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Assessing the Impact of EU Digital Interventions (2021-2027): A Dynamic Spatial General Equilibrium Approach

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Contents

Abstract

This paper examines the macroeconomic effects of digital investments in the European Union during the 2021–2027 period. Using a dynamic spatial multi-country and multi-sector general equilibrium framework calibrated for all EU Member States, we analyse how different forms of digital interventions, such as public infrastructure investment, firm-level digitalisation, and skills development, affect the macroeconomy of EU27. The analysis draws on a novel dataset that covers approximately €175 billion of planned investments financed through five major EU programmes. Results show that digital investments have a positive and lasting impact on output, employment, as well as on capital accumulation and household consumption across the Union, revealing an interesting price-competitiveness channel for net exports. The inclusion of cross-border digital spillovers further amplifies these effects, suggesting that improvements in digital connectivity and infrastructure generate benefits beyond national economies.

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Executive summary

This study assesses the macroeconomic impact of digital investments in the European Union during the 2021-2027 programming period. Using a dynamic spatial multi-country and multi-sector computable general equilibrium (CGE) model calibrated for the EU-27, the analysis quantifies how different types of digital interventions, such as public investment in digital infrastructure, firm-level digitalisation, and digital skills training, affect economic performance across Member States.

The model incorporates cross-country trade linkages and allows for both domestic and cross-border effects through two simulation scenarios: a benchmark case, capturing national impacts, and a digital spillovers case, which includes productivity gains transmitted across borders via digitalization and trade integration.

Results indicate that digital investments have a positive and lasting effect on GDP, employment, investment, and other macroeconomic variables across the European Union. The digital spillovers scenario amplifies these effects, suggesting that investments in digital infrastructure such as 5G and gigabit networks create benefits that extend beyond national economies.

1 Introduction

The European Union (EU) has placed digital transformation at the frontier of its agenda, recognizing it as a key driver of long-term growth, innovation, and cohesion. The EU's Digital Decade programme lays out a digital compass targeting increased digitalization among its Member States by 2030 (European Commission, 2021). From gigabit connectivity and 5G deployment to the digitalization of public services, digital policy interventions aim to enhance firm-level productivity and promote a more digitally inclusive future for EU citizens. Within the broader strategic framework, funds such as the Recovery and Resilience Facility (RRF) or the EU Cohesion Policy, among others, have allocated a substantial fraction of their investments to support digital transition among EU Member States (European Commission, 2022).

Studies have shown that large-scale digital investments yield substantial macroeconomic benefits. Adopting digital technologies—such as broadband networks, cloud computing, and artificial intelligence (AI)—can significantly enhance GDP and productivity. For instance, Czernich et al. (2011) find that a 10 percentage-point increase in broadband penetration across OECD countries is associated with an increase in annual GDP per capita growth of up to 1.5%. Similarly, Koutroumpis (2019) using evidence from OECD countries finds a consistent effect of broadband adoption on national economic output. Niebel (2018) provides cross-country evidence that information and communication technologies (ICT) capital investments confirm the positive link between ICT and economic development. At the technological frontier, Graetz and Michaels (2018) show that robot use has contributed to annual labour productivity growth, as well as has raised factor productivity and decreased output prices in the countries examined. 0.36 percentage points of annual labor productivity growth in 17 advanced economies. At the firm level, Czarnitzki et al. (2023) document a significant positive association between the adoption of AI technologies and productivity among German firms.

However, as emphasized by European Central Bank (2023), factors such as skill levels, organizational change, and strong institutions are key enablers for digital investments to translate into productivity growth. The lack of these complementary factors may contribute to a widening digital divide, whereby advanced and more digitalized economies are able to leverage digital interventions more effectively, while less prepared economies risk falling further behind. This risk is reinforced by OECD findings, which highlight that uneven digital skill levels, low intangible investment, and institutional weaknesses constrain the productivity potential of digital technologies OECD (2021, 2023a). Similarly, Cedefop (2016) reports that a significant share of the EU workforce lacks the digital skills required for modern jobs, especially in lower-skilled occupations. Furthermore, differences in national skill strategies across the EU contribute to divergent outcomes from similar digital investments OECD (2023b). The coexistence of such structural asymmetries underscores the importance of designing inclusive digital investment strategies that take into account country-specific characteristics.

Improvements in one country's digital infrastructure and capabilities can generate substantial cross-border benefits through trade, knowledge diffusion, and value chain integration. The literature has long emphasized that technological advances in one economy can positively impact others. Coe and Helpman (1995) showed that a country's productivity increases with the R&D capital of its trading partners, highlighting the importance of international knowledge spillovers. In the EU context, Bottazzi and Peri (2003) demonstrated that regional innovation has geographically bounded but significant spillover effects across European borders, especially where integration is strong. More recently, Shahnazi (2021) provided direct evidence that a increasing a country's ICT development leads to a productivity increase in other EU countries, indicating powerful digital spillovers within the European Union. Using a novel regional trade database and a gravity model framework, Barbero and Rodríguez-Crespo (2018) find that broadband—used as a proxy for ICT—has a significant and positive impact on bilateral trade flows between EU regions in 2007 and 2010, highlighting the role of digital infrastructure in strengthening regional economic integration. Cai et al. (2022) develop a unified model of trade, innovation, and knowledge diffusion, showing that reductions in trade costs trigger R&D reallocation and sectoral specialization, with cross-country knowledge diffusion amplifying the resulting welfare gains. These findings highlight the economic rationale for coordinated, large-scale digital investment strategies across the EU, where one country's digital advancement can multiply benefits across the entire single market.

In this context, this paper studies the macroeconomic impact of EU digital investments using a multi-country and multi-sector spatial computable general equilibrium (CGE) model aiming to quantify the impact of possible digital spillovers. We use a novel dataset from five major EU funding instruments (the Recovery and Resilience Facility, Cohesion Policy, the Connecting Europe Facility- Digital, the Digital Europe Programme, and Horizon Europe) which collectively allocate approximately €175 billion across 15 categories of digital investments spanning all EU 27 Member States. The model is calibrated to capture the sectoral and geographical structure of the EU economy, assuming a ten sector production economy in each country, and is used to simulate the impacts of digital investments aligned with the EU's Digital Decade policy agenda.

The key contribution of this paper lies in its general equilibrium assessment of the EU's digital transition. While previous studies often focus on micro-level analyses or partial equilibrium approaches, this paper uniquely employs a spatial CGE model to quantify the economy-wide and cross-border effects of digital investment across the EU.

The remainder of the paper is structured as follows. Section 2 introduces the reader to the picture of digitalization in the EU with a focus on presenting our novel dataset on EU digital investments from five different funds. Section 3 discusses the model and calibration and presents the simulation strategy. In Section 4 we present and discuss our results. Finally, Section 5 concludes.

2 Digitalization and the EU

2.1 EU Digital Agenda

With the launch of the Digital Agenda for Europe in 2010, the European Commission recognized digital technologies as pivotal to Europe's prosperity and economic growth. This agenda laid the foundation for creating a true digital single market in Europe. Following the COVID-19 pandemic, the pace of digital transformation accelerated, particularly with the widespread adoption of telework, e-learning, and e-commerce. Simultaneously, the decreasing cost of electronics and the proliferation of the Internet of Things (IoT) generated vast amounts of data. Coupled with enhanced computing power, this data fueled the rise of Artificial Intelligence (AI). The transformative and disruptive potential of AI, alongside the rapid adoption of other digital technologies, significantly expanded the scope and depth of digital transformation across our societies and economies. In order to grasp the benefits and minimize the risks of digital transformation, and in particular of Artificial Intelligence, the European Commission developed during the period 2019-2020 an ambitious policy agenda including several policy initiatives that were targeting particularly digital technologies. Among these initiatives we could highlight the following ones:

— The **Digital Decade policy programme**: To track the European Union's progress toward becoming the most digitized continent by 2030, the Digital Decade policy program outlines a set of indicators, targets, and objectives at both the European and Member State levels. It also provides trajectories to guide the achievement of these objectives. The program includes a Digital Compass, which organizes the indicators and targets around four main axes and establishes a governance and monitoring framework to ensure effective follow-up on the established goals.

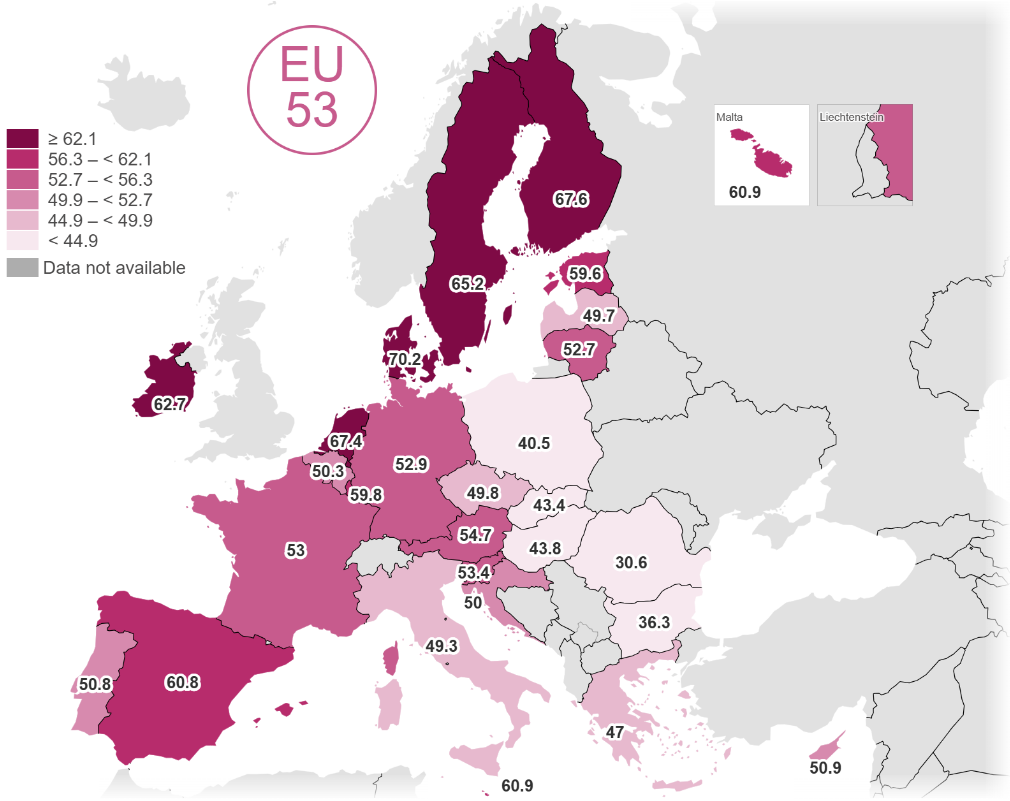
— The **European Data Strategy**: With the aim of making the EU a leader in data-driven society and creating a real European single market for data, the European Data Strategy encompasses three key initiatives: The Data Governance Act, which facilitates data sharing across sectors and Member States; the creation of common interoperable European Data Spaces, designed to support secure data flow across sectors and Member States; and the Data Act, which aims to enhance data sharing by addressing the technical, legal, and economic challenges that contribute to the underutilization of data.

— The **Coordinated plan on Artificial Intelligence** and the **Artificial Intelligence Act**: Due to its widespread influence and transformative potential, AI is one of the most promising digital technologies. To maximize its benefits in Europe, the European Commission has developed a comprehensive strategy aimed at establishing an ”ecosystem of excellence” for AI. This strategy is implemented through the AI Coordinated Plan, which seeks to accelerate AI investments, eliminate fragmentation across countries and sectors, and align AI projects and strategies at both the EU and national levels. Additionally, through the AI Act, the European Commission has created a level playing field designed to foster an ”ecosystem of trust,” ensuring that AI can be adopted safely in Europe, by using a risk-based system to classify AI systems.

— The **Digital Services Act** and the **Digital Markets Act**: Digital technologies and digital infrastructures are the key cornerstones for the building of digital services, which must function within fair and contestable markets. These markets should enable innovators, particularly European start-ups, to compete on equal terms. The Digital Markets Act aims to achieve this by outlining the rules and obligations for the so-called ”digital gatekeepers.” Additionally, to ensure that digital service providers effectively manage associated risks, the Digital Services Act has set forth key regulations to ensure that harmful and illegal online content is adequately addressed by digital platforms.

These major policy initiatives have the goal of establishing the legal framework for digital technologies to function within the European Union and will set the boundaries for digital investment to function.

Figure 1: Digital Economy and Society Index (DESI), 2022



Notes: DESI is taken from the country profiles of the 2022 edition of the index and can be found here: https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022. The EU27 average stands at 53. Source: European Commission and authors' calculations.

2.2 The Digital Economy and Society Index (DESI)

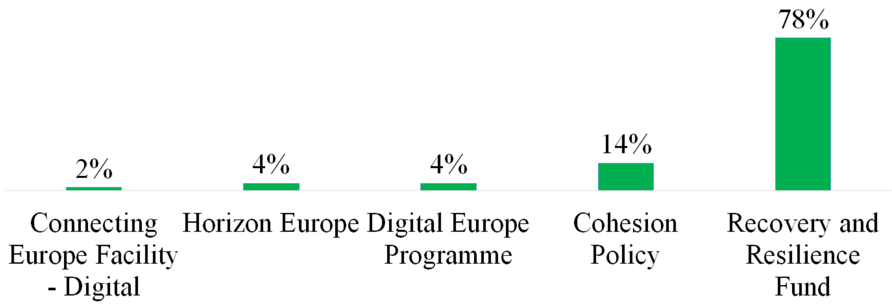
To monitor the implementation and effectiveness of these strategies, the European Commission has developed the Digital Economy and Society Index (DESI), which since 2014 has provided a comprehensive assessment of Member States' digital performance. DESI aggregates a range of indicators across four dimensions (connectivity, human capital, integration of digital technologies, and digital public services, thereby capturing the multifaceted nature of digital transformation. In line with the Digital Decade Policy Programme 2030, DESI was integrated in 2023 into the *State of the Digital Decade Report*, which serves as the main monitoring tool for progress toward the EU's digital targets. The DESI framework not only measures how far Member States have advanced but also reveals persistent asymmetries in the pace of digitalization across the Union. As illustrated in Figure 1, countries such as Denmark (70.2), Finland (67.6), and the Netherlands (67.4) exhibit high DESI scores, reflecting their strong performance in human capital development, broadband connectivity, and digital public services. Conversely, countries such as Romania (30.6), Bulgaria (36.3), and Poland (40.5) remain below the EU average (53), signaling structural gaps in digital infrastructure and adoption.

2.3 An overview of European digital investments

As outlined above, the *Digital Decade Policy Programme* seeks to shape Europe's digital transformation around four key pillars: digital skills, digital infrastructures, digitalisation of businesses, and digitalisation of public administration. To support progress in these areas, several EU funding instruments have incorporated dedicated investment components in digital innovation and infrastructure.

In this analysis, we examine approximately €175 billion in EU investments directed toward digital innovation and infrastructure, financed through five major funding programmes, each characterised by distinct objectives, priorities, and geographical scopes. The *Recovery and Resilience Facility* constitutes the largest share, with allocations of about €135 billion—equivalent to 78% of the total digital-related funds examined. This is followed by *Cohesion Policy* programmes, amounting to around €24 billion (14%), the *Digital Europe Programme* (€6.5 billion, 4%), *Horizon Europe* (€6 billion, 4%), and the *Connecting Europe Facility – Digital* (€2.7 billion, 2%). Figure 2 summarises the relative importance of each funding instrument in supporting digital investments across the Union.

Figure 2: Funds examined



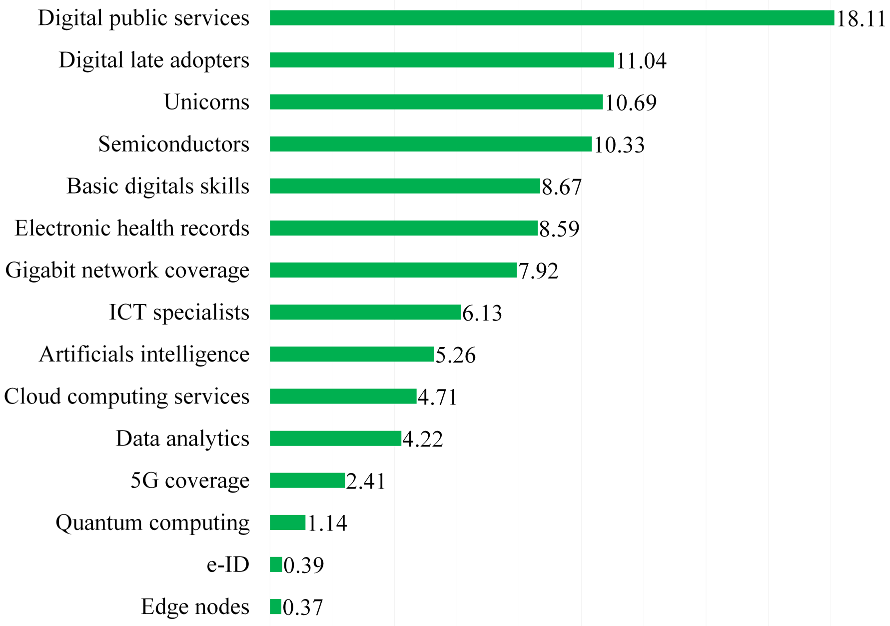
Source: European Commission and authors' calculations.

A total of approximately €175 billion in EU digital investments is distributed across fifteen key thematic areas, as illustrated in Figure 3. These areas span a broad range of initiatives that underpin Europe's digital transformation, including the digitalisation of public services, support for digital late adopters and high-growth enterprises (unicorns), advancements in semiconductor technologies, the enhancement of basic digital skills, the development of electronic health records, and the expansion of gigabit network coverage. Further resources are allocated to the promotion of artificial intelligence, cloud computing, data analytics, quantum computing, electronic identification (e-ID), and edge node infrastructure.

The distribution of investments reveals that the largest share—approximately 18% of the total budget—is directed toward the digitalisation of public services. Substantial allocations are also devoted to the digitalisation of small and medium-sized enterprises (11%) and to support for scale-ups and unicorns (10.7%). Semiconductor technologies, critical to Europe's strategic autonomy, account for around 10% of total funding, while programmes enhancing basic digital skills receive close to 8.7%. Collectively, these five categories represent nearly 60% of the overall investment envelope, reflecting the EU's focus on reinforcing technological capacity, productivity, and digital inclusiveness. The diverse composition of investments implies heterogeneous macroeconomic effects: for instance, the adoption of artificial intelligence is likely to induce productivity gains within the private sector, whereas the digitalisation of public services primarily enhances administrative efficiency and public-sector performance.

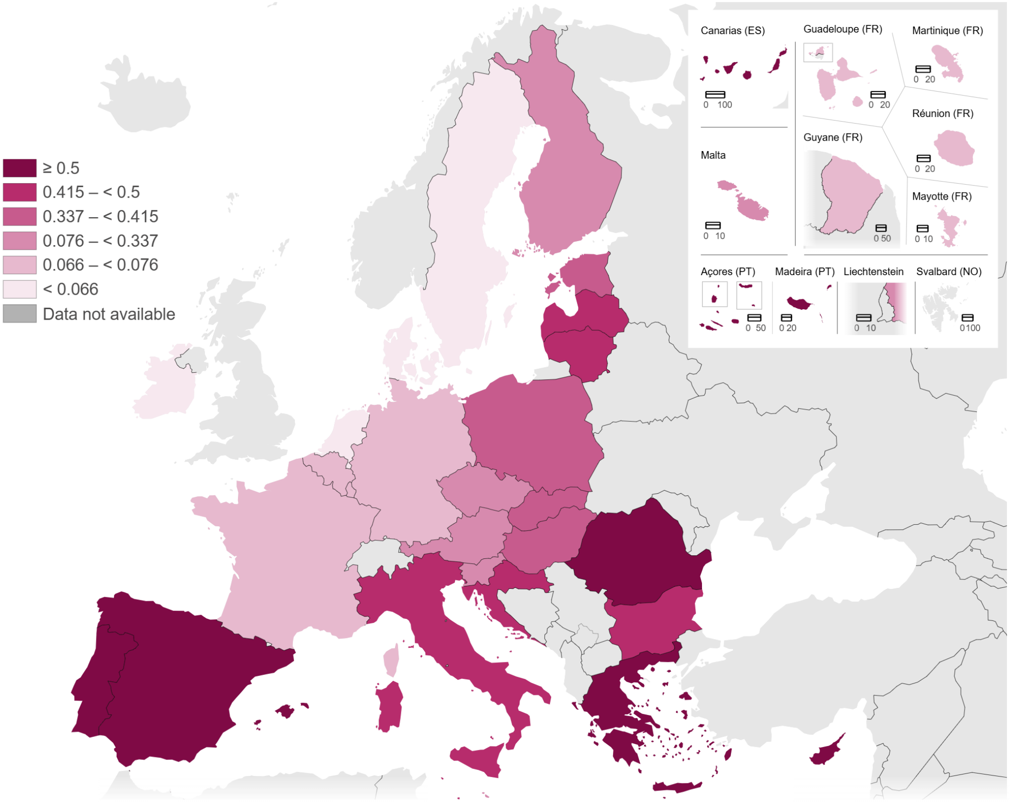
Finally, Figure 4 presents the average yearly EU digital investments over the seven-year deployment period, expressed as a percentage of each country's 2017 GDP. The map illustrates the intensity of investment across the EU, with darker shades representing higher investment shares. The distribution of digital investments reveals strong regional patterns: Southern and Eastern European countries, such as Spain, Portugal, Greece, and Romania, record the highest relative investment levels—exceeding 0.5% of their GDP. Italy, Bulgaria, and the Baltic States also display relatively high intensities, between 0.4% and 0.5%. In contrast, several Northern and Western European countries, including Sweden, Denmark, Ireland, and

Figure 3: Breakdown by categories
€175 billion of digital investments, % value of each category



the Netherlands, show markedly lower shares, with EU-funded digital investments accounting for less than 0.07% of their GDP. Overall, the geographical distribution highlights that EU digital investments are more concentrated in countries with greater infrastructure and innovation needs, supporting convergence across the Union.

Figure 4: EU digital investments: Average yearly over the deployment period (% of base year GDP)



Source: European Commission and authors' calculations.

3 Model and Simulation strategy

3.1 Brief description of model and calibration

To assess the impact of digital investments across the European Union, we use the country-level version of the RHOMOLO model, a dynamic spatial multi-country and multi-sector computable general equilibrium (CGE) framework developed and used by the European Commission for policy evaluation and impact assessment of EU funding programmes. The model assumes a 27 country framework with a 13 sector economy, and an exogenous rest of the world (RoW) aggregate. Each country is represented as a small open economy linked to others through trade, and composed of three blocks: households, firms, and the government. The government collects taxes, provides transfers to households, and purchases goods and services. Firms operate under monopolistic competition à la Dixit and Stiglitz (1977), producing differentiated goods through a value-added technology that combines private and public capital with labour of three skill levels (low, medium, and high). Production also requires intermediate inputs, which can be sourced domestically or imported from other countries, subject to imperfect substitutability and asymmetric trade costs. The model explicitly incorporates bilateral trade flows among the EU27 economies. Investment dynamics follow a partial adjustment mechanism, where new investment gradually closes the gap between desired and actual capital stocks. Households allocate disposable income between consumption and savings according to a fixed saving propensity.

The model is calibrated using country-level Social Accounting Matrices (SAMs) for the EU27 from García-Rodríguez et al. (2025), along a single aggregate representing the rest of the world. Each national economy is disaggregated into thirteen NACE Rev. 2 sectors (Eurostat), covering all major economic activities. The ten broad sectors include: A (Agriculture, forestry and fishing); B–E (Mining, energy, and water supply); C (Manufacturing); F (Construction); G–I (Trade, transport, and hospitality); J (Information and communication); K–L (Finance and real estate); M–N (Professional and technical activities); O–Q (Public administration, education, and health); and R–U (Arts, recreation, and other services). The digitally intensive sectors C and J are further decomposed into C26 (Computer, electronic and optical products), J61 (Telecommunications), and J62–J63 (Computer programming, consultancy, and information service activities). Our calibration is based on 2017 data, which define the input–output structure of the underlying dataset and serve as the reference equilibrium for all counterfactual simulations. This procedure ensures that the model replicates observed 2017 values for key domestic variables and bilateral trade flows, including pre-existing trade imbalances.

3.2 Simulation strategy

EU Member States report their planned digital-related investments as financed through five main EU programmes: the Recovery and Resilience Facility (RRF), Cohesion Policy funds, the Digital Europe Programme, Horizon Europe, and the Connecting Europe Facility. Together, these instruments amount to approximately €175 billion in digital investments. The majority of this funding (around 78%) is provided directly by national governments through the RRF, while the remaining 22% is financed via the EU budget, with Member States contributing in proportion to their share of EU GDP. This financing structure is replicated in the model: the nationally financed portion is represented as a lump-sum tax that reduces household disposable income, while the EU-level contribution is modelled as a proportional deduction from national income.

The reported digital expenditures are classified into a set of intervention categories, which are mapped onto three types of shocks in the model:

— Public investment in digital infrastructure (Inv^g): increases the stock of public capital and enhances productive capacity across sectors;

— Training and digital skills investments ($LabPro$): raise labour productivity based on country-specific returns to an additional year of training (Psacharopoulos and Patrinos, 2018a,b; Mincer, 1974);

— Private-sector digital investments (Inv^p): lower the user cost of capital, stimulating investment and capital accumulation. The corresponding total factor productivity (TFP) gain depends on R&D intensity, with elasticities ranging between 0.01 and 0.04 (Männasoo et al., 2018; d'Artis Kancs and Siliverstovs, 2016).[1]

In our simulations we assume two different scenarios: the *benchmark* scenario and the *digital spillovers* scenario. The distinction between them allows the analysis to isolate cross-country effects arising from the digital nature of the interventions. In the *digital spillovers* scenario, it is assumed that a share of public digital investment (for example, of the categories in 5G and gigabit network infrastructure) generates productivity gains that extend beyond national borders through trade and production linkages.[2] These effects, stemming from the connectivity-enhancing nature of digital infrastructure, are referred to as *digital spillovers* and are denoted in the model as Inv^g_s, representing the share of public digital investment that benefits other EU economies through shared networks and integration mechanisms.

Table 1 summarises the distribution of digital investment shocks across EU Member States. On average, the largest share of total investment is directed toward firm-level digitalisation (Inv^p), accounting for approximately 45% across countries. Public infrastructure investment (Inv^g) and training-related expenditure ($LabPro$) represent about 20% and 21%, respectively. Cross-border spillover effects (Inv^g_s) display greater variation, averaging roughly 13% across Member States, reflecting differences in digital connectivity and integration within the EU.[3]

[1] Private digital investments (Inv^p) are assumed to take place primarily in the most digitally intensive sectors—C26 (Computer, electronic and optical products), J61 (Telecommunications), J62 (Computer programming and consultancy), and J63 (Information services)—whereas public investment (Inv^g) and training ($LabPro$) apply to all sectors of the economy.

[2] This assumption aligns with empirical evidence indicating that productivity gains can diffuse internationally through trade networks and global value chains (see, e.g., Haini and Loon, 2023; Carrascal-Incera et al., 2025; Freund and Weinhold, 2004; Wang et al., 2025).

[3] A detailed sectoral decomposition of Inv^p shocks is provided in the Appendix.

Table 1: EU digital investments mapped to model shocks, by country (% of each country's total investment)

Country	Inv^g	$LabPro$	Inv_s^g	Inv^p	*Country*	Inv^g	$LabPro$	Inv_s^g	Inv^p
AT	0.09	0.20	0.22	0.49	LU	0.17	0.09	0.05	0.70
BE	0.27	0.14	0.05	0.54	LV	0.35	0.16	0.07	0.42
BG	0.27	0.19	0.17	0.37	MT	0.53	0.03	0.00	0.43
CY	0.29	0.08	0.10	0.53	NL	0.16	0.18	0.03	0.63
CZ	0.30	0.14	0.14	0.42	PL	0.35	0.20	0.22	0.23
DE	0.44	0.13	0.01	0.42	PT	0.29	0.24	0.06	0.40
DK	0.18	0.04	0.04	0.74	RO	0.43	0.19	0.01	0.37
EE	0.41	0.04	0.15	0.40	SE	0.04	0.17	0.47	0.31
EL	0.32	0.11	0.18	0.40	SI	0.41	0.13	0.08	0.38
ES	0.17	0.11	0.07	0.65	SK	0.40	0.19	0.06	0.35
FI	0.27	0.08	0.12	0.53	HU	0.28	0.20	0.08	0.45
FR	0.32	0.17	0.09	0.42	IE	0.16	0.12	0.10	0.62
HR	0.27	0.18	0.15	0.41	IT	0.26	0.16	0.12	0.46
LT	0.37	0.15	0.09	0.39					

Notes: Shares of country-level digital investments mapped to model shocks. Inv^g: public investment in digital infrastructure; $LabPro$: digital skills training; Inv_s^g: digital spillovers; Inv^p: private-sector digital investments.
Source: European Commission and authors' calculations.

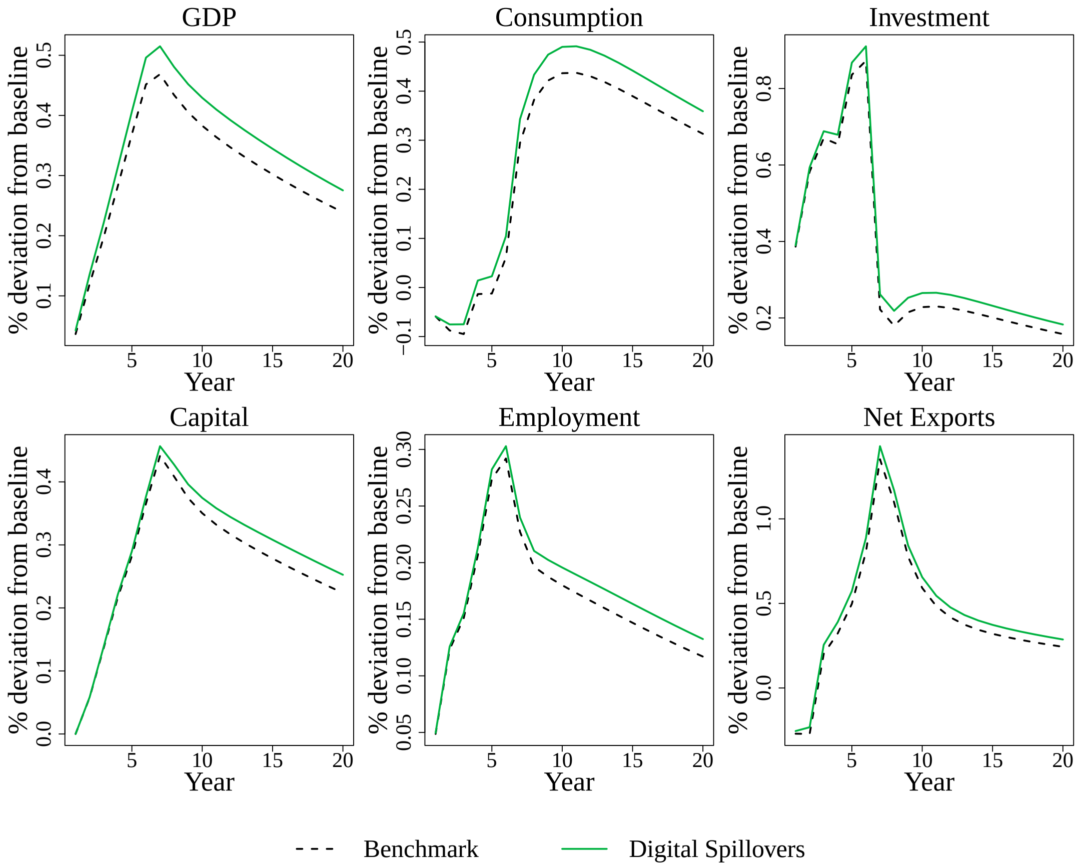
4 Results

In this section, we present the main findings from our simulations. Figure 5 illustrates the impact of EU digital investments on several key macroeconomic variables at the EU level under the two scenarios: *benchmark* (dashed black line) and *digital spillovers* (green line). The results are expressed as percentage deviations from a no-policy baseline over a 20-year horizon following the start of policy implementation.

Overall, the results show that, across all variables—including GDP—the *digital spillovers* scenario generates a stronger and more persistent positive impact than the *benchmark* scenario. In the early years of implementation, both scenarios follow a similar trajectory; however, over time, the divergence between them widens as *digital spillovers* scenario records higher impact than the *benchmark* scenario

Investment rises sharply due to the reduction in the user cost of capital, which in turn supports the accumulation of private capital stock. Employment increases as digital training programmes enhance labour productivity, while household consumption grows in response to higher income levels. Net exports also rise, reflecting a price-competitiveness channel: productivity gains reduce production costs, improving EU competitiveness relative to the rest of the world (ROW). Since the ROW is modelled as exogenous, this relative advantage translates into higher exports. Finally, the decline in all variables after 7th year corresponds to the completion of the investment phase, as demand-side shocks are zero and the economy gradually converges back to its baseline path.

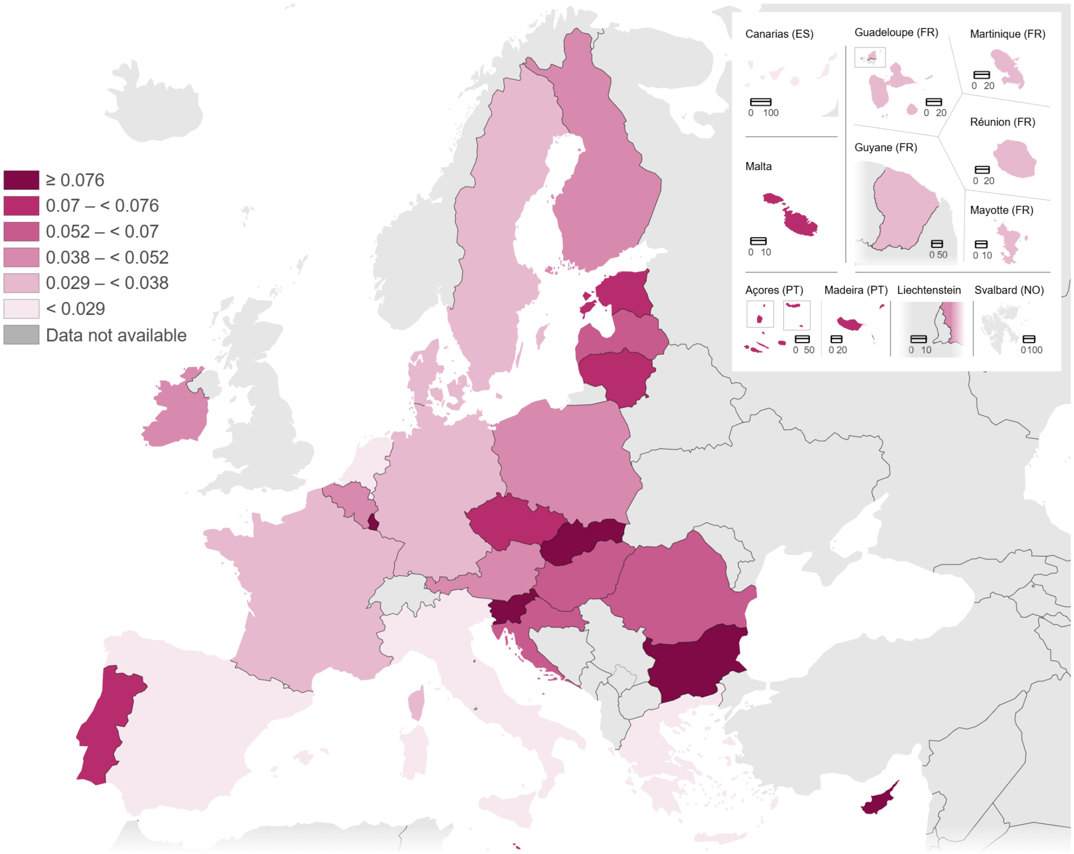
Figure 5: Impact on macroeconomic variables: *benchmark* vs *digital spillovers* scenario



Source: Authors' calculations.

Figure 6 shows the long-run GDP effects (20 years after the implementation) of digital spillovers relative to the benchmark scenario across EU Member States. The map reveals significant spatial heterogene-

Figure 6: Difference between *digital spillovers* and *benchmark* scenarios across EU27, % deviations from baseline GDP

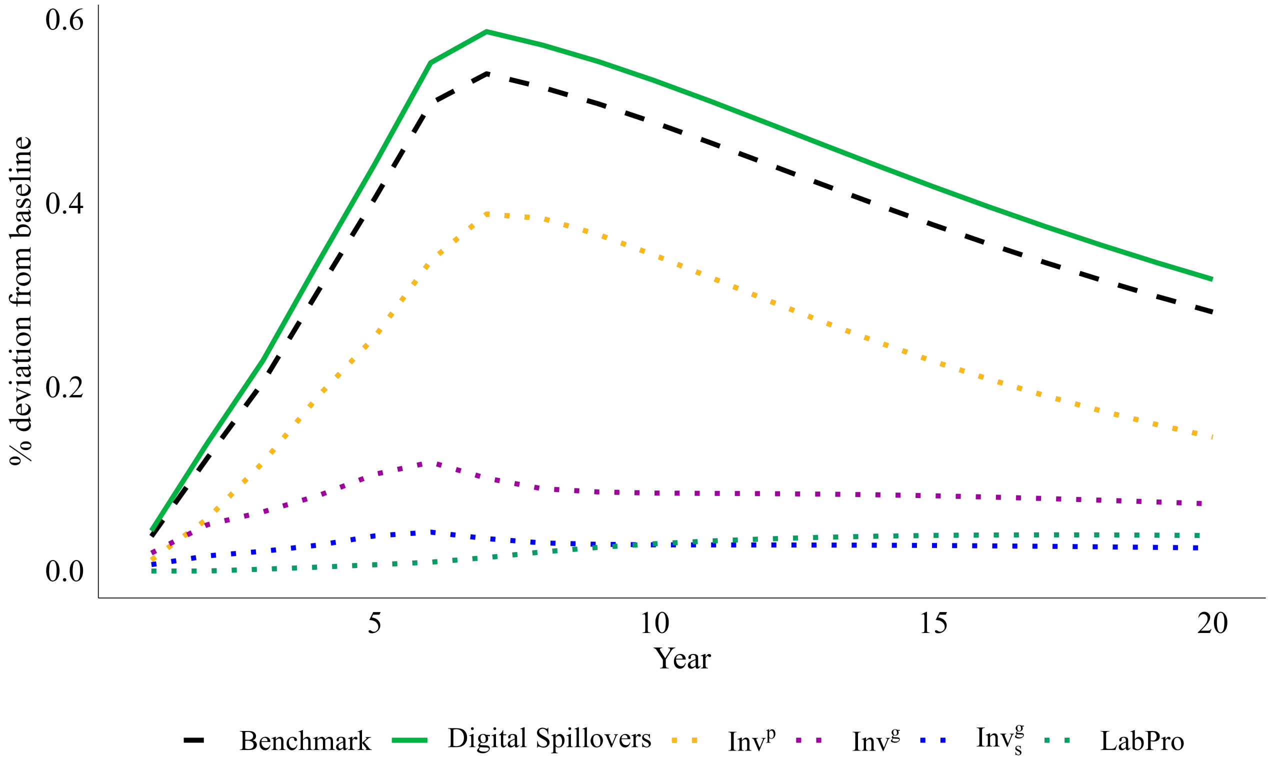


Source: Authors' calculations.

ity in the magnitude of GDP gains, with Eastern and Southeastern European countries such as Romania, Bulgaria, Cyprus, Portugal, and Slovakia experiencing the highest positive deviations, exceeding 0.076 percentage points. In contrast, more digitally advanced economies like France, Germany, northern European countries as well as Spain and Italy see relatively smaller gains, suggesting diminishing marginal returns to digital spillovers or higher digital capacity. The results emphasize the strong convergence potential of digital investment when spillover effects are accounted for, particularly in lagging countries.

Figure 7 presents a decomposition of the macroeconomic impact of digital investments on GDP under the *benchmark* and *digital spillovers* scenarios, along with the contribution of each policy channel (Inv^p, $LabPro$, Inv^g, and Inv^g_s). The results show that as expected the *digital spillovers* scenario delivers the highest overall impact, driven by the additional benefits arising from cross-border effects. Of the various channels, productivity-enhancing investments (Inv^p) and public infrastructure investment (Inv^g) account for the largest share of the impact, with digital skills training investments ($LabPro$) contributing slightly less. The presence of spillovers from digital infrastructure investment (Inv^g_s) in the *digital spillovers* scenario demonstrates that cross-country complementarities can enhance the effectiveness of national digital policies.

Figure 7: Decomposition of shock: *benchmark* vs *digital spillovers* scenario



Notes: GDP impact is presented as % deviations from baseline equilibrium.
Source: Authors' calculations.

5 Conclusions

This paper employs a dynamic spatial multi-country multi-sector computable general equilibrium (CGE) model to evaluate the macroeconomic impact of EU digital investments during the 2021–2027 programming period. Using a novel dataset of approximately €175 billion of planned investments from five major EU instruments, we translate the reported investment categories into three types of shocks: public investment in digital infrastructure, private-sector digitalisation, and digital skills training.

The results show that digital investments generate positive and persistent effects on key macroeconomic variables across the European Union. We find that digital investments have a positive and lasting impact on output, employment, as well as on capital accumulation and household consumption across the Union, revealing an interesting price-competitiveness channel for net exports. When cross-border digital spillovers are included, the gains are larger and more sustained, indicating that investments in digital infrastructure, such as broadband and gigabit networks, can yield benefits beyond national borders through enhanced connectivity and integration.

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List of Abbreviations and Definitions

Abbreviations	Definitions
AI	Artificial Intelligence
AT	Austria
BE	Belgium
BG	Bulgaria
CEF	Connecting Europe Facility
CZ	Czechia
CY	Cyprus
DE	Germany
DESI	Digital Economy and Society Index
DK	Denmark
EC	European Commission
ECB	European Central Bank
EE	Estonia
EL	Greece
ES	Spain
EU	European Union
FI	Finland
FR	France
GDP	Gross Domestic Product
HR	Croatia
HU	Hungary
ICT	Information and Communication Technologies
IE	Ireland
IT	Italy
JRC	Joint Research Centre
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
OECD	Organisation for Economic Co-operation and Development
PL	Poland
PT	Portugal
R&D	Research and Development
RRF	Recovery and Resilience Facility
RoW	Rest of the World
SAM	Social Accounting Matrix
SE	Sweden
SI	Slovenia
SK	Slovakia
TFP	Total Factor Productivity

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Annexes

Annex 1. Sectoral decomposition by country

Table 2: Sectoral composition by country (% of Inv^p)

Country	*C*	*C26*	*J*	*J61*	*J62_J63*	*Country*	*C*	*C26*	*J*	*J61*	*J62_J63*
AT	0	0.45	0	0.09	0.46	LU	0	0.35	0	0.12	0.53
BE	0	0.24	0	0.12	0.65	LV	0.39	0.07	0.10	0.12	0.32
BG	0.40	0.03	0.21	0.11	0.25	MT	0	0.10	0	0.11	0.79
CY	0.22	0.05	0	0.12	0.61	NL	0	0.53	0	0.09	0.38
CZ	0	0.05	0	0.11	0.84	PL	0	0.04	0	0.15	0.81
DE	0	0.36	0	0.19	0.46	PT	0.63	0.04	0.09	0.12	0.12
DK	0	0.23	0	0.12	0.66	RO	0.11	0.08	0	0.09	0.72
EE	0	0.06	0	0.11	0.83	SE	0	0.28	0	0.13	0.59
ES	0.78	0.01	0.06	0.06	0.08	SI	0	0.11	0.04	0.11	0.74
FI	0	0.30	0	0.12	0.58	SK	0	0.19	0	0.10	0.71
FR	0	0.19	0	0.11	0.70	HU	0	0.02	0.33	0.11	0.53
EL	0.81	0.01	0.02	0.12	0.05	IE	0	0.25	0	0.12	0.63
HR	0.29	0.02	0.19	0.11	0.39	IT	0.36	0.05	0.10	0.13	0.36
LT	0.38	0.11	0.12	0.11	0.27						

Notes: Sectors correspond to NACE classifications: C (Manufacturing), C26 (Computer, electronic and optical products), J (Information and communication), J61 (Telecommunications), and J62_J63 (IT and other information services).
Source: Authors' calculations based on Eurostat data.

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