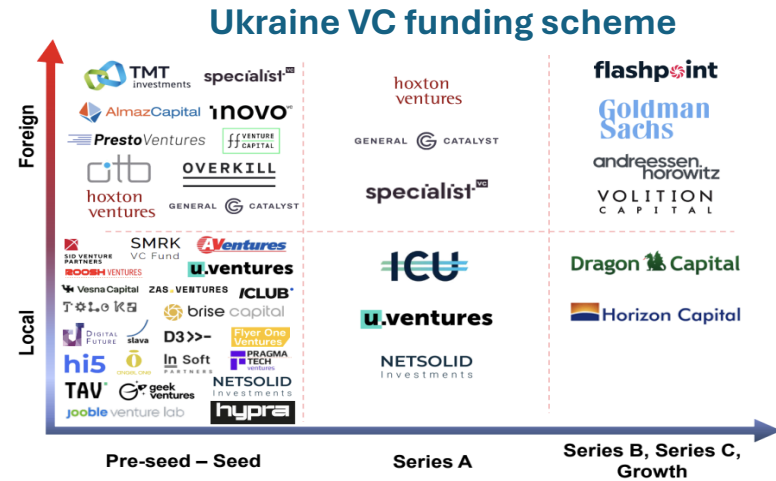


## Internet speed heatmap



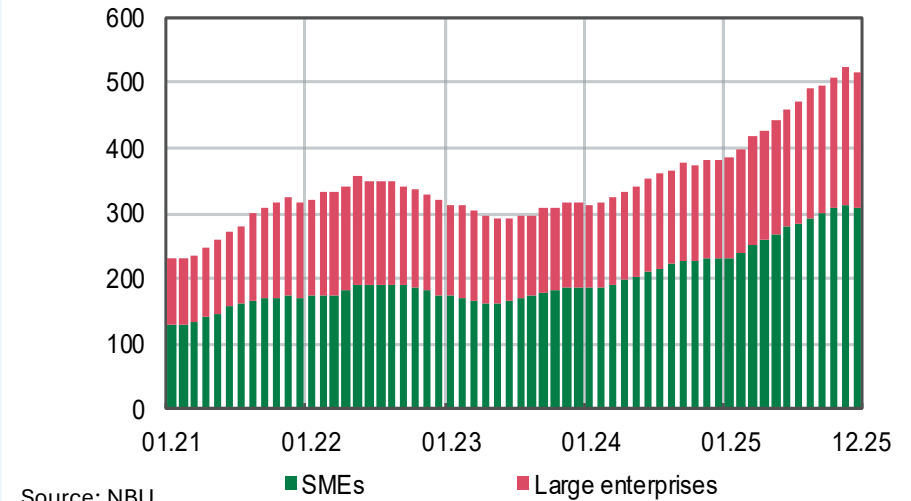
# Enablers (2/3): Local companies have limited sources of financing for innovation, and VC and capital markets remain critically underdeveloped, especially for post-seed firms

- **Access to early-stage capital is limited**, with many firms relying primarily on self-financing, small international grants and government support (~40% of R&D was financed by state funds).
- **Venture capital market stabilizing amid wartime at low levels:** In 2025, startups raised approximately USD 498 mn in investment and grant funding, representing an 8% increase over 2024 (AVentures data), with defense and dual use accounting for almost 25%. The largest traditional VC funding rounds of 2025 remain relatively small by global standards. Grant-based seed programs such as Google for Startups' expanded \$10 million Ukraine Support Fund provided non-dilutive grants and cloud credits to 98 startups, helping bridge financing gaps.
- **Domestic VC activity is still shallow**, highly risk-averse. **Ukraine-focused funds** (~28 VC / 12 PE) currently attracting >\$4 bn new capital, with shortage of institutional investors/LPs to back funds (~1/2 CEE region average) being the main constraint. The WBG estimates that under strong reform optimistic scenario the market can grow to USD 14 bn over 2026-2029 (see UEF Phase II PCM deep-dive).
- **The MDT's Ukrainian Startup Fund (USF)** offers non-equity early-stage support – but the amounts are small, typically USD 25k (pre-seed) and USD 50k (seed), and thus not applicable for larger projects. It has funded 380+ startups with US\$8.7 million since 2022, **prioritizing dual-use and deep tech** – supporting early-stage firms when equity exits are limited.
- **The Government should consider implementing a clear consecutive funnel to support innovative and viable projects**, e.g. using USF for new initiatives, reformed 5-7-9 Loans/other instruments for projects at more developed stages, and target for successful graduates of these programs to move to the banking sector and market instruments.



Source: <https://civitta.com/news-insights/scaling-up-accelerating-ukraines-tech-sector-ecosystem-report/>  
 Source: Aventures - DealBook of Ukraine – [2023-2024]  
 Notes: List of organizations is not exhaustive and made solely for illustrative purposes

## Net hryvnia loans of non-financial corporations, UAH bn



Source: NBU.

# Enablers (3/3): Government is creating a regulatory environment conducive for innovation. However, state support should be more targeted to scalable innovative firms

## REGULATORY ENVIRONMENT

- **Deregulation progress:** Over 1300 regulatory documents have been reviewed from the start of work of the Interagency Working Group on Deregulation, and in 2025 the Government abolished 205 instruments of state regulation.
- **Tech sector (and especially DefenseTech) particularly benefits from regulatory easing:**
  - ✓ **Diia.City** provides a **special employment** model (GIG-contracts), as well elements of **English law not available to other sectors.**
  - ✓ **In 2025 the Ministry of Defense (MoD)** significantly simplified the use (flight rules, registration requirements etc.) of UAVs for military personnel to increase flexibility in employing modern technologies.
- NBU launched **regulatory sandboxes\*** for authorized providers of financial or payment services in 2023.
- Ministry for Digital Transformation in 2024 launched **consultations for AI/blockchain startups** on legal and technology issues, and business models. MDT plans to expand the use of AI for state regulation (as indicated in the draft AI Development strategy).

\* A **regulatory sandbox** is a controlled environment where firms can test innovative products or services under regulatory supervision and temporary exemptions or tailored requirements.

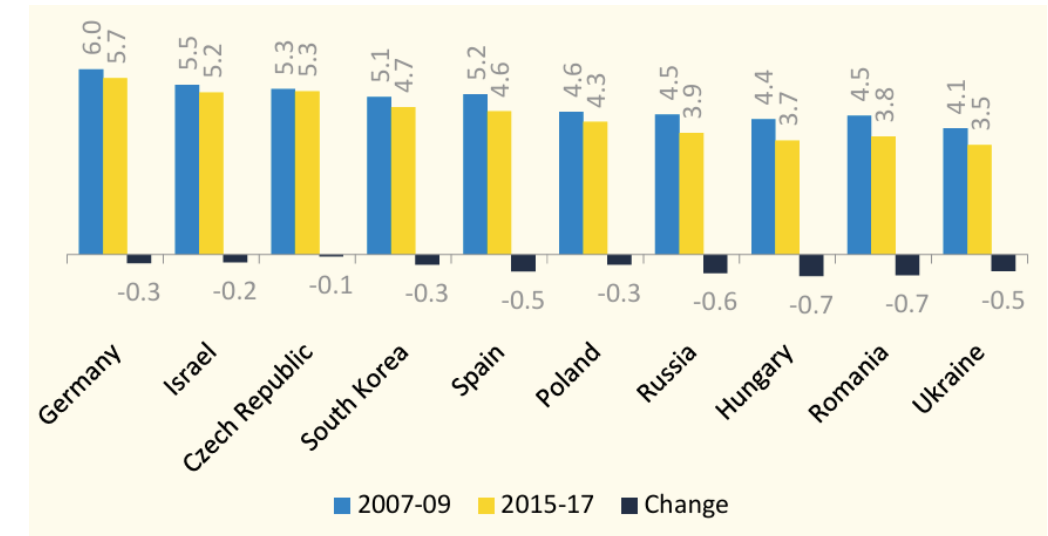
## STATE SUPPORT/INCENTIVES

- **Existing economic incentives:**
  - ✓ **Special economic zones (Diia.City, Defense.City)** with lower taxes for high tech sectors.
  - ✓ **Targeted defense and dual-use support:** Tax incentives (almost no VAT is paid on military goods), and grants for defense-related startups. In 2026, **MoD has allocated 20% of budget funds for drone procurement toward new models for testing.**
- **Most state incentives do not have special quota/requirements to support productive and/or innovating firms.** If innovation is identified among state priorities, firm support needs to become more targeted toward proven innovators (evidenced by local / foreign patent registrations or other measurable indicators).
- **Some of the general firm support programs** (5-7-9 loans used for working capital, national cashback) **may even decrease motivation for innovation**, as they reward existing business models in addition to having no M&E to assess how the funds were used.

# Firms' organizational capabilities affect innovative performance...but the data on managerial practices are outdated for this analysis

- **Efficiency of internal processes, recruitment of managers and established managerial practices in local businesses are important both for nurturing and diffusing innovation as they allow firms to:**
  - ✓ identify opportunities, allocate and coordinate necessary human resources and R&D projects;
  - ✓ reap the benefits from innovation, for instance through deployment of effective marketing and communication campaigns;
  - ✓ help initiate effective diffusion of existing technologies even with no access to external markets through attraction of managers with foreign experience – in this regard engagement of highly educated diaspora has gained major interest in developing economies.
- Studies have shown **that college-educated managers and good management practices increase the likelihood of using advanced digital technologies.** Professional management is expected to improve firms' capacity to absorb technology and better management practices are associated with higher technology sophistication.
- **For Ukraine, the data on managerial practices is outdated** (the latest available WBG Enterprise Survey and World Economic Forum Competitiveness data come from 2017-2019), but indicates lagging behind developed economies.
- **Broad recommendations on strengthening organizational capabilities** are mirrored in recommendations on reforming the labor market (see Labor policy recommendations in other UEF materials), as well as trade diversification and knowledge creation policy recommendations (see slides 35-36).

Reliance on Professional Management (1 – friends/family, 7 – mostly professional managers chosen for merit)



Source: Path for Ukraine's Economic Growth: Technology Update, 2017.

## 4 What would it take for Ukraine?

An emerging policy agenda to strengthen the Innovation Ecosystem, drawing from global/regional lessons (the case of Estonia)

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# Recommendations (1/3): Strengthen fundamentals to lower risks for long-term investments, including in innovation



## Sound macro-fiscal policies

- **Implement reforms to maintain external financing support to the budget; growth-enhancing fiscal adjustment and tax policies** that restores debt sustainability post war and eliminates distortions.
- **Continue balanced monetary policy** that anchors inflation expectations and safeguards FX reserves for productive use.
- **Ensure sound public debt management.** Maintaining public debt sustainably, reducing sovereign risk premiums, avoiding crowding out of corporate borrowings.



## Strengthen anticorruption and rule of law

- Ensure the **independent anticorruption institutions** maintain their independence and can function effectively.
- **Full implementation of the Ukraine-EU Rule of Law Roadmap** for building investor confidence and advancing the EU accession process.
- Improve **enforcement of court decisions**, particularly in cases where the state is the debtor.



## Enhance investor and intellectual property rights protection

- **Strengthen investor protection** by adopting a new Investment law and increase access to alternative dispute resolution mechanisms, including international commercial arbitration.
- **Enshrine guarantees against expropriation, discrimination, transfer restriction** by updating existing laws and avoiding arbitrary regulatory changes.
- **Ensure full alignment with EU acquis** on intellectual property protection, state aid and antitrust.



## Improve FDI, investment and trade policies

- **Approve a new FDI strategy**, powered by streamlined investment promotion.
- **Introduce or optimize or scale-up de-risking programs** to attract investors during wartime.
- **Intensify trade integration with the EU**, ensure synchronization with the EU technical requirements and quality norms to allow broader access to markets.

# Recommendations (2/3): Enhance knowledge creation by improving STEM learning, strengthening university-firm linkages and improving quality of public R&D expenditures



## Strengthen STEM learning and research

- Upgrade **STEM curricula** in line with global leaders and in cooperation with industry.
- Promote **high-risk, high-impact research** through funding mechanisms.
- Promote **knowledge exchange between vocational institutions, businesses, Universities, R&D organizations**, using the greater flexibility provided by recent changes in legislation on vocational education institutions, e.g. by dual education and workplace-based training.



## Improve university/academia-business nexus

- Establish **Diia.Business offices at universities and science parks acting as technology transfer offices** (IP, commercialization, fundraising).
- Establish **industry-focused research centers** and consulting services **within universities**.
- Expand **science parks and innovation clusters (per MDT's WINWIN Innovation Strategy)** connecting businesses, educational and research institutions, and integrate them into regional innovation ecosystems.
- Strengthen **university-industry interaction** via forums, joint initiatives, and promotion of successful cases.



## Improve quality of public R&D expenditures

- Create a more **level playing field between sectoral academies of sciences and universities in public R&D funding**, recognizing universities' comparative advantage in combining research, education, and industry engagement.
- Start discussion on shifting from **quantitative to qualitative** evaluation of research (focus on impact and commercialization, using the San Francisco Declaration on Research as an inspiration)
- Introduce **clear KPIs for publicly funded R&D to strengthen competitive allocation mechanisms**, with greater emphasis on industry collaboration and commercialization outcomes.
- Ensure judicious use of **public procurement and grants** to support university-industry R&D in priority sectors



## Foster international scientific linkages

- Increase participation in **EU R&D programs (e.g. Horizon Europe)**, leveraging public funding with EU and private funding in the areas where Ukraine has competitive advantages.
- Develop **joint labs and partnerships** with international universities and firms.
- Engage the **Ukrainian scientific diaspora**.
- Attract foreign talent via **targeted national programs**.
- Promote **researcher mobility** and simplify **recognition of foreign qualifications**.

# Recommendations (3/3): Improve the enabling environment by addressing cybersecurity risks, facilitating access to finance and target state support to scalable innovative firms



## Maintain digital infrastructure and reduce cybersecurity risks

- **Ensure reconstruction of broadband networks, development of last mile solutions for underserved areas and further diversification of connective routes.**
- Adopt **modern legal framework for cybersecurity** that aligns with the EU acquis.
- Adopt and implement **National Cloud Strategy** and **Law for Cloud Migration**.
- Adopt **Critical Entities Resilience Directive**.



## Facilitate access to finance

- **Increase access to domestic finance** by diversifying the financial sector, developing alternative financing instruments targeted at MSMEs, such as leasing and factoring.
- **Facilitate access to venture capital and start-up capital**, by establishing business acceleration platforms for startups and connect to the deal flow, **and to growth capital**.
- **Advance EU integration to improve access to international capital markets**, ensure synchronization of prudential regulation and payment systems.



## Improve targeting of government support

- **Improve the targeting, efficiency and impact of existing government firm support programs to MSMEs and start-ups** by focusing on innovative and high-growth potential firms and projects and consider them systemically as part of the “smart industrial strategy”.
- **Strengthen administrative and personnel capacity across central and territorial levels of government** to enable targeted state support at the local level.
- **Continue EU-aligned business regulation simplification** to spur firm entry, exit and dynamism and increase ease of doing business.

# Global/Regional Example: Estonia's rise to the EU's top innovation tier driven by deliberate policy choices in R&D, higher education, and digital transformation

Both **Estonia and Ukraine in 1991 inherited structurally similar research systems**: funding concentrated in Academies of Sciences rather than universities, research agendas set by Moscow, aging researcher populations, outdated equipment, and no interaction with international science communities or market-driven demand.

## Rebuilding R&D Funding from the Ground Up

- Dismantled Soviet Academy of Sciences model from 1991; **competitive peer-reviewed grants** to Universities via Estonian Science Foundation from day one of independence
- Shifted from ~60% government-led R&D (late 1990s) to a balanced public-private system; business now the main funder
- **State R&D spending increased 17x per capita** over 25 years: ~€14/capita (late 1990s) → ~€246/capita (2023)
- EU structural funds used strategically post-2004 to **co-finance research infrastructure** – scaling up domestic investment

## Higher Education Reform – Breaking with Soviet Legacy

- Granted universities **full institutional autonomy** and integrated research with teaching, ending the Soviet-era separation
- Introduced **performance-based funding** (2013, 2017), linking up to 20% of university funding to performance agreements
- Academy of Sciences plays virtually no role today; **universities run independent private ecosystems** (biotech, materials)
- Tenure track system at Tallinn University of Technology recognised as EU best practice (World Bank, 2019)
- National **international research marketing strategy** launched; "Research in Estonia" portal to attract global researcher

**Estonia is now ranked 11th among EU Member States in the 2025 European Innovation Scoreboard** (104.8% of EU average); classified as a "Strong Innovator" 10 unicorns produced – the highest number per capita in Europe (Skype, Wise, Bolt, Playtech, Pipedrive, Veriff, and others), 99% of public services available online; 100% digital state declared in 2024.

## Digital Transformation as Industrial Policy

- **Tiger Leap** (late 1990s): 98% of schools connected to internet
- **X-Road** data exchange layer: all public databases interoperable; ~99% of public services online
- **e-ID** (2002): universal digital identity enabling e-signatures, e-banking, e-voting, e-health
- **e-Residency** (2014): 80,000+ non-citizen e-residents; 16,000+ EU companies registered globally
- **100% digital state** in 2024 – outcome of 30 years of deliberate policy choices

## Stimulating Private Innovation Investment

- **Zero corporate income tax** on retained earnings (since 2000): profits reinvested in R&D and growth are tax-free
- Full telecom market liberalisation (2001): internet costs fell 50%, international calls 50–80%
- **Startup Estonia** (2014): four pillars – community, talent, investment, public-private cooperation
- **Startup Visa** (2017): international talent pipeline for tech firms
- Smart Specialisation (RIS3): public investment concentrated in **ICT, biotech, resource innovation**

# Annex

## Government Innovation-related Strategies:

- WINWIN
  - Digital Infrastructure
  - AI
-

# WINWIN Strategy - innovation as the key vehicle for turning Ukraine into a modern, secure state

## Key objectives:

**Economic:** achieve an economic breakthrough

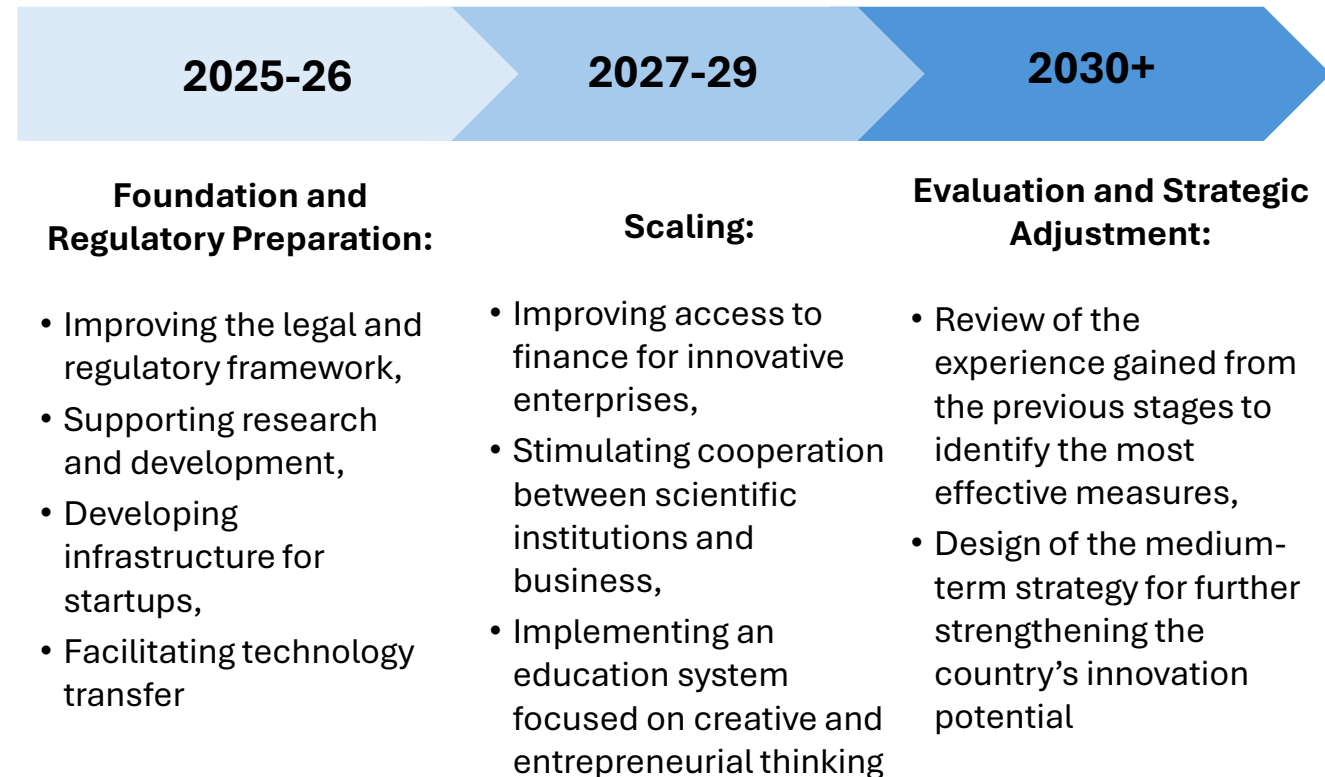
**Political:** strengthen Ukraine's global position by becoming a regional innovation leader and a driver of innovation within the EU

**Security:** use innovation to advance the defense sector, enabling Ukraine to become an influential actor in the global security system and a center for developing technologies that defend peace and democracy.

**Social:** ensure inclusive innovation that improves quality of life.

**Digitalization:** build a strong digital economy by providing efficient digital services, encouraging entrepreneurship, and reducing corruption risks through advanced digital tools

## A phased implementation



### Four Strategic Focuses (21 goals) translate the mission into instrument

- 1. Human Capital Development** — STEM & digital skills, researcher mobility, lifelong learning, entrepreneurial mindset in education
- 2. National Innovation System** — technology transfer offices, Industry 4.0 centers, science parks, proposed Science.City legal regime
- 3. Economic Incentives** — R&D tax credits, Innovation Development Fund, Ukrainian Startup Fund, Diia.City Invest
- 4. Sectoral Policy** — vertical strategies for priority industries (next slide), defense-led innovation (Brave1), sectoral regulation & standards

# The WINWIN Strategy aims to create conditions where technology (including AI) is used in every sector and innovation is happening across the whole economy

## *Priority industries of WINWIN Innovation Strategy*

- **DefenseTech:** Strong legacy defense-industrial base and wartime-driven innovation; large pool of engineers and rapidly iterating startups.
- **GovTech:** Proven digital governance infrastructure anchored in the Diia ecosystem; deep IT talent and strong political commitment; wartime acceleration of digitalization and reconstruction need
- **MedTech:** Robust IT talent adaptable to digital health; high domestic demand for advanced care (prosthetics, skin repair) and diagnostics.
- **AgriTech:** Global-scale agriculture, precision farming potential, and reconstruction-driven land recovery.
- **EdTech:** Deep digital talent and nationwide adoption potential for personalized, AI-enabled learning.
- **GreenTech:** Strong imperative for decarbonization and energy resilience; potential in renewables, storage, hydrogen, and green metallurgy.
- **Semiconductors:** Historical microelectronics capabilities; strategic role in strengthening Europe's chip supply chains.
- **Cybersecurity:** Heightened threat environment and mission-critical need to secure defense, government, and critical infrastructure; strong cybersecurity and software engineering talent, rapid wartime hardening, and growing ecosystem of security vendors
- **Immersive technologies:** Cross-sector demand from defense, public administration, construction, manufacturing, health, and education; robust 3D/graphics and game-engine talent, plus strengths in simulation and digital twin development.
- **AI:** Large, adaptable IT workforce; ability to localize AI (Ukrainian-language models) and embed AI in priority sectors.
- **Autonomous Unmanned Vehicles:** Wartime-driven leadership in unmanned tech across defense, agriculture, logistics, and maritime.
- **SpaceTech:** Legacy space engineering assets and capacity to integrate with European programs and standards.
- **“Fluid Economy”** (digital-first business environment): Enabling regulatory and digital infrastructure (e.g., Diia/Diia.City) to help firms scale globally.

Source: WINWIN Strategy, team analysis

# Ukraine's National Digital Strategy

**Vision for 2030:** Ukraine as a leading digital democracy in Europe, delivering secure, user-centric services and resilient growth

**Mission for the Digital Agenda 2030:** Build a digital nation through skills, proactive services, innovation, and a strong digital economy

## Problem Statement

Fragmented digital governance & weak coordination, limiting impact and leading to duplication and siloed systems

Digital infrastructure gaps & war-related disruption, including connectivity, cybersecurity risks, and damaged energy/ICT systems

Uneven digital skills & inclusion gaps, reducing participation in the digital economy and services

Low adoption of digital technologies by businesses, constraining productivity, innovation, and global competitiveness

Data governance, interoperability, and trust deficits, limiting evidence-based policymaking and EU integration

## Areas of Transformation/Intervention:

Strategic Goals (4 Pillars)

- Digital Government: Transparent, accountable, AI-enabled services and interoperability
- Digital Infrastructure & Resilience: Secure, reliable, defense-capable systems
- Digital Society & Trust: Skills, inclusion, and e-participation
- Digital Economy & Innovation: AI adoption, cloud, startups, and global competitiveness

## KPIs (by 2030 – selected highlights)

### Government & Services

- 100% of key services available digitally via Diia
- 90%+ user satisfaction; 100% “once-only” data use
- 

### Infrastructure & Connectivity

- 75% households with gigabit fixed broadband
- 98% population covered by mobile broadband

### Cybersecurity & Resilience

- 99.9% uptime of critical systems
- Full compliance with cybersecurity standards

### Digital Skills & Inclusion

- 80% of population with basic digital skills
- 62% using AI tools in daily life/work

### Digital Economy & Innovation

- 500 startups per 1M population
- 9+ unicorn companies; 200,000 ICT professionals

# Ukraine's National AI Strategy: AI Readiness

## AI Readiness

- Ranks 54 in 2024 [Oxford Insights Government AI Readiness Index](#) and 62nd in the [IMF AI Preparedness Index \(2023\)](#).
- Ranks 54th globally with strengths in adaptability and ethics but weaknesses in infrastructure and innovation capacity.
- AI adoption among adults was 31% in 2023, with enterprise usage at 4.6% in 2025.
- Ukraine's relative strength in governance, strategic vision, and alignment with digital policy frameworks, particularly its commitment to ethical AI and integration with European frameworks.
- The defense sector excels in battlefield AI innovations, including drones and cyber defense, creating unique datasets and expertise.
- Public sector innovation includes pioneering AI agents for service delivery (Diia.AI) and a national large language model (LLM) initiative in partnership with Kyivstar.
- Investment and ecosystem: 243 AI companies (2 unicorns), 5,200 AI/ML specialists (~1% of the IT sector) , 106 educational programs ([source](#)). Pre-war AI talent pool (300,000+ IT specialists) supports growth, but many have also left Ukraine ([source](#)). The VC market remains small (UAH 22B in 2021, [source](#)) and R&D spending is low (0.3% of GDP vs the EU's 2.3%, [source](#)).
- Infrastructure challenges are severe due to war damage, electricity shortages, and lack of domestic data centers.

# Ukraine's National AI Strategy: Becoming a top global performer in AI-driven digital transformation and public service delivery

**Vision (2030):** Ukraine becomes a **global leader in applied AI**, with high-impact integration across: Public administration, Defense and security, Education and science and priority economic sectors.

**Mission:** To strengthen resilience, accelerate recovery, and drive long-term development through:

- Rapid, responsible deployment of AI in priority sectors
- Sequential investments in infrastructure, skills, data, and governance
- A demand-led, adoption-first approach focused on real-world deployment

## Problem Statement

- *Low AI adoption in enterprises (≈4.6%), especially SMEs and traditional sectors*
- *Strong public sector digital base but uneven AI integration* due to legacy processes and institutional capacity constraints
- *Risk of lagging in competitiveness and reconstruction* if AI deployment is not scaled rapidly
- *Strategic vulnerability:* dependence on external infrastructure and limited domestic innovation capacity

## Areas of Transformation/Intervention:

Strategic Goals (4 Pillars)

### Goal 1 – Deploy AI at Scale

Drive adoption across government, enterprises, and society and transform into an **agentic state**

### Goal 2 – Build Foundational AI Ecosystem

Ensure access to tools, compute, and platforms, and strengthen domestic AI innovation and sovereignty

### Goal 3 – Enable Foundations

Develop infrastructure, skills, and data ecosystems, and build a **regional hub for AI computing**

### Goal 4 – Ensure Governance & Trust

Align with EU AI Act, and enable **responsible, secure, and transparent AI deployment**

## KPIs (by 2030 – selected highlights)

### Adoption & Use

- 75% of enterprises** using AI
- 100 AI-enabled public services** available via agents
- 100% of learners** with access to AI learning tools

### Ecosystem Development

- 1,000 AI companies** in Ukraine
- 1,000 organizations** using shared AI compute
- 200B tokens** of Ukrainian-language datasets

### Infrastructure & Skills

- 50 petaflops compute capacity**
- 70% population** using AI tools
- 100 AI-ready datasets**

### Governance & Institutions

- 100% of government entities** with AI-enabled functions
- 10 sectoral AI roadmaps** implemented
- Full alignment with **EU AI regulatory framework**

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