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REGULATORY FRAMEWORK AND FOREIGN INVESTMENT IN DIGITAL DEVELOPMENT: CASE OF CENTRAL EUROPE AND UKRAINE

Foreign Direct Investment (FDI) plays a crucial role in advancing digital development by facilitating technology transfer, innovation diffusion, and the integration of economies into global digital value chains. Through FDI, countries gain access to advanced digital infrastructure, managerial expertise, and international business networks that accelerate the digital transformation of industries and public services. In developing and transition economies, FDI often serves as a catalyst for

upgrading ICT sectors, supporting start-up ecosystems, and fostering digital skills among the labor force.

However, the positive impact of FDI on digital development depends largely on the quality of a country's national regulatory framework. A transparent, stable, and innovation-oriented regulatory system enhances investor confidence and reduces risks associated with market entry and digital operations. Effective regulations on data protection, cybersecurity, intellectual property rights, and digital taxation ensure fair competition and safeguard both investors and consumers. Additionally, targeted policies such as investment incentives, streamlined administrative procedures, and public-private partnerships can attract technologically advanced investors. Therefore, the combination of active FDI inflows and a well-structured regulatory environment is essential for sustainable digital growth and global competitiveness.

A lot of experts and international agencies investigate an investment flow in digital economy.

The *UNCTAD World Investment Report 2025* [1] devotes a separate chapter to the role of FDI in digital development. The report reveals that between 2020 and 2024, developing countries attracted over USD 530 billion in greenfield digital economy projects, with nearly 80% concentrated in just ten countries, and the United States identified as the main investor. UNCTAD emphasizes that factors such as infrastructure quality, digital capabilities, resource availability, market conditions, and the regulatory environment significantly influence both the attraction and the effectiveness of FDI in the digital sector. The report also highlights that regulatory gaps and investment restrictions continue to hinder FDI flows into the digital economy, limiting the potential for inclusive and sustainable digital growth. Technology firms now generate over 20% of revenues among the top 100 MNEs, reflecting FDI's growing digital focus. Large digital multinational companies are major international investors in the global digital economy. The top 100 digital MNEs operate in four major segments of the digital economy, reflecting diverse business models [1]:

– digital platform and services (social media, search engines and cloud services. Companies: Alphabet and Meta (both United States), ByteDance (China));

– digital solutions (enterprise software, ICT services, cybersecurity, cloud-based solutions, AI applications and digital finance platforms Key players: IBM, Microsoft and Salesforce (all United States));

– e-commerce (Cross-border e-commerce and last-mile delivery. Key players: Amazon (USA), Alibaba, JD.com (China));

– digital content (streaming services, gaming and digital publishing. Notable players are Netflix (United States), Spotify (Luxembourg) and Tencent (China))

The European Investment Bank (2024) [2] highlights that the EU's complex regulatory framework and global standard-setting ambitions often create legal uncertainty, raising capital risk. Ambiguous and shifting rules increase compliance costs, especially for firms active in multiple states. Regulations also cause delays through bureaucracy and legal hurdles, harming competitiveness. Moreover, regulatory unpredictability discourages investors, reducing capital inflows in favor of more stable markets [2].

ECIPE report [3] investigate the perspectives of FDI in EU. Authors compare FDI inward and outward flows for EU and USA and made some important conclusions. To foster growth, policies should balance protection with innovation, strengthen digital infrastructure, align standards globally, and invest in digital skills. Reducing regulatory burdens would boost EU firms' competitiveness, attract tech investment, and secure the EU's leadership in the global digital economy.

The issue of digital investments has been examined in numerous academic studies.

Petreski and Olczyk [4] analyze FDI's effect on employment in 109 regions of old EU member states (2012-2023), finding that FDI promotes job creation but in a nonlinear, sector-dependent way. High FDI concentration drives stronger employment growth and spatial spillovers, while regions attracting high-value jobs (R&D, management) see slower overall gains. The study also shows that forward

GVC (global value chains) participation strengthens FDI's positive impact by enhancing domestic value-added, especially in high-tech sectors and older EU states, whereas backward GVC participation – reliance on foreign inputs – reduces local employment, particularly in newer members and low-tech industries.

A. Bobenič Hintošová and G. Bódy [5] analyzed the link between FDI and digital development in EU countries using cluster analysis. Their findings reveal consistent groupings – especially among Nordic, Visegrad, Baltic, and Balkan countries. Nordic countries show advanced digital development, which likely attracts sustainable FDI, particularly in high-tech sectors. In contrast, Visegrad, Baltic, and Balkan states appear to leverage inward FDI to boost their digital progress. Overall, countries with higher FDI inflows tend to have better Digital Economy and Society Index scores.

A. Guidara examined the relationship between digital development and foreign direct investment in the country, focusing on how this relationship varies with the level of corruption. The results indicate a positive and significant link between digitalization and foreign direct investment (FDI). This relationship is stronger and more stable in countries with low corruption, but weak and insignificant where corruption is high [6].

In our investigation we study the relationship between forein direct investments flows (inflows and outflows), indexes of digital development and indexes, that characterise a regulatory environment at each country.

Foreign direct investments flows are taken from World Bank, World Development Indicators [7-8].

Let's describe an economic essence of initial data.

FDI net inflows (% of GDP) measures how much foreign direct investment entered a country (foreigners buying assets, building businesses) minus the amount of investment foreign investors withdrew. Expressed as a share of GDP. Positive value indicate about net capital inflow, while negative – net withdrawal of foreign investments [7].

FDI net outflows (% of GDP) measures how much the country's residents invested abroad minus the amount of capital they brought back home (sold assets or withdrew investments abroad). Positive value indicate about net capital sent abroad; negative value means that residents repatriated more capital than they invested abroad. Together – inflows and outflows, show the country's role in the global investment network.

To measure a quality of national regulation framework the World Governance Indicators (WGI), developed by the World Bank, were used [8]. Such indicators measure governance quality in 200+ countries since 1996. They include six dimensions:

- Voice & Accountability – citizen participation and freedoms;
- Political Stability – risk of violence or terrorism;
- Government Effectiveness – quality of services and policy implementation;
- Regulatory Quality – ability to design sound, pro-market policies;
- Rule of Law – adherence to laws, rights, property, and justice;
- Control of Corruption – limits on misuse of power.

Scores range from -2.5 (weak) to +2.5 (strong). The WGI's main advantage lies in its comparability and synthesis of multiple data sources, which enables longitudinal and cross-country analysis of governance trends. However, scholars criticize it for methodological opacity, reliance on perception-based data, and potential bias toward Western governance models.

In economic analysis, WGI indicators serve as key explanatory variables for understanding variations in investment, growth, and institutional performance. They have become a standard tool in assessing governance quality, institutional risk, and development effectiveness in global policy research.

To measure countrie's digital development Network Readiness Index (NRI) was analyzed [9]. It evaluates how effectively countries utilize information and communication technologies (ICTs) to foster economic growth, innovation, and social development. The NRI framework consists of four main pillars: *technology*

(measuring ICT infrastructure, affordability, and access to digital services), *people* (digital skills, inclusion, and ICT usage among individuals, businesses, and governments), *governance* (policy frameworks, regulations, and trust in digital systems) and *impact* (examining how ICT contributes to the economy, environment, and society). It highlights not only the presence of infrastructure but also the effectiveness of digital policies and societal adaptation to technology and complements other governance measures, such as the World Governance Indicators, by focusing specifically on the digital dimension of institutional and economic performance.

At first we analyzed the dynamics of FDI for EU and Eurozone due to data of World Bank [7]. For both regions during 2016-2024 FDI outflows were greater then FDI inflows. FDI outflows were positive through the whole period (this is a signal, that EU investor send abroad greater sum, then they return to host country), while FDI inflows were negative in 2020 and 2023 – negative inflows indicate deficit of FDI – investors invest in EU less capital, then return to their host countries.

At figure 1 the dynamics of FDI inflows and outflows for EU and Euro zone.

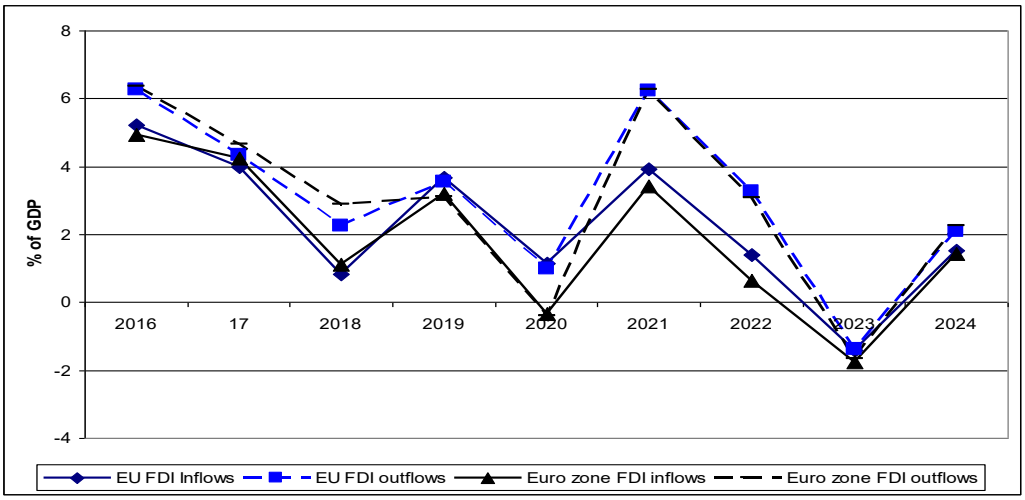

Figure 1 – FDI inflows and outflows for EU and Euro zone

Source: constructed by authors based on World Bank data [7]

The EU's outward FDI flows have been volatile, shaped by global crises (COVID-19, Ukraine war), shifting trade conditions, and changes in investor risk appetite. The negative 2023 value is unusual, indicating capital repatriation rather than expansion. The Eurozone trend closely mirrors the EU average, but downturns (2020, 2023) are more pronounced, suggesting the single currency area is more sensitive to global shocks and capital flow reversals. As about FDI inflows, the Euro area generally shows larger drops in crisis years (2020, 2022, 2023), meaning it is more sensitive to global shocks than the EU as a whole.

Several countries have extreme swings in dynamics of FDI inflows and outflows: Ireland, Malta, Netherlands.

Ireland's extreme swings in FDI net inflows/outflows (% of GDP) from 2015–2023 reflect a mix of structural and statistical factors rather than purely real economy capital movements:

– Many multinational corporations (MNCs), especially in tech and pharma, base their European HQs in Ireland to benefit from its corporate tax regime

– FDI statistics capture intra-company flows (e.g., intellectual property relocation, intra-group loans, retained earnings), which can be huge relative to GDP.

Malta's extreme FDI ratios do not signal extraordinary domestic investment opportunities but rather the country's function as a conduit for global capital flows**,** where the bulk of transactions are intra-company or fund movements.

The Netherlands' FDI inflows 2015-2024 show the same «whiplash» profile as Ireland and Malta, for similar reasons – it is one of the world's largest conduit economies for multinational capital flows.

We initially analyzed the correlation among the Digital Development Index (NRI) [9], the Worldwide Governance Indicators (WGI) [8], and Foreign Direct Investment (FDI) [7] flows. The results of this analysis indicated a strong correlation between the level of digital development and the quality of national governance. However, the correlation observed between FDI inflows, and both the digital and governance indicators was estimated at a very low level. Consequently, this finding

suggests the necessity of employing more sophisticated mathematical and modeling approaches.

At figure 2 the scatterplots between NRI and governance indicators (government Effectiveness (ge), regulatory quality (rq), rule of law (rl), control of corruption (cc)).

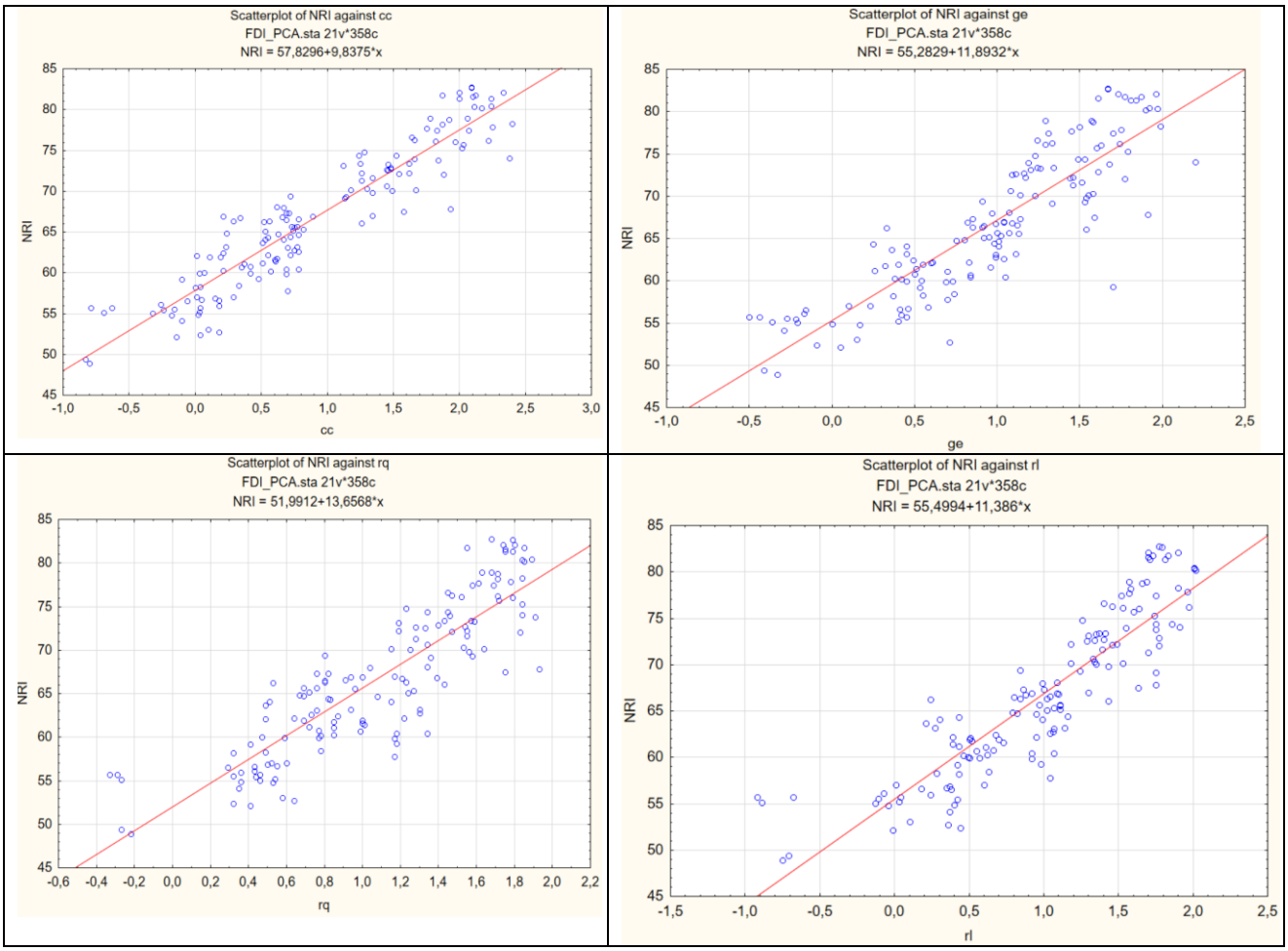

Figure 2 – Scatterplots between NRI and governance indicators (control of corruption (cc), government effectiveness (ge), regulatory quality (rq), rule of law (rl))

Source: constructed by authors in Statistica software

Foreign investment plays a pivotal role in bolstering the EU's digital ecosystem. Below are several notable examples of foreign investment in the EU digital market:

– Microsoft announced plans to invest €4 billion in France for expanding AI and cloud infrastructure, aiming to train one million individuals and support

2,500 startups by 2027. This underscores substantial U.S. commitment to digital transformation in the EU;

– also Microsoft took a €15 million stake in the French AI startup Mistral AI, gaining access to its new model via Azure and potentially shaping the European AI ecosystem through strategic partnership;

– during the first half of 2025, U.S. investors contributed €10.1 billion to European startups, surpassing the total from the previous year. For instance, Klarna attracted backing from Japan's SoftBank alongside U.S. funds;

– the Trusted Investors Network, supported by the European Innovation Council Fund, brings together global venture capital – including Dublin's Atlantic Bridge and Atomico – to co-invest in European deep-tech firms;

– the EIC Accelerator program enables non-EU entrepreneurs to relocate or establish entities within the EU to qualify for funding – grants up to €2.5 million and equity up to €15 million.

Also Central European countries receive digital FDI.

In April 2023 Microsoft opened its first cloud region in Poland (three independent datacenter locations around Warsaw) – the first such region in Central and Eastern Europe. Initially (May 2020) Microsoft announced a plan of US $1 billion to build the region, enhance digital skills, and foster the «Polish Digital Valley». In February 2025 Microsoft announced an additional investment (≈ PLN 2,8 billion / ~US $700 million / ~€600–670 million) to expand hyperscale cloud and AI infrastructure in Poland by June 2026, including a focus on national cybersecurity. The 2025 investment is explicitly tied to expanding its existing datacenter campuses (Azure services) and to collaboration with the Polish Ministry of National Defence on cyber-resilience [10].

An experience of Romania can be useful for Ukraine. Romania has emerged as a dynamic ICT hub in Central and Eastern Europe (CEE). The Romanian Government has prioritised digital transformation under the EU's Digital Decade framework. In mid-July 2024, the Romanian government signed a memorandum of

understanding (MoU) with Google concerning digital infrastructure, cloud technologies and public-sector transformation. Discussions indicate a potential hyperscale data centre valued between USD 1-2 billion [11].

The collaboration supports the state's aim to build a «government cloud» infrastructure (project funded under Romania's National Recovery & Resilience Plan) which will consolidate public-sector IT systems, improve service delivery, increase security and reduce costs. From an economic perspective, such infrastructure investment contributes to the digital competitiveness of Romania, may stimulate local employment (in construction, operations, tech services), and reinforce the country's position in the Central/Eastern Europe (CEE) tech ecosystem.

Similar investments observed in Hungary, Slovakia and the Czech Republic indicate regional competition for digital FDI.

Volvo Cars announced a new manufacturing plant in eastern Slovakia (near Košice / Valaliky industrial park) for fully electric vehicles (EVs). Investment projected approximately €1.2 billion (≈ US$1.25 billion). The plant, which will be Volvo's first new European manufacturing site for almost 60 years, is planned to be climate neutral, be able to produce 250,000 vehicles/year and only manufacture EVs. The investment reinforces Slovakia's role as a major automotive manufacturing hub and transitions it into the e-mobility era and create about 3,000 jobs [12].

CATL (China) announced in August 2022 a planned investment of €7.34 billion to build a gigafactory in Debrecen (Hungary) with a planned annual production capacity of 100 GWh. The project is described as the largest green-field investment ever in Hungary. Production is expected to begin early 2026 (or late 2025 according to some sources) for first output. The plant will supply battery cells and modules to major European automakers (e.g., BMW Group, Stellantis N.V., Volkswagen Group) in support of Europe's EV transition. The plant is described as a «state-of-the-art» facility for Europe, meaning likely use of Industry 4.0 practices: real-time monitoring, automated logistics, high-precision production [14].

Based on these cases we can make a conclusion, that FDI is shifting from many small projects to fewer, strategic, capital-intensive digital investments (data centres, advanced manufacturing with Industry 4.0). That raises opportunity (jobs, tech transfer) but also policy challenges (grid capacity, skills, competition policy, and regional cohesion).

But for EU economies, large investments by non-EU firms (like CATL, Google and Amazon) in critical infrastructure provoke questions of sovereignty, data control, local vs foreign ownership, regulatory oversight.

As about Ukraine, in October 2024, IFC & EBRD (backed by EU & France) invested US$435 million into the merged company Lifecell + Datagroup-Volia. The goal was to provide stronger mobile coverage (10 million subscribers), faster/reliable fixed broadband for about 4 million homes, enhanced cybersecurity, network resilience. This is considered the largest FDI since the 2022 invasion in digital/telecom in Ukraine.

Comparing Ukraine and Central European countries it is worth to analyze the level and quality of digital regulations in analyzed countries.

Central European countries are advancing digital regulation unevenly. Slovenia and Czechia are frontrunners in AI strategy implementation, while Poland and Slovakia face institutional delays. Harmonized enforcement of NIS2 and the AI Act remains critical for attracting digital FDI and ensuring EU-wide digital sovereignty.

Poland, Hungary, the Czech Republic, Slovakia, and Romania have experienced rapid digitalization during the past decade, yet their regulatory frameworks remain heterogeneous and unevenly aligned with EU standards.

At the supranational level, digital policy in the region is largely influenced by the EU Digital Strategy, including the Digital Services Act (DSA), Digital Markets Act (DMA), Data Governance Act, and Artificial Intelligence Act. These legislative instruments establish a unified framework for data sharing, competition, cybersecurity, and ethical AI. Central European countries are thus adapting their

national regulations to ensure compliance, while simultaneously developing domestic strategies to promote innovation and digital inclusion.

However, several structural challenges persist. First, the regulatory capacity of national institutions is often limited compared to Western Europe, which constrains effective enforcement of complex digital norms. Second, fragmentation of digital governance across ministries and agencies weakens policy coherence. Third, regulatory uncertainty – especially concerning data protection, platform governance, and AI deployment-discourages private investment and innovation.

At the same time, there are positive developments. Governments in the region are investing in e-government systems, cybersecurity frameworks, and national AI strategies. Regional cooperation–through the Three Seas Initiative and Visegrád Group – has also emerged as a mechanism to coordinate cross-border digital infrastructure projects and harmonize standards.

Ukraine combines advanced digital public infrastructure and a clear AI/cyber legal framework trajectory with ongoing alignment to EU standards. Compared with CE states, Ukraine offers strong digital assets (talent, Diia) and high reform momentum backed by EU funding, but political/security risk and transitional legal harmonisation raise investor and implementation uncertainty. National AI Strategy (2021–2030) and recent White Paper / updates positioning AI as strategic for resilience and recovery. World-class e-services via Diia (digital IDs, business registration, many public services) used as digital public infrastructure. Diia – ecosystem created by the Ministry of Digital Transformation of Ukraine. In Diia application 11 digital documents and 12 services are available as of today. More than 70 online services for citizens and businesses are available on Diia website. Ukraine is the first state in the world in which digital passports have become full legal counterparts of paper documents.

Strong EU financial and technical support for digital reconstruction (Ukraine Facility / EU programmes) continues. In total, EU support to Ukraine since the beginning of Russia's war of aggression amounts to €177.5 billion. This includes:

over €93.6 billion made available so far by Team Europe to support Ukraine's overall economic, social, and financial resilience; €63.2 billion in military assistance measures; up to €17 billion to help Member States cater to the needs of Ukrainians in the EU; €3.7 billion from the proceeds of Russian immobilised assets.

But CE countries generally provide greater regulatory predictability (EU membership) though with uneven transposition and capacity gaps.

Based on our investigation, we can make some important conclusions about regulation of Digital Development in Ukraine and Central European (CE) Countries.

Ukraine has strong institutional momentum (Diia etc.), good human capital in IT, and visible large-scale telecom infrastructure projects. The war has created urgent digital infrastructure needs which attract international finance (IFC, EBRD, EU). These make Ukraine potentially attractive for FDI in digital sectors, despite high risks. War damages to physical infrastructure, regulatory uncertainty, security Risks, capital flight, challenges in providing guarantees or risk mitigation, needing massive reconstruction funding. If stability situation and investor protection improves, there's likely to be more FDI in data centres, cloud infrastructure, cybersecurity, e-gov platforms or AI-R&D investment.

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