THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

EIQ Europe in Question
Discussion Paper Series at LSE

NextGenerationEU lands: Assessing the territorial allocation of Italy's Recovery and Resilience funds

Francesco Scotti, Carlo Caporali, and Davide Luca

EIQ Paper No. 193/2026
January 2026

lse.ac.uk/ei

EIQ
Europe
in Question
Discussion Paper Series at **LSE**

NextGenerationEU lands: Assessing the territorial allocation of Italy's Recovery and Resilience funds

Francesco Scotti*, Carlo Caporali**, Davide Luca***

Abstract

In response to COVID-19, the EU launched *NextGenerationEU*, its most extensive stimulus package to date. We focus on Italy, Europe's largest beneficiary, and analyse the territorial allocation of its funds from central to local governments. Using a two-stage Heckman selection model, we find that funds primarily target Southern urban areas with stronger administrative capacity and prior EU Cohesion Policy experience. Allocation strategies vary by policy mission: Inclusion and Cohesion funds follow a convergence rationale, while Digital, Education, and Healthcare investments follow a specialisation logic, targeting areas with pre-existing sectoral strengths. Lastly, administrative efficiency and strong local governance reduce project delays.

Keywords: NextGenerationEU; Recovery and Resilience Plan; Heckman model; local institutions; administrative capacity; Italy.

---

* Department of Management, Economics and Industrial Engineering, Politecnico di Milano, Italy.

** Area of Social Sciences, Gran Sasso Science Institute (GSSI), L'Aquila, Italy. Environmental Economics Knowledge Centre, Nova School of Business and Economics, Portugal.

*** Department of Land Economy, University of Cambridge. International Inequalities Institute, London School of Economics and Political Science, UK. **Corresponding Author:** dl622@cam.ac.uk

Table of Contents

NextGenerationEU lands: Assessing the territorial allocation of Italy's Recovery and Resilience funds

1. Introduction

In response to COVID-19, the European Union (EU) launched *NextGenerationEU*, the most extensive stimulus package in its history, designed to propel member states toward a more sustainable, digital, and resilient future. The pandemic not only tested the resilience of health systems but also exposed pre-existing deep economic and social fractures across the continent. Lockdowns, supply chain disruptions, and soaring unemployment rates underscored the vulnerabilities of Europe's national and subnational economies, with some regions hit significantly harder than others (Bonaccorsi et al., 2020, Guan et al., 2020, Saltelli et al., 2020, Scotti et al., 2023). The core of the EU response is the *Recovery and Resilience Facility* (RRF)—a powerful financial instrument worth over €650 billion aimed at fostering structural reforms and strategic investments (Schramm and Wessels, 2023). The initiative is comparable to the post-pandemic strategies implemented in the US by the Biden administration (cf. Gansauer, 2025) and can be seen as part of the broader industrial and regional strategies implemented over the last decades (Bailey et al., 2023). Due to its size and scope, the RRF is likely to play a significant role in shaping Europe's future patterns of regional growth and divergence (Schramm et al., 2022, Aparicio-Perez et al.′, 2025). The facility offers member states performance-based grants and loans to support

structural reforms and investments, which are implemented through national *Recovery and Resilience Plans* (RRPs).[1]

In this paper, we study the determinants of territorial recovery funds distribution and spending delays in Italy. Although existing literature has discussed the financial architecture of the overall programme (Crescenzi et al., 2021, Fama, 2023), empirical evidence on how the national *Recovery and Resilience Plans* are being targeted and spent remains limited. Understanding the allocation mechanisms governing the plans is particularly relevant for policymakers, as it can help tailor and/or correct strategies to ensure that EU funds are spent efficiently and distributed in a manner consistent with their stated goals.

We focus on the case of Italy, Europe's largest *NextGenerationEU* beneficiary, receiving approximately €194.4 billion (€71.8 billion in grants and € 122.6 billion in loans).[2] While the central government is responsible for the funds' overall coordination, most of the expenditure is allocated to and spent by subnational governments, who have to bid for it.

We address three policy-relevant sub-questions: (1) What are the key drivers of the distribution of Italy's recovery funds from central to local governments? (2) Are the

[1] In other words, *NextGenerationEU* is the overarching EU instrument for economic recovery, while the Recovery and Resilience Facility (RRF) is the core mechanism within it, and Recovery and Resilience Plans (RRPs) are the national roadmaps for reforms and investments that Member States submit to access RRF funding.

[2] The country received substantially more resources than any other major EU economy. For instance, Spain received around €69.5 billion in grants and €70.2 billion in loans, while France was allocated €39.4 billion in grants and did not request loans. Further details about Italy's RRP are available at the following link: https://commission.europa.eu/business-economy-euro/economic-recover y/recovery-and-resilience-facility/country-pages/italys-recovery-and-resilience-plan_en, accessed in June 2025.

drivers different across different policy domains (so-called *missions*)? (3) Which local-level factors are associated with delays in project implementation?

We first examine the territorial distribution of funds to local administrations by identifying the key local characteristics that explain territorial participation in Italy's *Recovery and Resilience Plan*. We focus on Italy's municipalities, which are the country's lowest tier of government and the main implementers of RRP projects. While some projects are managed centrally and others by subnational administrative tiers such as regional governments, municipalities are responsible for around 80% of Italy's RRP total value, or over 99.8% of the total number of approved projects. Featuring a double-stage Heckman correction model, we examine the relationship between municipal fund allocations and local socioeconomic, administrative, financial, and political economy factors. In so doing, we also build a novel indicator of local administrative efficiency through robust Data Envelopment Analysis (DEA), replicating the approach of Luca and Modrego (2021).

We find that funds are primarily allocated to Southern, relatively worse-off urban municipalities with better administrative capacity. Previous experience with EU Cohesion Policy funds influences the distribution of RRP monies, while the existing infrastructure and service levels in each sector also impact the distribution across different missions.

Second, we discuss whether recipient territories adopt specialisation strategies, i.e., they attract funds in policy areas where they already have strong territorial endowments, or convergence strategies, i.e., apply for funds in policy domains where they are 'lagging behind'. We observe a process of specialisation in the Digital, Education, and Healthcare missions. By contrast, we find a pattern of convergence in the Social mission, in line with the mechanism of the EU Cohesion Policy.

Third, while examining whether monies have been spent effectively is still premature, since most projects are still ongoing, we identify and discuss the local characteristics associated with project delays. We find that higher municipal efficiency and greater

quality of human capital in the city council enhance project execution, reducing delays. By contrast, we do not see a clear North-South divide (Rungi and Biancalani, 2019).

Overall, our results relate to the literature exploring the spatial distribution of EU Cohesion Policy funds. For instance, a large body of work has explored and discussed whether EU Funds are – or should – be targeted to regions with the weakest socioeconomic conditions following a principle of convergence, or to areas where monies are likely to achieve the most substantial returns (Bodenstein and Kemmerling, 2011, Zubek and Henning, 2016, Bonaccorsi et al., 2020, 2021, Capello and Caragliu, 2021, Polyakova et al., 2020, Becker et al., 2013, 2018). Furthermore, existing research has demonstrated the importance of local administrative capacity and government quality in the allocation and effective use of EU funds, often benefiting regions with stronger institutions rather than those with the greatest need (Bachtler et al., 2014, Surubaru, 2017, Tiganasu et al., 2018, Sostar et al.ˇ , 2023). This can create an uneven distribution of resources, where less developed regions struggle to access funds due to weaker bureaucratic and human resource infrastructures. Additionally, there is a significant amount of research on distributive politics, strategic targeting and the role of political bargaining in influencing the allocation of public monies (Castells and Sole-Oll´ e´, 2005, Arulampalam et al., 2009, Luca, 2021, Golden and Min, 2013). As a result, political considerations may override objective economic criteria, undermining the efficiency and fairness of the allocation process. Our paper also contributes to the discussion about those factors that may influence local governments in applying for EU funds (Incaltarau et al., 2020, Santos and Conte, 2024). Moreover, we discuss the main barriers that hinder or delay the implementation of RRPs (Becker et al., 2013, Crescenzi et al., 2021). In so doing, we inform policymakers about possible corrective actions to the ongoing implementation of Italy's RRP. Given the unprecedented scale and complexity of the *NextGenerationEU* framework, ongoing assessment is essential to ensure its effectiveness. While the *Recovery and Resilience Plans* are still being implemented, preliminary analyses can provide early warning signals about potential inefficiencies, regional disparities, or structural barriers to fund absorption. These

insights are particularly valuable for policymakers, enabling them to make timely adjustments and enhance the allocation process before the program reaches full implementation. By examining Italy's RRP distribution at the municipal level, this study contributes to this proactive approach, identifying key factors that influence participation and unveiling emerging territorial dynamics in local sustainable development.

The remainder is structured as follows: Section 2 summarises the existing literature and offers an institutional overview of the Italian case. Section 3 describes the data sources and illustrates the variables used in the empirical analysis. Section 4 explains the empirical estimators. Section 5 then presents our main results, while Section 6 discusses their policy implications. Finally, Section 7 concludes.

2. Conceptual Framework and background

2.1 Conceptual framework

The *NextGenerationEU* is a recently developed and ongoing programme aimed at providing an economic response to the COVID-19 pandemic. Consistently, the bulk of the discussion is related to its legal architecture and socioeconomic governance (Bokhorst, 2022, Fabbrini, 2022, Vanhercke and Verdun, 2022). *The Recovery and Resilience Facility* (RRF), constituting the centrepiece financial instrument of *NextGenerationEU*, has led to a major re-balancing between the economic and the monetary integration of the Economic and Monetary Union. (D'Erman and Verdun, 2022). By reallocating substantial new spending, borrowing, and taxation powers to the EU level, the RRF has reinforced the legitimacy of EU economic governance. As a result, the EU now exhibits characteristics akin to those of established federal systems, featuring a centralised fiscal capacity designed to support the economic policies of its constituent units (Fabbrini, 2022). However, it remains uncertain whether bridging the asymmetry between EU monetary and economic policy constitutes a true 'Hamiltonian moment' signalling a permanent transformation in European

integration, or merely an exceptional, temporary measure that will be phased out as the pandemic subsides (Celi et al., 2020).

Despite a rich debate on the EU macro-economic policy coordination framework of *NextGenerationEU*, empirical evidence on the management and delivery of specific national *Recovery and Resilience Plans* is still limited. Two exceptions focus on Portugal and Spain, respectively. Santos and Conte (2024) explore the regional participation in research and innovation projects part of the *NextGenerationEU* programme in Portugal. They find that the regional distribution of funds is more similar to that observed for Horizon 2020 than the Cohesion Policy (2014–2020). Their results also show a rural-urban divide in regional participation, due to a lack of demand for research and innovation funding in less developed, more rural areas. Furthermore, Aparicio-Perez´ et al. (2025) use a synthetic control method to evaluate the potential impact of RRF funds in Spain, suggesting that the support package has boosted per capita GDP by between 3.0% and 5.6% over the period 2022-2025. However, to the best of our knowledge, no other study has explored the case of Italy, Europe's biggest *NextGenerationEU* beneficiary.

Furthermore, existing studies do not provide a comprehensive analysis of the factors driving the territorial distribution of RRF monies. Conversely, systematically identifying the determinants and possible problems in the allocation process could offer valuable insights for policymakers, enabling them to receive early warnings about the need to adjust their resource distribution strategies and ensure a more effective and equitable allocation of transfers.

Combining different contributions from the existing policy literature, we identify five main classes of factors potentially influencing the territorial distribution of public monies. These include local (i) socioeconomic, (ii) administrative, (iii) financial and (iv) political-economic factors. Additionally, in the specific context of *NextGenerationEU*, we also consider the (v) severity of the COVID-19 pandemic.

First, the local socioeconomic environment is expected to play a key role in the distribution of funds, with larger amounts devoted to places with lower socioeconomic development levels (Dall'Erba and Le Gallo, 2008, Mohl and Hagen, 2010, Di Cataldo, 2017, Mogila et al., 2022).

Whether public funds should be preferentially targeted to 'lagging behind' areas or not has been hotly debated (Barca et al., 2012, World Bank, 2009). For example, more developed areas may benefit from larger amounts because of a better absorptive capacity (Becker et al., 2013, Tosun, 2014), and/or better ability to match funding. This pattern is reinforced by spatial spillovers, particularly when neighbouring communities have to collaborate in applying for financing for shared infrastructure projects (Zubek and Henning, 2016, Dall'Erba and Le Gallo, 2008). Importantly, national or supranational policy-makers may also intentionally decide to target resources to core/better-off areas (World Bank, 2009) in expectation of 'higher returns' per unit invested. Past research has, for example, shown such a pattern in the distribution of transport infrastructure funding in the United Kingdom, where London has often received more resources than areas in the North (Coyle and Sensier, 2019). Similarly, Luca and Rodr´ıguez-Pose (2015) shows how, during the 2000s, central public investments in Turkey were allocated to provinces that were lagging behind but not to the poorest ones, plausibly reflecting a strategic targeting of peripheral areas with the strongest 'growth potential'.

Second, a vast and growing body of literature emphasises how local 'institutional thickness' and government capacity play a key role in the effective use of public monies (Gertler, 2010, Rodr´ıguez-Pose, 2013, Charron et al., 2013, Amin, 1999). For instance, local quality of government (Charron et al., 2013, Rodr´ıguez-Pose and Garcilazo, 2018, Mendez and Bachtler, 2024), administrative continuity/political stability, and administrative capacity (Bachtler et al., 2014, Milio, 2007, Surubaru, 2017, Tiganasu et al., 2018, Incaltarau et al., 2020) may foster/hinder the ability of local administrations to apply for and secure national and supra-national resources.

Third, local financial capacity may also play an important role. When co-financing is formally required, or when supra-local resources are insufficient to fully fund local projects, local public and private actors may need to step in, activating crowding-in mechanisms, attracting additional investments, and maximising the impact of the available funds.

Fourth, a huge number of studies in political economy demonstrate that the redistribution of public monies is also almost always driven by electoral politics (Luca, 2021, Golden and Min, 2013, Livert and Gainza, 2018, Luca and Rodr´ıguez-Pose, 2019). Dixit and Londregan (1996) define this as tactical redistribution, as opposed to programmatic redistribution. Under this perspective, equity and efficiency – the two key drivers which, independently of the existence or not of a trade-off between targeting areas most in need and those with the greatest expected returns, motivate the second form of redistribution – are germane only if understood as tools for increasing the probability of re-election of those in public office. The distributive politics literature has identified a full range of potential political determinants, including the type of party in power, whether a local politician faces re-election or not, and partisan alignment, i.e. whether the local party in power has the same political colour as the upper tiers of government (Sole-Oll´ e and Sorribas-´ Navarro, 2008). Exploring EU funds in Bulgaria, Surubaru (2017) also argues that enhancing fund absorption requires not only administrative capacity but also closer political-administrative coordination.

Fifth, since *NextGenerationEU* was explicitly designed to support recovery from the COVID19 crisis, measures capturing the local severity of the pandemic may also help elucidate patterns of participation in the RRF, as they may have shaped both need and motivation to engage with the funding process.

2.2 The Italian Context

Italy was one of the hardest-hit European countries during the COVID-19 pandemic. In 2020, its GDP contracted by 8.9%, significantly more than the EU average of 6.2%

(Bonfiglio et al., 2022, Cottafava et al., 2022). The first EU country to impose a nationwide lockdown in March 2020, Italy experienced severe public health impacts, leading to nearly 120,000 recorded deaths, the highest toll in the EU (Clark et al., 2020, Di Porto et al., 2022).[3] The crisis exacerbated Italy's preexisting economic, social and administrative structural weaknesses, including sluggish productivity growth (Bugamelli et al., 2018, Giordano and Zollino, 2021), underinvestment in digital infrastructure (Ben et al., 2017), and inefficiencies in public administration (Bianco and Napolitano, 2011, Datta et al., 2020).

Italy's *Recovery and Resilience Plan* was designed around seven core policy areas, called 'missions'. Monies are allocated as follows: (1) *Green Revolution and Ecological Transition*, receiving the largest share, equal to €55.5 billion (29% of the total funds); (2) *Digitisation, Innovation, Competitiveness, and Culture*, €41.3 billion (21% of the total); (3) *Education and Research*, €30.1 billion (15% of the total); (4) *Infrastructure for Sustainable Mobility*, €23.7 billion (12% of the total). (5) *Inclusion and Cohesion*, €16.9 billion (just over 9% of the total); (6) *Healthcare,* €15.6 billion (just over 8% of the total), and (7) *RepowerEU*, €11.3 billion (around 6% of the total). Figure 1 provides a breakdown. Each of the seven overarching missions is further subdivided into specific components and initiatives, each with its own dedicated financial envelope. [4] National RRPs are also required to align with general EU guidelines mandating that a minimum of 37% of resources are devoted to climate-related investments and reforms, and at least 25% are used for the digital transition. Furthermore, in pursuit of territorial cohesion objectives, Italy has earmarked approximately 40% of its RRP resources for the country's less-developed southern regions, complemented by targeted technical

[3] As at the beginning of 2023, Italy reported a COVID-19 death rate of 295 per 100,000 inhabitants, surpassing other major EU countries such as France (239 per 100,000), Germany (182 per 100,000), and Spain (252 per 100,000).

[4] For further details, please see the document available at the following link: https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698847/EPRS_BRI(2021)698847_EN.p df.

assistance to strengthen local administrative capacity for project preparation and implementation.

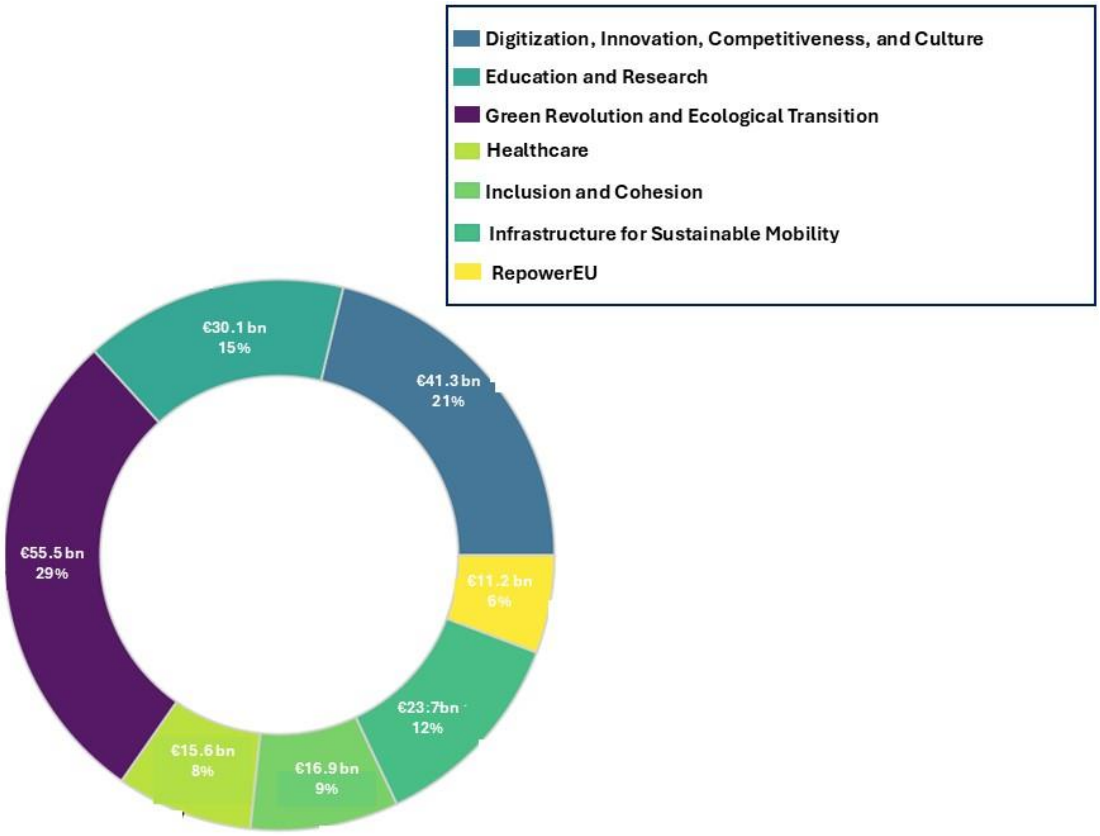


Figure 1: The sectoral allocation of Italy's Recovery and Resilience Plan across its seven policy missions.

The following paragraphs describe each of the seven missions. The mission *Digitalisation, Innovation, Competitiveness, Culture, and Tourism* is structured into three main components. The first aims to transform public administrations by promoting the migration of administrative systems to cloud computing, streamlining bureaucratic procedures, and strengthening cybersecurity measures. The second component includes substantial technological investments (Transition 4.0) as well as support for Research and Development (R&D) activities at the firm level. Furthermore, it entails significant investments to ensure nationwide ultra-broadband coverage. The third component aims to revitalise the cultural and tourism sectors through the

restoration and promotion of historical and cultural sites, as well as the improvement of accommodation facilities to enhance overall service standards and the attractiveness of both urban and rural areas.

The mission *Green Revolution and Ecological Transition* is organised around four components. The first promotes the circular economy by strengthening waste recycling infrastructures and developing an innovative and sustainable agri-food supply chain. The second component fosters the adoption of renewable energy sources, including hydrogen-based solutions. The third aims to enhance energy efficiency by improving the overall environmental performance of buildings. Finally, the fourth contributes to the country's resilience to climate change, protects natural ecosystems and biodiversity, and ensures the security and efficiency of the water management system by reducing the hydro-geological risk.

The mission *Education and Research* includes two components. This first strengthens educational offerings by enhancing the competencies of the teaching staff, improving infrastructure and technological tools available for education, and expanding doctoral programmes. The second component aims to raise R&D expenditure and foster more effective collaboration between public research institutions and the business sector.

The mission *Social Inclusion and Cohesion* includes three components. The first facilitates employment transition, enhances workers' employability, and strengthens labour protection through training initiatives. The second component supports policies related to urban planning, housing, childcare services, and elderly care. It also encompasses initiatives related to education, family support, security, multiculturalism, gender equity, and social inclusion. The third component promotes territorial cohesion by reinforcing economic support for so-called 'inner areas',[5]

[5] In the Italian policy context, these are remote areas, often in mountainous or isolated rural settings and frequently lacking access to public services and to economic poles.

enhancing the utilisation of assets confiscated from organised crime, and improving assistance for special economic zones.

The mission *Healthcare* has two components. The first aims to strengthen home care services, develop telemedicine, and improve integration among social and healthcare services. The second component supports innovation, research and digitisation in the national health service.[6]

The mission *Infrastructure for Sustainable Mobility* focuses on two main components. The first supports the development of the Italian railway system by completing some of the major national high-speed and high-capacity railway corridors, ensuring their integration with the regional railway network, and improving the overall safety of the existing network. The second component promotes inter-modality and integrated logistics solutions and modernises the logistics system.

The mission *RepowerEU* focuses on one single component, providing support for the production system to achieve ecological transition, strengthen energy distribution networks, accelerate renewable energy production, enhance energy efficiency, and foster expertise in green transition in both the public and private sectors.

The allocation of resources reflects a multi-level nature, combining EU-level earmarking requirements, national strategic priorities, which shape both the sectoral and territorial distribution of funds, and sub-national, bottom-up engagement. Within this architecture, municipalities and other sub-national actors were invited to apply for funding under the pre-defined missions and components. It is important to note that the allocation process did not entail a strict zero-sum logic between missions: resources were pre-assigned to each mission at the national level, and applications were evaluated within these established boundaries. Nevertheless, practical tradeoffs may have still emerged, particularly in regions with weaker administrative structures.

[6] A more detailed description of each mission is available at the following link: https://www.italiadomani.gov.it/it/home.html.

In such contexts, municipalities with limited technical capacity may have struggled to prepare and submit high-quality applications across multiple domains, effectively constraining their ability to access the full breadth of available funding opportunities. This dynamic underscores the importance of investigating the main factors affecting the distribution of RRP resources.

The disbursal of funds from the EU is attached to conditions. An initial tranche of around 13% of the total was disbursed upon approval of the plan submitted by the Italian government to the European Commission. Further payments are not automatic but depend on Italy achieving specific milestones and targets set out in its RRP. For each tranche, the government submits a formal payment request to the Commission, which then evaluates progress. Following a positive assessment and consultation with the EU's Economic and Financial Committee, the funds are released.

At the national level, the implementation and financial management of these resources are centrally coordinated. The Minister for European Affairs serves as the primary liaison with the EC, while the Ministry of Economy and Finance manages operational aspects through its General Inspectorate for the RRP. This body oversees coordination, monitoring, financial reporting, and compliance, supported by an independent audit unit and the integrated IT platform ReGiS. Once funds are received by the national government, they are allocated to central, regional, and local administrations according to their areas of competence. Key sectoral ministries — such as the Ministry of Infrastructures and Transport, the Ministry of Environment and Energy Security, and the Ministry of Enterprises and Made in Italy — manage the most significant shares of funding. These ministries then distribute resources to regions, municipalities, and other agencies responsible for implementing projects on the ground.

As anticipated in the introduction, municipalities are receiving the lion's share of funding, as they are responsible for around 80% of Italy's RRP total value, or over 99.8% of the total number of approved projects. Importantly, municipalities had to apply for funding and participate in competitive tenders.

After securing funding, municipalities may collaborate with private actors, including businesses and non-profit organisations, to execute specific components of their projects. This collaboration can involve public-private partnerships, subcontracting, or other forms of cooperation, depending on the project requirements and objectives. The involvement of private parties aims to leverage additional expertise, resources, and innovation, thereby enhancing the overall impact and efficiency of the RRP initiatives.

Italy has encountered challenges in the timely utilisation of funds. The country has received six payments tied to the completion of 270 milestones and targets, representing only 44% of the total plan. A seventh payment of €21 billion has been approved on 1st July 2025, which is expected to raise the share of fulfilled milestones and targets to 54%. This instalment supports 64 reforms and investments, including measures to streamline renewable energy permits, address environmentally harmful subsidies, strengthen cybersecurity, promote renewable energy and sustainable transport, and provide scholarships. Italy has also submitted an eighth payment request worth €14.7 billion, covering 40 additional milestones such as reforms to reduce late payments by public administrations. Delays in project completions, with over 60% of tenders in 2023 and 2024 still incomplete, have diluted the anticipated economic impact, with GDP growth projections adjusted downward. These challenges underscore the complexities inherent in managing and deploying substantial EU funds within stringent timelines. They further justify the necessity for a comprehensive investigation into the primary factors influencing territorial participation in RRP projects and the underlying causes of implementation delays.

3. Data

This section is structured as follows. Subsection 3.1 describes our dependent variables. Subsection 3.2 presents the explanatory variables we include to address RQ1 and RQ3, while A discusses how we create one of our key regressors using Data Envelopment Analysis. Subsection 3.3 then presents the alternative set of regressors that we include

in our analysis when disaggregating overall allocations into mission-specific expenditures, that is, when we address RQ2.

3.1 Dependent Variables

To address RQ1, our dependent variable is the total amount of RRF funds per capita allocated by the central Italian government to each municipality:

$$Y_j = \frac{Aggregate\ amount\ of\ RRF\ allocated\ to\ municipality\ j}{Residents\ in\ municipality\ j} \quad (1)$$

We collect the data from the Open Polis platform.[7] Table A1 provides some key descriptive statistics. To address RQ2, we also disaggregate the total funds by each of the different policy missions that structure Italy's *Recovery and Resilience Plan*:

$$Y_j^m = Per\ capita\ amount\ of\ RRF\ allocated\ to\ municipality\ j\ in\ mission\ m \quad (2)$$

Importantly, we exclude the *Infrastructure for Sustainable Mobility* mission from the analysis, since transportation funds tend to be managed by central or regional authorities, and they usually involve more than one municipality. Notably, projects related to this mission involve only 155 individual municipalities.

In addition, we exclude the *RepowerEU* mission from our analysis, as it comprises only 29 projects, all managed at the national or regional level. Moreover, since this mission was approved in December 2023, its associated projects may still be subject to updates.

We also exclude from our analysis two measures under the *Digitisation, Innovation, Competitiveness and Culture* mission. The first refers to M1C1I1.03.01 (5,972 projects; €0.2 billion), which supports the implementation of a National Digital Data Platform involving the entire national territory. The second concerns M1C3I4.02.01 (3,635 projects; €0.6 billion), which provides non-repayable grants and tax credits for the

[7] The dataset is available at the following link: https://openpnrr.it/opendata/. We rely on the most recent dataset available at the time of writing, updated as of 31st July 2025.

restructuring of tourism and hospitality enterprises, managed at the regional level. In the *Education and Research* mission, we also exclude measure M4C2I2.02 (10,159 projects; €0.6 billion), related to the Fund for the National Research Programme and Projects of Relevant National Interest, as it is national in scope and directly managed by universities rather than municipalities. Combined, these two measures correspond to less than 5% of the mission budget, meaning that we cover over 95% of the *Education and Research* mission funds.

Our final dataset includes information on 269,299 projects. We focus on initiatives that are unambiguously linked to a single municipality responsible for their implementation (245,823 projects, accounting for 91.2% of all initiatives). In contrast, we exclude cases where projects are managed at the regional level or span the entire national territory (23,476 projects, representing 9.8% of the total). Overall, the analysed sample accounts for €156.6 billion, corresponding to 80.6% of the entire budget.

Lastly, to address RQ3, our dependent variable captures the extent to which projects managed by each municipality experience implementation delays. Specifically, we measure the percentage of RRF funds allocated to delayed projects relative to the total RRF allocated to each municipality:

$$Y_j = \frac{Aggregate\ amount\ of\ RRF\ allocated\ to\ municipality\ j\ for\ projects\ experiencing\ a\ delay}{Aggregate\ amount\ of\ RRF\ allocated\ to\ municipality\ j} \quad (3)$$

Unfortunately, the Open Polis repository does not provide detailed information on the extent of delays, but only reports a binary indicator specifying whether a project is behind schedule or not. Consequently, we are unable to distinguish between minor and major delays. In the absence of better indicators, we believe that the variable can still provide useful preliminary insights into how municipalities manage their funds, especially considering the association highlighted in the literature between local funding absorption, delays and administrative capacity (e.g. Milio, 2007).

3.2 Explanatory Variables: All missions

Drawing on the conceptual framework discussed in Section 2, we account for five main groups of factors which may influence both the ability and readiness of local governments to attract and access *NextGenerationEU* funds. These include local (a) socioeconomic, (b) administrative, (c) financial and (d) political-economic factors, along with (e) the local impacts of the COVID-19 pandemic.

Socioeconomic conditions. *Income pc.* We first include income per capita. This is relevant considering that the RRP allocates a substantial portion of its resources to reduce regional disparities and support less advantaged territories.[8] Moreover, this is consistent with the fact that the bulk of EU Cohesion Policy funds is transferred to regions with a GDP per capita below 75% of the EU average (Di Cataldo, 2017, Scotti et al., 2024).

Cohesion Policy funds. Although the RRP was explicitly designed to respond to the COVID19 pandemic, other authors noticed similarities between *NextGenerationEU* and other EU programmes, such as Horizon 2020 and the Structural and Cohesion funds (Crescenzi et al., 2021, Santos and Conte, 2024). For such reasons, we also control for the total allocated Cohesion Policy funds in the last concluded programming period 2014-2020. Previous allocations from Cohesion Policy funds may serve as indicators of a municipality's capacity to manage and utilise external funding effectively. A track record of successful fund management could positively influence the allocation of and the capability to spend the RRP budget.

Population density. Coherently with the literature on other EU funds, we include population density (Becker et al., 2012, Barone et al., 2016) to distinguish between urban and rural areas.

[8] See, for instance, the section of the RRP devoted to "Reducing the gaps in standards of living", available at the following link https://www.italiadomani.gov.it/content/sogei-ng/it/en/il - piano/priorita-del-piano/riduzione-del-divario-di-cittadinanza.html, accessed in August 2025.

Population. Moreover, to account for heterogeneity in municipal size, we also control for the logarithm of total population, even if our dependent variables are measured per-capita. This helps us mitigate the risk that our results are mechanically driven by the scale of the municipality, given that larger municipalities typically have greater administrative capacity and economies of scale. Moreover, smaller municipalities may face structural constraints, such as limited technical staff or expertise, that may hinder their ability to prepare and submit competitive project proposals, effectively creating barriers to participation in the allocation process.

NUTS1 dummies. Considering that the RRF allocates about €82 billion to the South,[9] corresponding to more than 40% of the total budget, we control for macro-regional (NUTS1) dummies (North-West, the baseline, then North-East, Centre and South).

Administrative capacity. *Efficiency.* Our first and most important variable is an efficiency score that we compute following the approach of Luca and Modrego (2021). This is a key metric that reflects the level of municipal efficiency in delivering specific service levels across various sectors based on incurred expenditures. A high efficiency score signals that a municipality can effectively plan, implement, and monitor projects. Moreover, efficient municipalities demonstrate effective governance and resource management, thus being perceived by national/international institutions as more capable of properly executing funded projects. Since higher local administrative capacities should increase the absorption of EU funds (Zubek and Henning, 2016, Incaltarau et al., 2020), we expect the efficiency score to be positively associated with the amount of funds allocated to Italian municipalities and with less project delays.

We construct the variable ourselves using Data Envelopment Analysis (DEA), a robust nonparametric methodology for assessing technical efficiency within the public sector

[9] For further details, see the following link: https://www.mef.gov.it/en/focus/The-Nat ional-Recovery-and-Resilience-Plan-NRRP/?utm_source=chatgpt.com.

(Charnes et al., 1978, Banker et al., 1984). Appendix A provides a detailed technical description of our empirical approach and the data sources.

Nr of projects. Our model also includes the number of projects managed by each municipality to assess whether higher funding levels are associated with a greater volume of applications or can be attained through fewer, larger interventions. Additionally, this variable allows us to examine whether delays are more likely when municipalities are tasked with managing a larger portfolio of initiatives.

Human capital. We take into account the percentage of city council members who hold at least a university degree. Local governments with a higher proportion of well-educated members are likely to possess better strategic planning and decision-making skills (Bradley and Taylor, 1996, Carmeli, 2004). This intellectual capital may enhance the municipality's ability to design and manage complex projects, thereby attracting more RRP projects and reducing their late implementation.

Female leadership. We control for the portion of women in the city council as genderdiverse councils bring varied perspectives and inclusive approaches to governance. Moreover, female leadership can positively influence fiscal performance and policy outcomes (Holman, 2014, Balaguer-Coll and Ivanova-Toneva, 2021), potentially leading to more effective utilisation of allocated funds.

Second term. We also account for a dummy variable indicating whether mayors serve a second term, as mayors in their second mandate often have established administrative processes and networks, providing continuity and stability. This experience can enhance the municipality's credibility and capacity to manage additional funds effectively (Wolman et al., 1996, Avellaneda, 2009).

Municipal Union. We include a dummy variable equal to 1 for municipalities that successfully joined a so-called 'Municipal Union', and 0 otherwise. These are intermunicipal cooperation bodies aimed at improving local service delivery and efficiency (See Ferraresi et al., 2018, Luca and Modrego, 2021). Controlling for this

variable allows us to account for potential differences in administrative capacity and resource pooling, which may influence both the ability to attract RRP funding and the timely implementation of funded projects.

Local finance. *Public debt.* We consider the level of municipal public debt. Debt burdens may signal financial distress, deterring the co-financing of projects (Timushev, 2020).

Political-economy. *Party colour.* We consider a categorical variable related to the local political party orientation (which we define as right, left and civic lists, the baseline). Italy's RRP was approved in July 2021 and then implemented, in its first stages, during the technocratic government led by Mario Draghi. We therefore do not have clear priors on the relevance of partisan orientation.[10]

COVID-19 impacts. *Excess mortality.* Finally, given that the RRP was explicitly designed to support recovery from the pandemic, municipalities more severely affected may have had stronger incentives to apply for funding. For this reason, we consider the excess mortality rate in 2020.

Economic shock. We similarly include the changes in employment (Δ*Employment*) and income per capita (Δ*Income pc*) between 2019 and 2021. These two indicators capture the economic impacts of the pandemic.

Tables A2 and A3 report some key descriptive statistics for our municipal-level regressors.

3.3 Explanatory variables: Mission specific

To address RQ2, i.e. to explore if the allocation of funds across each of the policy domains follows a specialisation or a convergence strategy, we consider five sets of mission-specific indicators. In so doing, we draw on the concept of *territorial capital*

[10] Unfortunately, we do not have data on the timing of fund disbursements, so we cannot exactly pinpoint individual investments to a specific year. Conversely, we only have data on how much funding has been allocated to each municipality to date.

introduced by Camagni et al. (2009) to describe the localised, specific assets — both material and immaterial — that characterise a territory and its potential for development. These assets encompass not only traditional infrastructure and physical capital but also human capital, social and relational networks, cultural heritage, institutional quality, and environmental resources. According to Camagni et al. (2009), the effectiveness of development policies critically depends on these territorially embedded endowments, as they shape a locality's ability to absorb and make productive use of public investment. While his framework has become a common reference in studies examining the uneven impact of EU funding across regions, particularly in the context of Cohesion Policy (Fratesi and Perucca, 2019, Bachtrogler et al.¨ , 2020), we differentiate from it in two ways. First, in some cases, we need additional variables to cover all the missions included in the RRP, whose scope is significantly broader than that of the EU Cohesion Policy. Second, the territorial capital framework is usually applied at the regional or provincial level (Fratesi et al., 2014, Fratesi and Perucca, 2019), while we adopt a more granular geographical scale. Therefore, in some cases, variables included in the territorial capital framework are not available at the municipal level, and we need to revert to alternative proxies.

Digitisation, Innovation, Competiveness, and Culture. We consider the percentage of people with fast internet connections (*Broadband coverage*) and the *Number of firms* per capita. These metrics serve as a proxy for the digitisation, connectivity, presence of competitive businesses, and entrepreneurial spirit of municipalities (Camagni et al., 2009). Furthermore, we take into account the number of *Museum visitors*, as well as a dummy variable describing whether the underlying municipality is a tourist hotspot or not (*Touristic hotspot*) based on a national statistical office classification.[11] Such variables should cover the availability of collective goods, including accommodation infrastructures as well as cultural heritage attractions and natural amenities,

[11] Detailed information about the touristic classification of Italian municipalities is available at the following link: https://www.istat.it/classificazione/classificazione-dei-comun i-in-base-alla-densita-turistica/.

contributing to raising the touristic engagement within a municipality (Lorenzini et al., 2011, Massidda and Etzo, 2012, Scotti et al., 2024).

Green Revolution and Ecological Transition. We include the fraction of people living in areas characterised by a high landslide (*Landslide risk*) and hydraulic (*Hydraulic risk*) risks, to account for local environmental vulnerability, particularly in the context of climate change-related events (Turconi et al., 2019, Santos et al., 2020). Landslides and hydraulic risks are particularly relevant for many of Italy's peripheral municipalities, which are often in mountainous areas or rugged terrains. Moreover, we include the percentage of *Soil consumption* and the share of *Waste recycling* as proxies of the level of human impact in an area and the quality of local environmental services. Finally, we account for the concentration of *PM2.5* as a proxy of air quality. This pollutant is considered a primary cause of death and health problems, and is therefore often used as a key environmental target indicator by the European Environment Agency (EEA)(Gonzalez´ et al., 2015, Beloconi and Vounatsou, 2023). While PM2.5 is a local pollutant and, as such, does not fully capture broader climate change dynamics, such as greenhouse gas emissions, it remains a robust indicator of environmental degradation with well-documented impacts on human health. Its inclusion thus allows us to proxy local ecological stress, which may influence fund allocation decisions, even if it does not encompass the full spectrum of climate-related concerns.

Education and Research. We consider the number of employees in the Education (*Education employees*) and Research (*Research employees*) sectors, as well as the number of university students per municipality of residence or of the university (*University students per municipality of residence*, *University students per municipality of university*). These indicators reflect the capacity of municipalities to offer adequate educational services, and host research institutions and innovation centres (Hancock, 2023). Moreover, they provide an insight into the geographical distribution of students, shedding light on the local attractiveness of universities, and social disparities in the access to higher education services (Agasisti and Vittadini, 2012, Agasisti and Longobardi, 2014).

Inclusion and Cohesion. We account for the percentage of *Active population* and the *Employment rate* to assess the level of labour market participation, and identify areas with ageing population. We also consider the share of *Foreign-born people* to map potential levels of social fragmentation. Finally, we include two indices of *Deprivation* and *Inequality* and a measure of crime rate (*Crimes*) to evaluate the level of wealth disparities and socio-economic polarisation within municipalities (Bonaccorsi et al., 2020, 2021). Such variables are in line with other studies exploring social inclusion and cohesion in Italy (Camagni et al., 2009, Calcagnini and Perugini, 2019).

Healthcare. We consider the number of *Hospital beds*, *Health infrastructures*, and *Health sector employees*. We expect these variables to provide an insight into the local healthcare service capacity and accessibility of Italian municipalities (Amaddeo et al., 2024).

Tables A4-A8 report the descriptive statistics for each group of mission-specific explanatory variables.

4. Empirical approach

In this section, we discuss our empirical approach. Section 4.1 explains the two-step selection model that we employ to identify the drivers of territorial fund allocation (RQ1 and RQ2). Section 4.2 then presents the OLS model we use to analyse the drivers of project delays (RQ3).

4.1 Participation, fund intensity, allocation strategies: the Heckman Model

Since not all municipalities apply for and receive RRP funds, we rely on Heckman (1979)'s selection model. This model is based on a two-stage problem, consisting of the following structural process:

$$yj = Xj\beta + u1,j \quad (4)$$

where y_j is the total amount of funds per capita allocated to each municipality j (cf. equation 1). X_j is a vector of explanatory variables. These include socioeconomic (SE), administrative (AC), financial (FC) and political-economy (PE) regressors when we explore the allocation of overall funding (RQ1, see section 3.2):

$$X_j = SE_j + AC_j + FC_j + PE_j + \epsilon_j \quad (5)$$

Alternatively, when we explore the mission-specific drivers (RQ2, see section 3.3), the vector X_j includes five sets of mission-specific regressors:

$$X_j = MS_j + \epsilon_j \quad (6)$$

Importantly, in both equations 5 and 6, the dependent variable y_j is only observed if:

$$Z_j\gamma + u_{2,j} > 0 \quad (7)$$

where Z_j constitutes a set of factors influencing whether a municipality is involved in the allocation process or not. These factors are defined as follows:

$$Z_j = ER_j + Population_j + Cohesion\ Policy\ Fund_j + MS_j \quad (8)$$

The model requires an exclusion restriction, i.e. that at least one variable influencing the probability of participation in the selection equation (z_j) is not included in the second-step regression measuring the amount of funding received. To satisfy this, we consider as exclusion restriction variables (ER_j) three measures capturing the local impact of the COVID-19 crisis. In addition to these exclusion restriction variables, the selection equation also controls for municipal population and the volume of EU Cohesion Policy funds previously received. These are expected to influence both the likelihood of participation and the amount of funds allocated conditional on participation. They are included in the first stage to account for structural and institutional features that may affect municipalities'

administrative capacity and strategic orientation toward external funding opportunities. For instance, larger municipalities may have greater technical and human resources to engage in application processes, while experience with EU funds may indicate a higher level of familiarity with managing complex funding schemes. When addressing RQ2, we also include mission-specific variables (MS_j) in both stages of the model, as detailed in Section 3.3, since the availability of mission-specific infrastructure and services may affect the decision to participate in the allocation process for a project.

A simple OLS estimation of equation 4 would yield biased coefficients for the vector of parameters β. The Heckman error correction model computes estimates based on a two-step procedure. First, it obtains Probit estimates of the selection equation:

$$Pr(y_j \mid z_j) = \Phi(z_j\gamma') \tag{9}$$

Then it computes the non-selection hazard, known as the inverse Mills ratio, m_j for each observation j:

$$m_j = \frac{\phi(z_j\hat{\gamma})}{\Phi(z_j\hat{\gamma})} \tag{10}$$

where $\phi(\cdot)$ and $\Phi(\cdot)$ are the standard normal density and cumulative distributions functions. Finally, as a second step, it estimates β by augmenting the regression equation with the nonselection hazard m:

$$y_j = x_j\beta + \rho\sigma m_j + \epsilon_j \tag{11}$$

where ϵ is an independent error term.

As a robustness check for the mission-specific regression model of equation 6, we also run a Principal Component Analysis (PCA), where we reduce the

multidimensionality of our secondstep, mission-specific explanatory variables and, then, correlate these principal components with the amount of resources allocated to municipalities in each specific policy area (See section 5.3 below for more details).

4.2 Project delays: Ordinary Least Squares

When investigating the drivers of project delays, we use two simple Ordinary Least Squares (OLS) models:

$$y_j = \beta SE_j + \gamma AC_j + \delta FC_j + \theta PE_j + \epsilon_j \quad (12)$$

$$y_j = \lambda MS_j + \epsilon_j \quad (13)$$

where y_j is the share of municipal RRP funds for projects behind schedule relative to the total funds allocated to the municipality (see equation 3). SE_j,AC_j, FC_j, PE_j and MS_j are again the same set of regressors as in equations 5 and 6.

5. Results

This section presents our results. Section 5.1 explores the first-step Heckman model outputs on the municipal likelihood of being involved in the *Recovery and Resilience Plan*. Sections 5.2 and 5.3, then, report the second-step results about, respectively, the amount of RRP funds received (RQ1), and whether, within each policy mission, monies are allocated following convergence or specialisation strategies (RQ2). Finally, Section 5.4 shows the outputs on project delays (RQ3).

5.1 Extensive margin: The likelihood of receiving RRP funds

In this section, we examine the factors associated with municipal participation in the RRP, that is, the 1st stage results of the Heckman model discussed in Section 4.1. The outputs are reported in Table 1.

Interestingly, while *NextGenerationEU* – and the RRP – were set up following the pandemic, only local employment contraction is significantly associated with a higher participation in the RRP. This coefficient is large in magnitude and statistically significant both when we analyse the total amount of funds received by municipalities (cf the first column) and when we split up the total by policy missions, although this is not the case for Health projects (cf columns two to six). By contrast, neither the pandemic-related per-capita income shock nor excess mortality is significant. We link this unexpected finding to the fact that, according to Italy's RRP, 40% of the overall budget was devoted to Southern areas, while the impacts of the pandemic were more severe in the North (Ascani et al., 2021, Scotti et al., 2023).

Table 1: Heckman model 1st stage results.

	Dependent Variable: RRF transfers per capita					
Participation (1st Stage)	(1) All	(2) Digital	(3) Green	(4) Education	(5) Social	(6) Health
Excess mortality	-0.117	-0.135	-0.169	-0.108	-0.162	-0.117
	(0.315)	(0.319)	(0.339)	(0.297)	(0.301)	(0.329)
Δ Employment	-0.078**	-0.091***	-0.058*	-0.066**	-0.079**	-0.029
	(0.037)	(0.038)	(0.030)	(0.031)	(0.037)	(0.057)
ΔIncome pc	-0.249	-0.314	-0.239	-0.431	-0.318	-0.752
	(0.221)	(0.564)	(0.751)	(0.192)	(0.264)	(0.313)
Population	0.417***	0.428***	0.157	0.273***	0.128***	0.190
	(0.115)	(0.128)	(0.167)	(0.272)	(0.512)	(0.613)
Cohesion Policy funds	0.265	0.618	0.512	0.382	0.661***	0.599
	(0.501)	(0.361)	(0.477)	(0.411)	(0.216)	(0.416)
Rho	-1.041***	-0.581***	-0.527***	-0.882***	-0.582***	1.081***
	(0.337)	(0.218)	(0.140)	(0.139)	(0.216)	(0.197)
Mills ratio	0.137***	0.181***	0.522***	0.596***	0.442***	-0.430*
	(0.038)	(0.047)	(0.192)	(0.211)	(0.160)	(0.241)
N	4534	4294	4534	4321	4107	4534

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

We also find that more populated municipalities have a substantially larger probability of receiving RRP funds, except in the Green and Health missions. Such a finding confirms that urban areas are more likely to participate in *NextGenerationEU* programmes (Santos and Conte, 2024). Furthermore, the amount of EU Cohesion Policy funds received in the last completed programming period (20014-2020) does not raise the likelihood of participating in the RRP. This is consistent with previous studies highlighting the differences between *NextGenerationEU* and the Cohesion Policy (Crescenzi et al., 2021, Santos and Conte, 2024). The only exception is the Social missions, and this is expected since, like the Cohesion Policy, this RRP mission aims to reduce territorial socioeconomic disparities. The statistically significant Inverse Mills Ratio in Table 1 highlights the need to account for a two-stage Heckman model since a simple OLS model would provide unreliable estimates due to the presence of a selection bias in the participation in RRP projects.

We replicate the 1st stage results, replacing the general regressors with the mission-specific explanatory variables (Results are reported in Appendix C). Interestingly, none of the sectoral regressors for the *Digitalisation, innovation, competitiveness and culture* mission is significant. For *Green transition*, PM2.5 and soil consumption are, even though only the indicator of local air pollution shows the expected sign (i.e., areas with higher pollution are more likely to receive funds, while soil consumption is inversely correlated). In the case of *Education and research*, the likelihood of participation in the RRP is higher in areas with more university students and research employees. For *Inclusion and cohesion*, the deprivation index is a strong and significant predictor. Finally, in the case of *Healthcare*, for which none of the general regressors of Table 1 were significant, we find that both the number of hospital beds and the number of health sector employees are positive and significant predictors.

5.2 Fund intensity: Cross-sectoral regressors.

Table 2 reports the 2nd stage intensive-margin results of the Heckman model, obtained by regressing the amount of RRP funds on the list of general explanatory variables.

Among the socioeconomic regressors, we find that Income per capita is negatively associated with RRP fund intensity when considering the overall financial envelope and when analysing the Education and Social missions (it is still negative but insignificant for *Digital* and *Green*). The variable is instead significantly and positively associated with more monies in the *Health* mission.

RRP funds are also positively correlated to previously allocated EU Cohesion Policy funds when considering *All* or *Digital* projects, but the relationship is negative in the *Education* mission, or not significant in the case of *Green*, *Social* and *Health* missions.

More densely populated municipalities tend to be associated with higher funds allocation in line with Santos et al. (2020), who find a stronger territorial participation in the *NextGenerationEU* programme in urban rather than rural areas of Portugal. An opposite pattern is displayed in the *Education* sector, while no significant coefficients characterise the *Social* and *Health* missions.

From a macro-regional perspective, Southern municipalities tend to receive more funds, while North-Western ones attract the lowest support. As discussed earlier, the preferential focus on the South is in line with the official RRP geographical guidelines, which set a target of 40% of resources addressed to the *Mezzogiorno*.

Taken together, these patterns underscore some differences between the targeting of the EU Cohesion Policy budget, which is primarily allocated in line with the economic convergence objective (Di Cataldo, 2017, Scotti et al., 2024), and the RRP, which follows more complex patterns.

With respect to administrative capacity regressors, the coefficient for municipal efficiency is strongly positive and statistically significant (except in the case of the *Health* mission). In particular, we find that a 1% increase in the efficiency score is associated with a rise in RRP funds of between 0.13-0.17 C per capita.

Interestingly, we do not find a statistically significant relationship between the number of projects obtained by municipalities and the total amount of funds received, suggesting that similar funding levels can be achieved either through a few large interventions or multiple smaller ones. Additionally, the interaction between the number of projects and municipal efficiency is positive but not statistically significant, indicating no robust evidence that efficiency moderates the relationship between project volume and funding allocation (as we will discuss later, we instead find evidence of a moderating role when we analyse the drivers of project delays. See Section 5.4 below).

Furthermore, we find that the percentage of municipal council members with tertiary education (Human capital) is positively associated with fund intensity. This evidence confirms EC studies highlighting how the lack of competence or insufficient staff may determine weaknesses in local management systems, poor coordination between different bodies, and inefficient implementation of public procurement (European Commission, 2018). Indeed, gaps in technical knowledge and low quality of the human capital in managing authorities and intermediate bodies constitute a challenge to process and absorb EU funding (Mendez and Bachtler, 2024). The only exceptions are the Social (no significance) and the Health (negative relationship) missions.

Female leadership in the City Council is insignificant in four out of six models. Unexpectedly, it is negative and significant in the case of the Education and Social missions. Further research may explore this unexpected finding. As we will discuss in more detail when assessing project delays (cf. Section 5.4), we hypothesise that this may be a spurious coefficient associated with the regional macro-dummies.

Having a mayor in their second mandate is positively associated with more overall funds (column one) and especially in case of the *Digital* mission. This pattern suggests that a stronger stability in local governments may facilitate the attraction of EU projects. Mendez and Bachtler (2024), for instance, found that the effective access and spending of EU funds during the 2007–13 programming period were dependent on

the maturity of the institutional system responsible for the implementation of the investment strategies.

We do not find any evidence that joining a Municipal Union is associated with a higher municipal capacity to attract more funds.

Regarding the political-economy drivers, municipalities governed by right- or left-wing parties tend to receive more funds than those led by civic lists. While this finding is counterintuitive visa-vis the existing political-economy literature – which often finds a clear allocation bias towards` only one party or coalition – it is important to note that the RRP was finalised, submitted and initially implemented during the government led by Mario Draghi. This temporary, technocratic executive received broad partisan support from both the left and the right of the Italian Parliament, and this may explain why municipalities governed by both the right and the left tended to receive more RRP funds than municipalities without a precise partisan alignment.

With respect to local finance, the results suggest that a higher level of public debt is associated with a lower ability to attract funds in all projects (column one) and in the *Digitalisation, innovation, competitiveness and culture* mission (column two). This finding is in line with the evidence suggesting that fiscal decentralisation and the territorial ability to co-finance projects represent important determinants of the absorption capacity of territories (Bachtler and Mendez, 2010).

While our analysis focuses exclusively on initiatives where the municipality can be designated as the responsible authority for implementation, the allocation of these resources may nonetheless be shaped by broader regional dynamics. Regional governments often play a coordinating or supervisory role in the implementation of national recovery strategies, and municipalities within the same region may share administrative practices, political networks, or strategic priorities that influence funding outcomes. Moreover, municipalities operating within the same regional context may adopt similar approaches to accessing funds or designing tender procedures. To account for this possibility, we re-estimate our models including

regional fixed effects, thereby controlling for all unobserved time-invariant heterogeneity at the regional level. The inclusion of these controls does not alter our main findings, which remain robust and statistically significant. Results are reported in the Appendix in Tables B1 and B2.

Table 2: Heckman model 2nd stage estimates: Cross-sectoral regressors

	Dependent Variable: RRP transfers per capita					
2nd Stage	(1) All	(2) Digital	(3) Green	(4) Education	(5) Social	(6) Health
Income pc	-0.518***	-0.227	-0.102	-0.710*	-0.882***	1.417*
	(0.148)	(0.161)	(0.174)	(0.399)	(0.251)	(0.758)
Cohesion Policy funds	0.049**	0.0452*	0.027	-0.090*	0.026	0.262
	(0.021)	(0.023)	(0.020)	(0.048)	(0.033)	(0.201)
Population density	0.161***	0.178***	0.123***	-0.148***	-0.068	-0.139
	(0.018)	(0.023)	(0.026)	(0.041)	(0.053)	(0.085)
Population	0.061***	0.054***	0.026	0.074***	0.055**	0.102***
	(0.020)	(0.021)	(0.058)	(0.019)	(0.025)	(0.031)
North-East	0.521***	0.539***	0.382***	0.020	-0.318*	0.518*
	(0.049)	(0.058)	(0.049)	(0.098)	(0.152)	(0.261)
Centre	0.839***	0.863***	0.519***	0.102	-0.197	-0.315
	(0.058)	(0.063)	(0.055)	(0.119)	(0.183)	(0.298)
South	0.991***	0.963***	0.635***	0.401*	1.218***	0.227
	(0.069)	(0.076)	(0.061)	(0.225)	(0.271)	(0.319)
Efficiency	0.138***	0.127***	0.142***	0.137**	0.171***	0.120
	(0.019)	(0.022)	(0.019)	(0.043)	(0.045)	(0.128)
N. Project	0.087	0.079	0.092	0.061	0.057	0.104
	(0.091)	(0.082)	(0.105)	(0.095)	(0.073)	(0.115)
Efficiency*N. Projects	0.104	0.097	0.116	0.084	0.093	0.138
	(0.201)	(0.163)	(0.137)	(0.118)	(0.115)	(0.209)
Human capital (%)	0.163***	0.120***	0.108***	0.086**	0.045	-0.160*
	(0.018)	(0.020)	(0.019)	(0.040)	(0.038)	(0.085)
Female leadership (%)	0.093	0.020	0.025	-0.090*	-0.161***	-0.128
	(0.118)	(0.019)	(0.021)	(0.048)	(0.039)	(0.119)
Second term	0.072*	0.095**	0.025	-0.039	0.089	-0.023

	(0.035)	(0.044)	(0.031)	(0.065)	(0.068)	(0.124)
Municipality union	-0.059	-0.021	-0.079	-0.050	-0.023	0.024
	(0.039)	(0.048)	(0.039)	(0.068)	(0.075)	(0.162)
Right party	0.958***	0.917***	0.563***	0.241	0.362*	0.025
	(0.148)	(0.127)	(0.163)	(0.182)	(0.191)	(0.116)
Left party	1.056***	1.151***	0.383**	0.062	0.427*	-0.301
	(0.147)	(0.162)	(0.185)	(0.201)	(0.211)	(0.267)
Public debt	-0.081**	-0.017***	0.069	0.086	0.072	-0.074
	(0.037)	(0.006)	(0.058)	(0.064)	(0.059)	(0.061)

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.3 Allocation strategies: Mission-specific regressors

In this subsection, we explore the mission-specific links between fund intensity and pre-existing municipal characteristics. Our goal is to address RQ2 and explore whether funds are allocated in each policy area according to a logic of convergence, where more money flows to municipalities with weaker sectoral characteristics, or a logic of specialisation, where more funds are allocated to local governments with pre-existing sectoral strengths.

Table 3 presents the Heckman model's second-stage results obtained when regressing the mission-specific allocations on the set of mission-specific covariates.

To further corroborate the regression results, which are our main outputs, we also perform a Principal Component Analysis (PCA) on each set of mission-specific indicators. We aim to assess the robustness of the regression outputs in Table 3 to reducing dataset multidimensionality and extracting essential features. In particular, we consider a number of principal components summarising at least 50% of the overall variation in the data. We then check the correlation between each principal component and the amount of mission-specific RRP funds per capita. We report these additional results in Appendix E.

Results from Table 3 suggest that all the regressors for the Digital mission are strong and significant predictors of the amount of funds allocated to a municipality. All coefficients are positive, meaning that more monies are targeted to areas with already larger broadband coverage, more firms per capita and a stronger tourism sector. Similarly, we observe a positive correlation between the RRP allocation and both PC1 (12.1%, p-value ~ 0, mainly reflecting firm number and fast internet connection) and PC2 (11.7%, p-value ~ 0, mainly summarising the cultural dimension of this mission). This pattern suggests that the Digitalisation, Innovation, Competitiveness and Culture mission follows a specialisation logic, since more RRP funds are allocated to areas with a higher pre-existing level of digital, cultural, and competitiveness features.

In the case of the Green Revolution and Ecological Transition mission, municipalities with a higher hydraulic risk and a lower percentage of waste recycling receive more funds, in line with a convergence logic. At the same time, higher local air pollution (PM2.5) is negatively associated with fund intensity. In the PCA analysis, PC1 is related to PM2.5 concentration, while PC2 summarises hydraulic risk and soil consumption. PC1 and PC2 cover more than 60% of the variability in the underlying indicators. We observe a negative correlation between RRP funds and PC1 (-19.6%, p-value ~ 0), and an almost absent relationship with PC2 (-1.5%, p-value = 0.289). While future work should address this mission in more depth, our explanation for these contrasting results is that the RRP preferentially targets the South, while the areas with the highest air pollution tend to be the most productive ones of the North (Northern Italy's Po Valley is notoriously one of Europe's most air-polluted regions).

With regards to the Education and Research mission, all regressors are positive and statistically significant, suggesting that more funds are allocated to municipalities with a larger pre-existing presence of university students, as well as research and education employees. These results provide evidence of specialisation. This is confirmed by the positive correlation between RRP funds per capita and both PC1 (15.6%, p-value ~ 0, mainly reflecting employees in the research and education sectors, as well as students

per municipality of residence) and PC2 (16.3%, p-value ~ 0, representing students per municipality of the university).

In the Social Inclusion and Cohesion mission, the regression results suggest that municipalities with higher deprivation and inequality indices obtain more funds. The share of active population is positive and significant, while the employment rate, the share of foreigners and crime rates are insignificant. In the PCA analysis, PC1 mainly summarises the deprivation index, whereas PC2 reflects active population and inequality indices. We observe a negative correlation between the RRP monies and both PC1 (-12.8%, p-value ~ 0) and PC2 (-17.1%, p-value ~ 0). Taken together, these results suggest a convergence pattern, whereby larger investments flow to areas with weaker socio-economic conditions.

Finally, in the Healthcare mission, regression coefficients suggest that municipalities receiving higher RRP transfers have a larger pre-existing presence of hospital beds and health care employees. The regression results are confirmed by the PCA analysis, where we find a positive correlation between fund intensity and PC1 (14.3%, p-value ~ 0, correctly summarising information on hospital beds, health infrastructures, and health sector employees). These results underscore, again, a specialisation strategy, whereby more money is directed to municipalities with pre-existing sectoral strengths.

Table 3: Heckman model 2nd stage results replacing the regressors of Table 2 with the mission-specific explanatory variables.

	Dependent Variable: RRF transfers per capita					
2nd Stage	(1) All	(2) Digital	(3) Green	(4) Education	(5) Social	(6) Health
Broadband coverage		0.259***				
		(0.021)				
Firms pc		0.251***				
		(0.019)				
Museum visitors		0.079***				
		(0.019)				

Tourist hotspot	0.527***					
	(0.072)					
Landslide risk		-0.018				
		(0.020)				
Idraulic risk		0.082***				
		(0.016)				
Soil consumption		-0.048				
		(0.031)				
Waste recycling		-0.065***				
		(0.021)				
PM 2.5		-0.149***				
		(0.037)				
N						
Education employees			0.127**			
			(0.061)			
Research employees			0.156*			
			(0.081)			
University students per municipality of residence			0.519***			
			(0.105)			
University students per municipality of university			0.148***			
			(0.042)			
Active population				0.193**		
				(0.089)		
Employment rate				-0.026		
				(0.042)		
Foreign people				-0.020		
				(0.045)		
Crimes				0.141		
				(0.096)		
Deprivation index				0.162*		
				(0.085)		
Inequality index				0.238***		
				(0.038)		
Hospitals beds						0.289***
						(0.069)
Health infrastructures						-0.196
						(0.301)
Health sector employees						0.459***
						(0.136)
	4307	4294	4185	2420	1701	329

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.4 Project delays

In this section, we analyse the main drivers of project implementation delays. While it is still early to evaluate the policy impact of the RRP, understanding the causes of delay

in the implementation can offer an initial assessment on whether monies are spent effectively.

Cross-sectoral regressors. In Table 4, we present the outputs obtained by regressing our indicator of project delay on the cross-sectoral variables. Among the socioeconomic regressors, we do not find any clear pattern. For example, population density is negatively associated with delays in the Green and Education missions, but positively correlated in the Digital mission, and its coefficient is insignificant in the other missions.

Interestingly, controlling for our complete set of covariates, we find only moderate evidence of a clear North/South divide. Southern municipalities, for example, are significantly more likely than Northwestern local governments to experience delays in the Education and Social missions. Still, they are less so overall (cf column one) and in other policy areas, such as Digitalisation. Similarly, Northeastern municipalities are on the whole less likely to experience delays (cf column one), although this total masks some heterogeneity between, on the one hand, the Digital and Green missions, and on the other, the Social mission, where, like Central areas, they are also more likely to experience delays.

In the case of administrative capacity variables, the patterns are clearer. Municipal efficiency is strongly and significantly inversely correlated to delays. In particular, a 1% increase in the efficiency score is associated with a reduction in the share of RRP projects behind schedule of between 0.04% and 0.06%. The Education and Social missions are the only two for which administrative capacity is insignificant. To better understand this result, we also examine whether delays in project implementation may be associated with the number of projects assigned to each municipality, reflecting potential constraints in local administrative capacity to manage multiple initiatives simultaneously. Interestingly, we find marginally positive but significant coefficients in the Education and Social mission. More importantly, the interaction between municipal efficiency and the number of projects is negative and statistically

significant across all sectors, suggesting that efficiency plays a crucial role in reducing delays, particularly when municipalities are responsible for managing a high volume of interventions.

Relatedly, we also observe that a higher quality of human capital in the city council is associated with fewer project delays. The main exceptions are the Social mission, where we do not find a significant impact, and Education projects, where we detect a positive association. Lastly, we do not find systematic patterns related to the other administrative, financial, and political-economy regressors, except for some specific missions. For example, female leadership is positively, rather than negatively, associated with project delay in the case of the Education and Social missions. However, we suspect this might be a spurious correlation linked to the macro-regional fixed effects. Female leadership is higher in Northern areas, with the highest shares in regions such as Emilia-Romagna, Lombardy and Tuscany, and lower in most of the South, which, incidentally, also receive a high amount of RRP resources in Education and Social, where it tends to have more pronounced delays (cf columns four and five).

Mission-specific regressors. We then replace the cross-sectoral regressors with the missionspecific covariates (results are reported in Appendix F). In the case of the Digitalisation mission, all regressors are negatively correlated with project delay (one is insignificant), suggesting that project implementation is faster in areas with already pre-existing specialisation. Indeed, and unsurprisingly, tourist areas with already higher broadband coverage and a stronger entrepreneurial base experience lower delays.

An opposite pattern holds for the Education mission, where a larger portion of projects are behind schedule in the municipalities with a higher presence of university students and education employees. Future research should explore this unexpected finding,

particularly considering that the Education mission is not the policy area with the highest delays overall.[12]

In the Green mission, project delays are higher in municipalities with a higher share of waste recycling and worse air quality. Again, this unexpected finding deserves further investigation. An explanation may be that these are spurious results, particularly considering how the Green Revolution and Ecological Transition mission is the one with the largest financial endowment and a broad set of sub-goals.

In the Social mission, delays are more prevalent in municipalities with a more active population and, yet, a higher deprivation index. These are also the places more likely to receive resources.

We exclude from the analysis the Healthcare mission since we do not observe heterogeneity in the dependent variable, since in every analysed municipality, all projects are subject to delays.

To summarise the overall results, measures of administrative capacity show – again – the most robust and consistent effects. Higher municipal efficiency scores are significantly associated with a lower proportion of delayed projects across most missions, with the effect amplified when municipalities face a larger project load. Human capital within the city council is similarly associated with reduced delays, except in the Social mission (no significant effect) and Education (positive association). Mission-specific regressions suggest that pre-existing specialisation facilitates timely implementation in the Digitalisation mission, while in Education, Green and Social missions, counter-intuitive correlations emerge that warrant further investigation.

Table 4: The drivers of project delay: Cross-sectoral regressors.

	Dependent Variable: Project delay

12 Cf., the Technical Reports submitted to the Italian Parliament about the stage of RRP progress (in Italian): https://www.italiadomani.gov.it/content/sogei-ng/it/it/strumenti/documenti.html, accessed in August 2025.

Income pc	−0.010	−0.068	−0.175	−0.148	−1.391
	(0.129)	(0.138)	(0.135)	(0.201)	(1.059)
Cohesion Policy funds	−0.009	0.005	0.011	−0.049*	−0.018
	(0.017)	(0.017)	(0.016)	(0.027)	(0.020)
Population density	0.018	0.186***	−0.088***	−0.106***	0.054
	(0.019)	(0.022)	(0.031)	(0.037)	(0.039)
Population	0.038	0.042	0.048	0.045	0.054
	(0.039)	(0.032)	(0.041)	(0.047)	(0.049)
North-East	−0.258***	−0.174***	−0.161***	0.101	0.188**
	(0.052)	(0.049)	(0.050)	(0.059)	(0.096)
Centre	−0.224***	−0.159***	−0.071	0.183**	0.262***
	(0.050)	(0.049)	(0.060)	(0.085)	(0.101)
South	−0.076	−0.118*	−0.079	0.437***	0.833***
	(0.065)	(0.064)	(0.063)	(0.138)	(0.174)
Efficiency	−0.061***	−0.059***	−0.043***	0.017	0.038
				*	0.051*
Efficiency*N. Projects					
Human capital (%)				0.059***	−0.037
	(0.018)	(0.015)	(0.015)	(0.019)	(0.032)
Female leadership (%)	−0.007	0.018	0.017	−0.048**	−0.081***
	(0.017)	(0.018)	(0.017)	(0.022)	(0.030)
Second term	−0.010	−0.008	−0.009	−0.058	0.030
	(0.028)	(0.029)	(0.029)	(0.042)	(0.049)
Municipality union	−0.010	−0.063*	0.052	−0.049	−0.183***
	(0.027)	(0.035)	(0.042)	(0.051)	(0.067)
Right party	−0.071	0.029	−0.382***	0.065	0.329***
	(0.080)	(0.092)	(0.101)	(0.107)	(0.122)
Left party	0.038	−0.098	0.042	0.063	0.257*
	(0.132)	(0.131)	(0.131)	(0.130)	(0.135)
Public debt	0.012***	0.001	0.002	0.004	−0.003
	(0.003)	(0.003)	(0.003)	(0.005)	(0.006)
Note:					*p<0.1; **p<0.05; ***p<0.01
	(1) All	(2) Digital	(3) Green	(4) Education	(5) Social
	(0.014)	(0.015)	(0.014)	(0.021)	(0.029)
N. Projects	0.024	0.028	0.007	0.047	
	(0.069)	(0.072)	(0.046)	(0.025)	(0.028)
	−0.049***	−0.043***	−0.051***	−0.037*	−0.035*
	(0.015)	(0.013)	(0.012)	(0.011)	(0.010)
	−0.038**	−0.051***	−0.057***		

6. Policy implications

In our results, we identify two cross-cutting themes relevant for the longstanding debates on how to level up spatial inequalities via place-based policies and place-sensitive industrial strategies (inter alia: World Bank, 2009, OECD, 2009, Barca et al.,

2012, Kline and Moretti, 2014, Iammarino et al., 2019, Martin et al., 2022, Ehrlich and Overman, 2020, Zhu et al., 2025, Bailey et al., 2019, 2023).

One theme relates to what kind of areas should be targeted by public funding strategies, ie whether territorial policies should prioritise better-off or lagging-behind areas (Gansauer, 2025, Zhu et al., 2025, Luca and Rodr´ıguez-Pose, 2015) and whether there are trade-offs, or not, between these two strategies. The second theme, then, concerns the importance of local institutional capacity for an effective absorption and use of national and supranational public funds.

Allocative trade-offs. First, our results underscore the allocative trade-offs that policies need to address, and how these differ across policy missions. It remains contested whether placesensitive policies should primarily target better-off areas or those that are lagging behind (Barca et al., 2012, World Bank, 2009). For example, according to a logic of 'efficiency', more developed areas may attract more funding because of higher expected returns (Coyle and Sensier, 2019), better absorptive capacity (Becker et al., 2013, Tosun, 2014) and stronger financial matching ability. Policy-makers may prioritise better-off areas (World Bank, 2009) and/or areas with higher expected returns, even if this risks leading to a 'Matthew effect' where those that are worse off – relatively, or in absolute terms – lag further behind. Examples include the spatial concentration of US place-based monies in already better-off regions under 'Bidenomics' (Gansauer, 2025), the disproportionate allocation of transport funding to London in the English context (Coyle and Sensier, 2019) and Turkey's public capital investment focus on peripheral but high-growth provinces rather than the poorest (Luca and Rodr´ıguez-Pose, 2015).

Our results show how policymakers *can* strive for a balanced approach that fosters specialisation in areas of comparative advantage, while ensuring convergence in policy domains where catching-up objectives are crucial. This balance is essential to avoid reinforcing existing territorial disparities and to maximise the impact of funds in both well-established and underdeveloped

sectors.

More broadly, we suggest that place-sensitive policies should be balanced and target different, complementary sectors/policy areas. There is debate on whether policies should focus on a single, specific sector/policy area, or support a diverse range of local initiatives across sectors and industries (Duranton and Venables, 2018). On the one hand, the concentration in a narrow policy domain/specific industry can benefit from knowledge spillovers, skilled labour pools, and supply chain efficiencies. According to Path Dependence Theory (Martin and Sunley, 2006), areas with strong sectoral specialisation can develop competitive advantages, facilitating recovery through innovation and productivity gains (Simmie and Martin, 2010). On the other hand, there is merit in place-sensitive policies targeting different, complementary areas. As an example, Scotti et al. (2022) found that during the 2007-2014 programming period, administrative units receiving EU Cohesion Policy funds targeting a wider set of projects achieved, on average, higher economic returns. Broad investment strategies can foster coordinated economic growth, reducing risks of sectoral misalignment, market failures, and suboptimal conditions for integrated development. Indeed, the presence of a varied economic structure reduces vulnerability to sector-specific downturns, since territories with diverse industries can better absorb shocks, shrinking systemic risk (Christopherson et al., 2010). This strategy enables regions to build on existing strengths while reducing sector-specific risks, fostering both adaptive capacity and long-term growth (Boschma, 2015).

Strengthening institutional capacity. Our results also underscore, once again, the importance of complementing financial transfers with targeted capacity-building measures at the local level. Consistent with prior work on EU fund absorption and public-sector performance (e.g., Mendez and Bachtler, 2024, Rodr´ıguez-Pose and Garcilazo, 2018), our evidence suggests that administrative capacity and competent personnel, proxied by their higher human capital, are key to improving local participation in national and supranational funds and timely project delivery, particularly when multiple interventions.

Policy design should therefore integrate project-load management, temporary deployment of specialised administrative staff, and strategic human-capital investments. Given the missionspecific patterns observed, implementation frameworks should be tailored to the institutional and sectoral context, for example, by streamlining procedures or providing bespoke technical assistance for Education, Green and Social missions.

To this aim, national and European policymakers should consider targeted projects aimed at administrative capacity building. This could include training programs for public officials, improvement of administrative processes, and technical support to municipalities with limited expertise in fund application and management.

Finally, efficient delivery of RRP projects is often hindered by bureaucratic inefficiencies, inadequate infrastructure, and administrative delays. A systematic identification of bottlenecks, ranging from delays in fund disbursement to mismatches between planned investments and local needs, is critical to ensure that funds are effectively absorbed and projects reach completion on time.

Such a result is consistent with previous qualitative and quantitative evidence unveiling a positive link between local administrative capacity and financial absorption in Italian regions (Milio, 2007), as well as in Central and Eastern European member states (Bachtler et al., 2014, Hagemann, 2019). Furthermore, it underlines how the quality of local administrations is a key factor in accessing and spending EU funding (Crescenzi and Giua, 2016, Rodr´ıguez-Pose and Garcilazo, 2015, Rodr´ıguez-Pose and Di Cataldo, 2014). Our results are also in line with previous findings related to the US context, where several authors recognised that the capacity of subnational governments is critical for the effectiveness of these jurisdictions in winning and spending intergovernmental transfers (Carley et al., 2015, Nicholson-Crotty, 2015, Collins and Gerber, 2008, Hall, 2008, Terman and Feiock, 2015, Terman et al., 2016). As explained by the Organisation for Economic Cooperation and Development (OECD), higher administrative capacity is critical for improving policy coordination, strategic

planning, project selection, expertise, and learning, which are all factors contributing to an effective access and delivery of public investment programmes (OECD, 2014, 2018).

7. Conclusions

Given the unprecedented scale and complexity of *NextGenerationEU*, ongoing assessment is crucial to ensure its effectiveness. While the national *Recovery and Resilience Plans* are still in the implementation phase, early warning signals regarding inefficiencies, regional imbalances, and structural bottlenecks are essential for timely policy adjustments. Focusing on the case of Italy, Europe's largest beneficiary of recovery and resilience funds, our study underscores the importance of proactive monitoring to optimise fund absorption and enhance territorial sustainable development.

Our findings highlight the complex interplay between economic, administrative, and institutional factors in shaping fund allocation patterns at the municipal level. Specifically, we observe that more efficient municipalities with a higher presence of highly educated employees in the city council obtain larger amounts of funds and experience lower project delays. Previous experience with EU Cohesion Policy funds, and variables related to the municipal leading political party, also determine the amount of RRP allocations.

Similarly, the fund allocation process across different policy missions is also affected by the pre-existing level of infrastructure and services in the underlying sectors. In those sectors in which there is no need for structured supra-local infrastructure, we do not observe strong specialisation. On the other hand, local actors' agency might be constrained in those sectors in which the role of infrastructure (physical and non-physical) is prominent. Indeed, we find a process of specialisation in the Digital, Education, and Healthcare missions. By contrast, we observe a pattern of convergence in the Social mission, in line with EU Cohesion Policy mechanisms. We do not find

significantly larger fund allocations for the environmental sector in areas with lower air quality. This suggests a trade-off between socio-economic convergence and green transition.

While our study provides a novel analysis on the allocation of Italy's *NextGenerationEU* funds, when data becomes available, future research should extend our analysis by incorporating longitudinal data to track the disbursement of RRP monies over time and evaluate the efficiency of project implementation. Additionally, while our findings offer insights applicable to other EU member states, national differences in fund size, sectoral priorities, and governance structures necessitate country-specific analyses to account for these variations. Future research could hence replicate our analysis in other recipient countries.

8. References

Agasisti, T. and S. Longobardi (2014). Inequality in education: Can italian disadvantaged students close the gap? *Journal of Behavioral and Experimental Economics 52*, 8–20.

Agasisti, T. and G. Vittadini (2012). Regional economic disparities as determinants of student's achievement in italy. *Research in Applied Economics 4*(2), 33.

Amaddeo, E., M. Arena, A. S. Bergantino, G. Bonaccorsi, A. Buongiorno, A. Clemente, A. Flori, M. Intini, F. Scotti, V. M. Urbano, et al. (2024). A set of multidimensional indicators to assess the resilience and attractiveness of italian provinces and municipalities (2010–2022 panel data). *Data in Brief 57*, 111042.

Amin, A. (1999, June). An Institutionalist Perspective on Regional Economic Development. *International Journal of Urban and Regional Research 23*(2), 365–378.

Aparicio-Perez, D., P. Espinosa, J. M. Pav´ ´ıa, and E. Tortosa-Ausina (2025). On the impact of next generation eu funds: A regional synthetic control method approach. *Papers in Regional Science*, 100082.

Arulampalam, W., S. Dasgupta, A. Dhillon, and B. Dutta (2009). Electoral goals and center-state transfers: A theoretical model and empirical evidence from india. *Journal of Development Economics 88*(1), 103–119.

Ascani, A., A. Faggian, and S. Montresor (2021). The geography of covid-19 and the structure of local economies: The case of italy. *Journal of Regional Science 61*(2), 407–441.

Avellaneda, C. N. (2009). Municipal performance: does mayoral quality matter? *Journal of Public Administration Research and Theory 19*(2), 285–312.

Bachtler, J. and C. Mendez (2010). Review and assessment of simplification measures in cohesion policy 2007-2013: Report to policy department b: structural and cohesion policies.

Bachtler, J., C. Mendez, and H. Oraze (2014). From conditionality to europeanization in central˘ and eastern europe: Administrative performance and capacity in cohesion policy. *European Planning Studies 22*(4), 735–757.

Bachtrogler, J., U. Fratesi, and G. Perucca (2020).¨ The influence of the local context on the implementation and impact of eu cohesion policy. *Regional Studies 54*(1), 21–34.

Bailey, D., A. Glasmeier, and P. R. Tomlinson (2019). Industrial policy back on the agenda: putting industrial policy in its place?

Bailey, D., C. N. Pitelis, and P. R. Tomlinson (2023). Place-based industrial and regional strategy– levelling the playing field.

Balaguer-Coll, M. T. and M. Ivanova-Toneva (2021). The impact of women's leadership in local governments: The case of spain. *International Public Management Journal 24*(4), 455–475.

Banker, R. D., A. Charnes, and W. W. Cooper (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Management science 30*(9), 1078–1092.

Barca, F., P. McCann, and A. Rodr´ıguez-Pose (2012, February). The Case for Regional Development Intervention: Place-Based Versus Place-Neutral Approaches. *Journal of Regional Science 52*(1), 134–152.

Barone, G., F. David, and G. De Blasio (2016). Boulevard of broken dreams. the end of eu funding (1997: Abruzzi, italy). *Regional Science and Urban Economics 60*, 31–38.

Becker, S. O., P. H. Egger, and M. Von Ehrlich (2012). Too much of a good thing? on the growth effects of the eu's regional policy. *European Economic Review 56*(4), 648–668.

Becker, S. O., P. H. Egger, and M. Von Ehrlich (2013). Absorptive capacity and the growth and investment effects of regional transfers: A regression discontinuity design with heterogeneous treatment effects. *American Economic Journal: Economic Policy 5*(4), 29–77.

Becker, S. O., P. H. Egger, and M. Von Ehrlich (2018). Effects of eu regional policy: 1989-2013. *Regional science and urban economics 69*, 143–152.

Beloconi, A. and P. Vounatsou (2023). Revised eu and who air quality thresholds: Where does europe stand? *Atmospheric Environment 314*, 120110.

Ben, S., R. Bosc, J. Jiao, W. Li, F. Simonelli, and R. Zhang (2017). Digital infrastructure overcoming the digital divide in china and the european union. *Centre for European Policy Studies*.

Bianco, M. and G. Napolitano (2011). The italian administrative system: Why a source of competitive disadvantage? *Bank of Italy Economic History Working Paper* (24).

Bodenstein, T. and A. Kemmerling (2011). Ripples in a rising tide: Why some eu regions receive more structural funds than others. *European Integration Online Papers 16*(1).

Bokhorst, D. (2022). The influence of the european semester: Case study analysis and lessons for its post-pandemic transformation. *JCMS: Journal of Common Market Studies 60*(1), 101–117.

Bonaccorsi, G., F. Pierri, M. Cinelli, A. Flori, A. Galeazzi, F. Porcelli, A. L. Schmidt, C. M. Valensise, A. Scala, W. Quattrociocchi, et al. (2020). Economic and social consequences of human mobility restrictions under covid-19. *Proceedings of the national academy of sciences 117*(27), 15530–15535.

Bonaccorsi, G., F. Pierri, F. Scotti, A. Flori, F. Manaresi, S. Ceri, and F. Pammolli (2021). Socioeconomic differences and persistent segregation of italian territories during covid-19 pandemic.

Scientific reports 11(1), 1–15.

Bonfiglio, A., S. Coderoni, and R. Esposti (2022). Policy responses to covid-19 pandemic waves: Cross-region and cross-sector economic impact. *Journal of Policy Modeling 44*(2), 252–279.

Boschma, R. (2015). Towards an evolutionary perspective on regional resilience. *Regional studies 49*(5), 733–751.

Bradley, S. and J. Taylor (1996). Human capital formation and local economic performance. *Regional Studies 30*(1), 1–14.

Bugamelli, M., F. Lotti, M. Amici, E. Ciapanna, F. Colonna, F. D'Amuri, S. Giacomelli, A. Linarello, F. Manaresi, G. Palumbo, et al. (2018). Productivity growth in italy: a tale of a slow-motion change. *Bank of Italy Occasional Paper* (422).

Calcagnini, G. and F. Perugini (2019). Social capital and well-being in the italian provinces. *Socio-Economic Planning Sciences 68*, 100668.

Camagni, R., R. Capello, and P. Nijkamp (2009). Territorial capital and regional development. *Handbook of regional growth and development theories 1*, 118–132.

Capello, R. and A. Caragliu (2021). Regional growth and disparities in a post-covid europe: A new normality scenario. *Journal of Regional Science 61*(4), 710–727.

Carley, S., S. Nicholson-Crotty, and E. J. Fisher (2015). Capacity, guidance, and the implementation of the american recovery and reinvestment act. *Public Administration Review 75*(1), 113–125.

Carmeli, A. (2004). Strategic human capital and the performance of public sector organizations. *Scandinavian Journal of Management 20*(4), 375–392.

Castells, A. and A. Sole-Oll´ e (2005). The regional allocation of infrastructure investment: The´ role of equity, efficiency and political factors. *European Economic Review 49*(5), 1165–1205.

Celi, G., D. Guarascio, and A. Simonazzi (2020). A fragile and divided european union meets covid-19: further disintegration or 'hamiltonian moment'? *Journal of Industrial and Business Economics 47*(3), 411–424.

Charnes, A., W. W. Cooper, and E. Rhodes (1978). Measuring the efficiency of decision making units. *European journal of operational research 2*(6), 429–444.

Charron, N., V. Lapuente, and B. Rothstein (2013). Quality of government and corruption from a european perspective: A comparative study of good government in eu regions. In *Quality of Government and Corruption from a European Perspective*. Edward Elgar Publishing.

Christopherson, S., J. Michie, and P. Tyler (2010). Regional resilience: theoretical and empirical perspectives.

Clark, A., M. Jit, C. Warren-Gash, B. Guthrie, H. H. Wang, S. W. Mercer, C. Sanderson, M. McKee, C. Troeger, K. L. Ong, et al. (2020). Global, regional, and national estimates of the population at increased risk of severe covid-19 due to underlying health conditions in 2020: a modelling study. *The Lancet Global Health 8*(8), e1003–e1017.

Collins, B. K. and B. J. Gerber (2008). Taken for granted? managing for social equity in grant programs. *Public Administration Review 68*(6), 1128–1141.

Cottafava, D., M. Gastaldo, F. Quatraro, and C. Santhia (2022). Modeling economic losses and´ greenhouse gas emissions reduction during the covid-19 pandemic: Past, present, and future scenarios for italy. *Economic Modelling 110*, 105807.

Coyle, D. and M. Sensier (2019, May). The imperial treasury: appraisal methodology and regional economic performance in the UK. *Regional Studies*, 1–13. Publisher: Routledge.

Crescenzi, R. and M. Giua (2016). The eu cohesion policy in context: Does a bottom-up approach work in all regions? *Environment and Planning A: Economy and Space 48*(11), 2340–2357.

Crescenzi, R., M. Giua, and G. V. Sonzogno (2021). Mind the covid-19 crisis: An evidence-based implementation of next generation eu. *Journal of Policy Modeling 43*(2), 278–297.

Dall'Erba, S. and J. Le Gallo (2008). Regional convergence and the impact of european structural funds over 1989–1999: A spatial econometric analysis. *Papers in Regional Science 87*(2), 219–245.

Datta, P., L. Walker, and F. Amarilli (2020). Digital transformation: Learning from italy's public administration. *Journal of Information Technology Teaching Cases 10*(2), 54–71.

D'Erman, V. and A. Verdun (2022). An introduction:"macroeconomic policy coordination and domestic politics: Policy coordination in the eu from the european semester to the covid-19 crisis". *JCMS: Journal of Common Market Studies 60*(1), 3–20.

Di Cataldo, M. (2017). The impact of eu objective 1 funds on regional development: Evidence from the uk and the prospect of brexit. *Journal of Regional Science 57*(5), 814–839.

Di Porto, E., P. Naticchioni, and V. Scrutinio (2022). Lockdown, essential sectors, and covid-19: Lessons from italy. *Journal of Health Economics 81*, 102572.

Dixit, A. and J. Londregan (1996). The determinants of success of special interests in redistributive politics. *Journal of Politics 58*(4), 1132–55.

Duranton, G. and A. J. Venables (2018). *Place-based policies for development*. The World Bank.

Ehrlich, M. V. and H. G. Overman (2020, June). Place-based policies and spatial disparities across

European cities. *Journal of Economic Perspectives 34*(3), 128–149. Publisher: American Economic Association.

European Commission, E. (2018). *Good governance for Cohesion Policy: Administrative capacity building*. Directorate-General for Regional and Urban Policy.

Fabbrini, F. (2022). The legal architecture of the economic responses to covid-19: Emu beyond the pandemic. *JCMS: Journal of Common Market Studies 60*(1), 186–203.

Fama, R. (2023). Repowereu: Next generation eu's architecture beyond the pandemic.

Ferraresi, M., G. Migali, and L. Rizzo (2018). Does inter-municipal cooperation promote efficiency gains? Evidence from Italian Municipal Unions. *Journal of Regional Science 58*, 1017–1044.

Fratesi, U. and G. Perucca (2019). Eu regional development policy and territorial capital: A systemic approach. *Papers in Regional Science 98*(1), 265–282.

Fratesi, U., G. Perucca, et al. (2014). Territorial capital and the effectiveness of cohesion policies: An assessment for cee regions. *Investigaciones Regionales 29*, 165–191.

Gansauer, G. (2025). For growth or equity: A taxonomy of 'bidenomics' place-based policies and implications for us regional inequality. *Regional Studies 59*(1), 2399802.

Gertler, M. S. (2010, February). Rules of the Game: The Place of Institutions in Regional Economic Change. *Regional Studies 44*(1), 1–15.

Giordano, C. and F. Zollino (2021). Long-run factor accumulation and productivity trends in italy. *Journal of Economic Surveys 35*(3), 741–803.

Golden, M. and B. Min (2013, October). Distributive Politics Around the World. *Annual Review of Political Science 16*(12), 1–27.

Gonzalez, A., G. Daly, P. Pinch, N. Adams, V. Valtenbergs, M. C. Burns, and H. Johannesson´ (2015). Indicators for spatial planning and territorial cohesion: Stakeholder-driven selection approach for improving usability at regional and local levels. *Regional Studies 49*(9), 1588– 1602.

Guan, D., D. Wang, S. Hallegatte, S. J. Davis, J. Huo, S. Li, Y. Bai, T. Lei, Q. Xue, D. Coffman, et al. (2020). Global supply-chain effects of covid-19 control measures. *Nature human behaviour 4*(6), 577–587.

Hagemann, C. (2019). How politics matters for eu funds' absorption problems–a fuzzy-set analysis. *Journal of European Public Policy 26*(2), 188–206.

Hall, J. L. (2008). Assessing local capacity for federal grant-getting. *The American Review of Public Administration 38*(4), 463–479.

Hancock, S. (2023). Knowledge or science-based economy? the employment of uk phd graduates in research roles beyond academia. *Studies in Higher Education 48*(10), 1523–1537.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica: Journal of the econometric society*, 153–161.

Holman, M. R. (2014). Sex and the city: Female leaders and spending on social welfare programs in us municipalities. *Journal of Urban Affairs 36*(4), 701–715.

Iammarino, S., A. Rodriguez-Pose, and M. Storper (2019, March). Regional inequality in Europe: evidence, theory and policy implications. *Journal of Economic Geography 19*(2), 273–298. Publisher: Narnia.

Incaltarau, C., G. C. Pascariu, and N.-C. Surubaru (2020). Evaluating the determinants of eu funds absorption across old and new member states–the role of administrative capacity and political governance. *JCMS: Journal of Common Market Studies 58*(4), 941–961.

Kline, P. and E. Moretti (2014, August). People, places, and public policy: some simple welfare economics of local economic development programs. *Annual Review of Economics 6*(1), 629– 662. Publisher: Annual Reviews.

Livert, F. and X. Gainza (2018, March). Distributive politics and spatial equity: the allocation of public investment in Chile. *Regional Studies 52*(3), 403–415.

Lorenzini, E., V. Calzati, and P. Giudici (2011). Territorial brands for tourism development: A statistical analysis on the marche region. *Annals of Tourism Research 38*(2), 540–560.

Luca, D. (2021). National elections, sub-national growth: the politics of Turkey's provincial economic dynamics under AKP rule. *Journal of Economic Geography*. Publisher: Oxford University Press (OUP).

Luca, D. and F. Modrego (2021, January). Stronger together? Assessing the causal effect of intermunicipal cooperation on the efficiency of small Italian municipalities. *Journal of Regional Science 61*(1), 261–293. Publisher: Blackwell Publishing Inc.

Luca, D. and A. Rodr´ıguez-Pose (2015, July). Distributive Politics and Regional Development: Assessing the Territorial Distribution of Turkey's Public Investment. *The Journal of Development Studies 51*(11), 1518–1540. Publisher: Routledge.

Luca, D. and A. Rodr´ıguez-Pose (2019). Building consensus: Shifting strategies in the territorial targeting of Turkey's public transport investment. *Regional Studies 53*(11), 1591–1602.

Martin, R., B. Gardiner, A. Pike, P. Sunley, and P. Tyler (2022). Levelling up left behind places. The scale and nature of the economic and policy challenge. *Regional Studies Policy Impact Books 3*(2).

Martin, R. and P. Sunley (2006). Path dependence and regional economic evolution. *Journal of economic geography 6*(4), 395–437.

Massidda, C. and I. Etzo (2012). The determinants of italian domestic tourism: A panel data analysis. *Tourism management 33*(3), 603–610.

Mendez, C. and J. Bachtler (2024). The quality of government and administrative performance: explaining cohesion policy compliance, absorption and achievements across eu regions. *Regional Studies 58*(4), 690–703.

Milio, S. (2007). Can administrative capacity explain differences in regional performances? evidence from Structural Funds implementation in southern Italy. *Regional Studies 41*(4), 429– 442.

Mogila, Z., T. Miklosovi˘ c, I. Lichner, M. Radvansk˘ y, and J. Zaleski (2022). Does cohesion policy` help to combat intra-country regional disparities? a perspective on central european countries. *Regional Studies 56*(10), 1783–1795.

Mohl, P. and T. Hagen (2010). Do eu structural funds promote regional growth? new evidence from various panel data approaches. *Regional Science and Urban Economics 40*(5), 353–365.

Nicholson-Crotty, S. (2015). Using grants to achieve public purposes. *Handbook of public administration*, 197–214.

OECD (2009). *How Regions Grow*. Paris: OECD Publishing.

OECD (2014). Recommendation of the council on effective public investment across levels of government.

OECD (2018). *Rethinking regional development policy-making*. ORGANIZATION FOR ECONOMIC.

Polyakova, M., G. Kocks, V. Udalova, and A. Finkelstein (2020). Initial economic damage from the covid-19 pandemic in the united states is more widespread across ages and geographies than initial mortality impacts. *Proceedings of the National Academy of Sciences 117*(45), 27934– 27939.

Rodr´ıguez-Pose, A. and E. Garcilazo (2018). Quality of government and the returns of investment:

Examining the impact of cohesion expenditure in european regions. In *Place-based Economic Development and the New EU Cohesion Policy*, pp. 34–50. Routledge.

Rodr´ıguez-Pose, A. (2013, January). Do Institutions Matter for Regional Development? *Regional Studies 47*(7), 1034–1047. Publisher: Routledge.

Rodr´ıguez-Pose, A. and M. Di Cataldo (2014, July). Quality of government and innovative performance in the regions of Europe. *Journal of Economic Geography*.

Rodr´ıguez-Pose, A. and E. Garcilazo (2015, August). Quality of Government and the Returns of

Investment: Examining the Impact of Cohesion Expenditure in European Regions. *Regional Studies 49*(8), 1274–1290. Publisher: Routledge.

Rungi, A. and F. Biancalani (2019). Heterogeneous firms and the north–south divide in italy. *Italian Economic Journal 5*(3), 325–347.

Saltelli, A., G. Bammer, I. Bruno, E. Charters, M. Di Fiore, E. Didier, W. Nelson Espeland, J. Kay, S. Lo Piano, D. Mayo, et al. (2020). Five ways to ensure that models serve society: a manifesto. *Nature 582*(7813), 482–484.

Santos, A. M. and A. Conte (2024). Regional participation to research and innovation programmes under next generation eu: The portuguese case. *Papers in Regional Science 103*(1), 100006.

Santos, P. P., S. Pereira, J. L. Zezere, A. O. Tavares, E. Reis, R. A. Garcia, and S. C. Oliveiraˆ

(2020). A comprehensive approach to understanding flood risk drivers at the municipal level.

Journal of environmental management 260, 110127.

Schramm, L., U. Krotz, and B. De Witte (2022). Building'next generation'after the pandemic: The implementation and implications of the eu covid recovery plan. *J. Common Mkt. Stud. 60*, 114.

Schramm, L. and W. Wessels (2023). The european council as a crisis manager and fusion driver: assessing the eu's fiscal response to the covid-19 pandemic. *Journal of European Integration 45*(2), 257–273.

Scotti, F., L. Dell'Agostino, A. Flori, and F. Pammolli (2024). Premature exit from and delayed entrance into the less developed status: An empirical appraisal of the structural funds allocation criterion. *Journal of Regional Science 64*(1), 5–59.

Scotti, F., A. Flori, G. Bonaccorsi, and F. Pammolli (2023). Do we learn from errors? the economic impact of differentiated policy restrictions in italy. *International Regional Science Review 46*(56), 613–648.

Scotti, F., A. Flori, and F. Pammolli (2022). The economic impact of structural and cohesion funds across sectors: Immediate, medium-to-long term effects and spillovers. *Economic Modelling 111*, 105833.

Scotti, F., A. Flori, P. Secchi, M. Arena, and G. Azzone (2024). Exploring drivers of overnight stays and same-day visits in the tourism sector. *Scientific Reports 14*(1), 9840.

Simar, L. and P. W. Wilson (1998). Sensitivity analysis of efficiency scores: How to bootstrap in nonparametric frontier models. *Management science 44*(1), 49–61.

Simar, L. and P. W. Wilson (2002). Non-parametric tests of returns to scale. *European Journal of Operational Research 139*(1), 115–132.

Simar, L. and P. W. Wilson (2011). Inference by the m out of n bootstrap in nonparametric frontier models. *Journal of Productivity Analysis 36*, 33–53.

Simmie, J. and R. Martin (2010). The economic resilience of regions: towards an evolutionary approach. *Cambridge journal of regions, economy and society 3*(1), 27–43.

Sole-Oll´ e, A. and P. Sorribas-Navarro (2008, December). The effects of partisan alignment on´ the allocation of intergovernmental transfers. Differences-in-differences estimates for Spain. *Journal of Public Economics 92*(12), 2302–2319. Publisher: Elsevier B.V.

Sostar, M., V. Ristanovi˘ c, and C. De Alwis (2023). Application of successful eu funds absorption´ models to sustainable regional development. *Economies 11*(9), 220.

Surubaru, N.-C. (2017). Administrative capacity or quality of political governance? eu cohesion policy in the new europe, 2007–13. *Regional Studies 51*(6), 844–856.

Terman, J. N. and R. C. Feiock (2015). Improving outcomes in fiscal federalism: Local political leadership and administrative capacity. *Journal of Public Administration Research and Theory 25*(4), 1059–1080.

Terman, J. N., A. Kassekert, R. C. Feiock, and K. Yang (2016). Walking in the shadow of pressman and wildavsky: expanding fiscal federalism and goal congruence theories to single-shot games. *Review of Policy Research 33*(2), 124–139.

Tiganasu, R., C. Incaltarau, and G. C. Pascariu (2018). Administrative capacity, structural funds absorption and development. evidence from central and eastern european countries. *Romanian J. Eur. Aff. 18*, 39.

Timushev, E. (2020). Debt burden, local fiscal decentralization and fiscal incentives of regional authorities. *Finance: Theory and Practice 24*(1), 58–75.

Tosun, J. (2014). Absorption of regional funds: A comparative analysis. *JCMS: Journal of Common Market Studies 52*(2), 371–387.

Turconi, L., F. Luino, M. Gussoni, F. Faccini, M. Giardino, and M. Casazza (2019). Intrinsic environmental vulnerability as shallow landslide susceptibility in environmental impact assessment. *Sustainability 11*(22), 6285.

Vanhercke, B. and A. Verdun (2022). The european semester as goldilocks: Macroeconomic policy coordination and the recovery and resilience facility. *JCMS: Journal of Common Market Studies 60*(1), 204–223.

Wolman, H., J. Strate, and A. Melchior (1996). Does changing mayors matter? *The Journal of Politics 58*(1), 201–223.

World Bank (2009). World Development Report 2009: Reshaping economic geography. Technical report, World Bank, Washington D.C.

Zhu, P., Y. Wang, and Y. Lin (2025). Unravelling regional inequality: the heterogeneous impact of china's great western development program. *Regional Studies 59*(1), 2438319.

Zubek, N. and C. H. Henning (2016). Local government, spatial spillovers and the absorption of eu structural funds. *Journal of Agricultural Economics 67*(2), 368–397.

9. Appendix

A The municipal efficiency score

One of our key regressors captures the level of municipal efficiency in delivering specific service levels across various sectors based on incurred expenditures. We construct such a variable using Data Envelopment Analysis (DEA), a robust non-

parametric methodology for assessing technical efficiency within the public sector (Charnes et al., 1978, Banker et al., 1984). Public sector organisations often operate with complex structures, utilising multiple inputs to produce various outputs while pursuing diverse objectives. DEA is suited to this environment due to its capacity to handle multi-input, multi-output scenarios without the need to specify a predefined functional form for the production process. This non-parametric nature is advantageous in public sector analyses, where defining a loss function based on market prices may not be feasible.

Technical efficiency θ_j is estimated according to Equations (14)–(17):):

$$\min\theta(x_0,y_0), \textit{ subject to } : \theta,\gamma \tag{14}$$

$$n\ \theta x_{0,i} \geq {}^{X}\gamma_i X_{j,i} 0,\ \forall i = 1,\ldots,m, \tag{15}$$
$$j=1$$

$$n$$
$$y_{0,r} \leq {}^{X}\gamma_j Y_{j,r},\ \forall r = 1,\ldots,s, \tag{16}$$
$$j=1$$

$$n$$
$$\gamma_j \geq 0,\ j = 1,\ldots,n \textit{ and } {}^{X}\gamma_j = 1 \tag{17}$$
$$j=1$$

where θ is the efficiency score, $X_{j,i}$ denotes the i^{th} input relative to unit j, $Y_{j,r}$ is the r^{th} output relative to unit j, and $x_{0,i}$ and $y_{0,i}$ are the i^{th} input and the r^{th} output of unit 0, for which the efficiency score is computed. Finally, γ_j refers to the set of weights attributed to each municipality j. Based on Equation 17 we rely on a model with variable returns to scale (VRS) which ensures more flexibility with respect to the constant return to scale approach.

Drawing on Luca and Modrego (2021), the input variable of the DEA is represented by the per-capita municipal spending in general social services in each municipality in

the year 2019.[13]Consistently, the outputs are the levels of provision for municipal services in each of the 12 functions that make up the municipal expenditure in general social services. These are: tax collection, civil registry, technical office, other general management services, local police, public schools, road maintenance, local public transport, territorial planning and environmental protection, waste management, welfare support, and public kindergartens.[14]

We employ an input-oriented Data Envelopment Analysis (DEA), wherein a Decision-Making Unit (DMU) that produces the same output while utilising a greater quantity of inputs is considered dominated and positioned within the empirical efficiency frontier. By assessing all DMUs in the dataset, we construct a production frontier that encompasses the observed data. The resulting efficiency scores range from 0 to 1, with DMUs on the frontier attaining the maximum efficiency score of 1.

Given the sensitivity of traditional DEA to outliers and measurement errors, which can lead to biased efficiency estimates, we implement the Robust DEA (R-DEA) approach proposed by Simar and Wilson (1998, 2002, 2011). These robust (bias-corrected) efficiency scores are estimated using 100 bootstrap resampling iterations.

B Descriptive Statistics

Table A1 shows some key descriptive statistics for our dependent variables. As anticipated in subsection 3.1, we exclude from the analysis funds from the *Infrastructure for Sustainable Mobility* mission since these tend to be managed by central or regional authorities, and they usually involve more than one municipality. Table A2 shows descriptive statistics for the administrative, financial, socioeconomic and political-economy regressors. Table A3 shows descriptive statistics for our exclusion

13 These data are available in the Open Polis platform www.openbilanci.it.

14 These data are available in the SOSE's Opencivitas database https://opendata.sose.it/fabbisognistandard/opencivitas.

restriction variables. Finally, Tables A4 - A8 show descriptive statistics for all our mission-specific variables.

Table A1: Descriptive statistics of our dependent variables

	Min	Mean	Median	Max	SD
Digital	0	760.261	158.970	23,291.083	17,805.340
Education	0	579.182	187.990	10,559.203	668.930
Green	0	1,096.927	334.263	32,983.102	5,150.794
Social	0	368.231	110.375	17,932,019	3,330.347
Healthcare	0	342.962	79.898	8,979.720	979.923

Table A2: Descriptive statistics of our explanatory variables used across all missions.

	Min	Mean	Median	Max	SD
Income pc	6,657	18,380	18,138	46,216	3545.32
Cohesion Policy Funds	0	161,190 680,900	625,000	1,236,000,000	40,639,748
Population density	0.944	121.082	300.295	11,722.079 579.497	
Population	33	2,390	6,516	2,519,609	17669.58
30, 669					
Efficiency	0.006	0.227	0.135	1	0.235
N. Projects	2	28.92	15	187	205.98
Human capital	0	0.162	0.011	0.683	0.361
Female leadership	0	0.216	0.107	0.581	0.272
Second term	0	0	0.357	1	0.499
Municipality Union	0	0.382	0	1	0.486
Public debt	0	46, 321.570	92, 321.570	8, 442, 835.000	254, 569.70

Table A3: Descriptive statistics of our exclusion restriction variables

	Min	Mean	Median	Max	SD
Excess mortality	-100.00	38.375	18.733	504.341	90.922
Δ Employment	-0.024	0.058	0.033	0.261	0.239
Δ Income pc	-0.062	0.070	0.050	0.197	0.420

Table A4: Descriptive statistics of our explanatory variables related to the Digital mission.

	Min	Mean	Median	Max	SD
Broadband coverage	0	933.752	0	45,567.610	2,437.641
Firms number	1	513.708	155.500	50,039.000	1,697.493
Museums visitors	0	4,089.108	0	8,082,787	138,195.800
Touristic hotspot	1	0.625	1	1	0.257

Table A5: Descriptive statistics of our explanatory variables related to the Education mission.

	Min	Mean	Median	Max	SD
Students per municipality	0	172.734	54	15,966	529.473
Students per university	0	136.713	0	48,662	1,825.341
Education employees	0	11.238	1	2,765.820	66.117
Research employees	0	128.646	21	20,953.070	658.933

Table A6: Descriptive statistics of our explanatory variables related to the Green mission.

	Min	Mean	Median	Max	SD
Landslide risk	0	0.057	0.005	1	0.124
Hydraulic risk	0	0.029	0.003	1	0.077
Waste recycling	0	0.630	0.687	0.975	0.210
Soil consumption	0.003	0.105	0.073	0.811	0.098
PM 2.5	3.160	25.487	23.255	49.365	10.427

Table A7: Descriptive statistics of our explanatory variables related to the Social mission.

	Min	Mean	Median	Max	SD	
Foreign people	0	0.071	0.065	0.308	0.041	0
Active Population	26.087	60.071	58.350	208	10.549	0
Deprivation index	-4.673	-0.125	-0.439	4.660	1.823	0
Inequality index	0.566	1.269	1.261	2.205	0.116	0
Employment rate	0.009	0.350	0.311	0.900	0.198	0
Crimes	0	16.691	0	8,750	196.606	0

Table A8: Descriptive statistics of our explanatory variables related to the Healthcare mission.

	Min	Mean	Median	Max	SD
Hospitals beds	0	21.887	0	3,334	151.263
Health infrastructures	0	0.101	0	8	0.488
Health sector employees	0	59.181	10	8,152	371.748

C Extensive margin: mission-specific regressors

In this appendix, we report the Heckman 1st stage results replacing the general regressors with the mission-specific sets of explanatory variables.

Table A9: Heckman model 1st stage results replacing the regressors of Table 1 with the mission-specific explanatory variables.

	Dependent Variable: RRF transfers per capita					
Participation (1st stage)	(1) All	(2) Digital	(3) Green	(4) Education	(5) Social	(6) Health
Broadband coverage		0.412				
		(0.281)				
Firms pc		-0.081				
		(0.068)				
Museum visitors		-0.081				
		(0.251)				
Touristic hotspot		0.387				
		(0.301)				
Landslide risk			0.161			
			(0.202)			
Idraulic risk			0.318			
			(0.300)			
Soil consumption			-0.421***			
			(0.138)			
Waste recycling			0.106			
			(0.121)			
PM2.5			0.587**			
			(0.281)			
Education employees				0.057		
				(0.041)		
Research employees				0.117*		
				(0.061)		
University students per municipality of residence				0.446***		
				(0.181)		
University students per municipality of university				0.161		
				(0.119)		

Active population	-0.028	
	(0.029)	
Employment rate	0.048	
	(0.039)	
Foreign-born people	-0.161	
	(0.137)	
Crimes	-0.051	
	(0.039)	
Deprivation index	0.433***	
	(0.039)	
Inequality index	0.003	
	(0.032)	
Hospital beds		0.178*
		(0.089)
Health infrastructures		0.431
		(0.569)
Health sector employees		0.691***
		(0.082)

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

D Robustness analysis: Including regional Fixed-Effects

Tables B1 and B2 show the results of the 2nd stage of the Heckman model introduced in Section 4.1, additionally controlling for regional fixed effects.

Table B1: We show the results of the 2nd stage of the Heckman model introduced in Section 4.1. Coefficients refer to the explanatory variables affecting all missions. We include regional fixed effects as additional control variables.

	Dependent Variable: RRF transfers per capita					
2nd Stage	(1) All	(2) Digital	(3) Green	(4) Education	(5) Social	(6) Health
Efficiency	0.121***	0.116***	0.128***	0.130**	0.162***	0.109
	(0.015)	(0.019)	(0.016)	(0.039)	(0.042)	(0.119)
N. Project	0.085	0.076	0.089	0.057	0.052	0.092
	(0.089)	(0.079)	(0.102)	(0.092)	(0.069)	(0.108)
Efficiency*N. Projects	0.100	0.093	0.108	0.079	0.089	0.102
	(0.191)	(0.121)	(0.117)	(0.109)	(0.198)	
Human capital (%)	0.154***	0.115***	0.096***	0.080**	0.041	-0.148*
	(0.015)	(0.018)	(0.017)	(0.038)	(0.035)	(0.074)
Female leadership (%)	0.089	0.018	0.020	-0.087*	-0.146***	-0.118
	(0.109)	(0.015)	(0.019)	(0.045)	(0.035)	(0.101)

Second term	0.066*	0.089**	0.024	-0.037	0.084	-0.019
	(0.034)	(0.042)	(0.028)	(0.068)	(0.070)	(0.092)
Municipality union	-0.053	-0.018	-0.073	-0.047	-0.018	0.019
	(0.041)	(0.043)	(0.055)	(0.063)	(0.070)	(0.148)
Right party	0.902***	0.842***	0.498***	0.229	0.301*	0.019
	(0.137)	(0.113)	(0.138)	(0.180)	(0.163)	(0.084)
Left party	0.971***	0.984***	0.367**	0.049	0.382*	-0.258
	(0.138)	(0.149)	(0.179)	(0.162)	(0.201)	(0.243)
Public debt	-0.072**	-0.015***	0.048	0.065	0.068	-0.062
	(0.033)	(0.005)	(0.046)	(0.057)	(0.055)	(0.059)
Income pc	-0.487***	-0.195	-0.087	-0.591*	-0.801***	0.982*
	(0.135)	(0.150)	(0.161)	(0.304)	(0.241)	(0.508)
Cohesion Policy funds	0.044**	0.042*	0.023	-0.083*	0.022	0.245
	(0.020)	(0.022)	(0.018)	(0.045)	(0.029)	(0.198)
Population density	0.147***	0.166***	0.108***	-0.138***	-0.065	-0.131
	(0.015)	(0.019)	(0.023)	(0.036)	(0.052)	(0.084)
Population	0.058***	0.048***	0.025	0.065***	0.052**	0.096***
	(0.019)	(0.015)	(0.053)	(0.016)	(0.022)	(0.025)
Regional FEs	yes	yes	yes	yes	yes	yes

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B2: We show the results of the 2nd stage of the Heckman model introduced in Section 4.1. Coefficients refer to the missionspecific explanatory variables. We include regional fixed effects as additional control variables

	Dependent Variable: RRF transfers per capita					
2nd Stage	(1) All	(2) Digital	(3) Green	(4) Education	(5) Social	(6) Health
Fast internet connection		0.247***				
		(0.019)				
Firms number pc		0.237***				
		(0.016)				
Museum visitors		0.075***				
		(0.018)				
Toruistic class		0.472***				
		(0.064)				
Landslide risk			-0.016			
			(0.019)			
Idraulic risk			0.078***			
			(0.015)			

Soil consumption			-0.045 (0.029)			
Waste recycling			-0.059*** (0.018)			
PM 2.5			-0.145*** (0.035)			
Education employees				0.114** (0.054)		
Research employees				0.138* (0.072)		
University students per municipality of residence				0.483*** (0.098)		
University students per municipality of university				0.129*** (0.038)		
Active population					0.164** (0.080)	
Employment rate					-0.028 (0.041)	
Foreign people					-0.018 (0.043)	
Crimes					0.125 (0.089)	
Deprivation index					0.146* (0.078)	
Inequality index					0.202*** (0.035)	
Hospitals beds						0.263*** (0.062)
Health infrastructures						-0.174 (0.286)
Human health employees						0.407*** (0.122)
Regional FEs	yes	yes	yes	yes	yes	yes
N	4307	4294	4185	2420	1701	329

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

E Robustness analysis: Using Principal Component Analysis (PCA) to study complementarity or specialisation

In the Digital mission, PC1 mainly reflects firm number and fast internet connection. PC2 reflects more the cultural dimension of this mission (e.g.museums visitors). PC1 and PC2 cover more than 95% of the variability in the underlying indicators. We observe a positive correlation of the RRF allocation with both PC1 (12.1%, p-val = 0.000) and PC2 (11.7%, p-val = 0.000). These results confirm our previous evidence of

further specialization since the RRF is allocated with a stronger intensity in areas with a higher pre-existing level of digital, cultural, and competitiveness features.

In the Green mission, PC2 reflects more the idraulic risk and soil consumption. PC1 and PC2 cover more than 60% of the variability in the underlying indicators. We observe a negative correlation of the RRF allocation with PC1 (-19.6%, p-val = 0.000). We find an almost absent relationship with PC2 (-1.5%, p-val = 0.289). These results confirm our previous evidence of lower funds allocation to areas with a higher PM2.5 level. We observe a trade-off between convergence mechanisms and green transition.

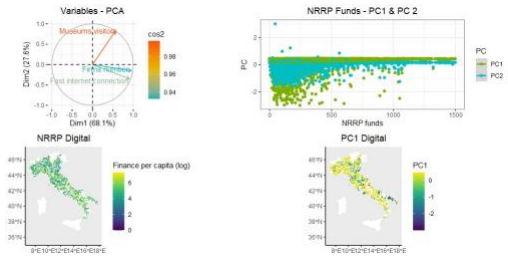
In the Education mission, PC1 mainly reflects employees in the research and education sectors, as well as students per municipality of residence. PC2 represents more students per municipality of the university. PC1 and PC2 cover about 95% of the variability in the underlying indicators. We observe a positive correlation of the RRF allocation with both PC1 (15.6%, p-val = 0.000) and PC2 (16.3%, p-val = 0.000). These results confirm our previous evidence of further specialization since the RRF is allocated with a stronger presence of education and research activities.

In the Sociul mission, PC2 represents more active population , deprivation and inequality indices (all with an opposite direction). PC1 and PC2 cover more than 50% of the variability in the underlying indicators. We observe a negative correlation of the RRF allocation with both PC1 (-12.8%, p-val = 0.000) and PC2 (-17.1%, p-val = 0.000). These results confirm our previous evidence of evident convergence patterns due to larger investments in areas with lower income per capita and higher deprivation and inequality. This is in line with the principle of convergence in the EU Cohesion Policy.

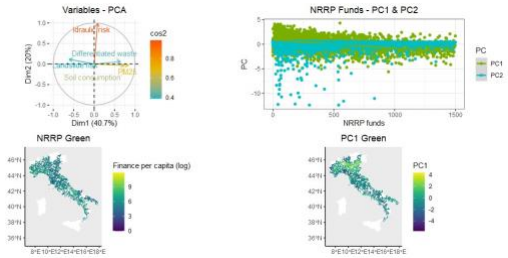
In the Healthcare mission, PC1 almost absorbs the whole variability of our data (90.4%), properly summarizing information related to hospital beds, health infrastructures and human health employees. PC2 covers only the 6.9% of the variability in the underlying indicators. We observe a positive correlation of the RRF allocation with both PC1 (14.3%, p-val = 0.000) and PC2 (6.1%, p-val = 0.007). These results confirm our previous evidence of further specialization since higher RRF

transfers are allocated with a stronger presence of healthcare services and infrastructures.

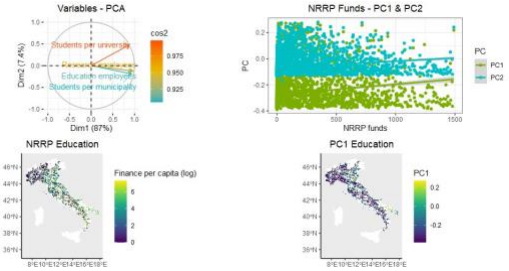
Digital Mission



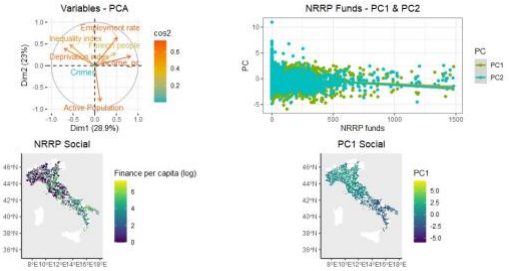
Green Mission



Education Mission



Social Mission



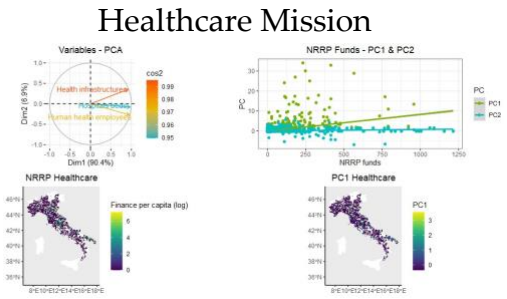


Figure B1: For all the analysed missions we show: (i) the relationship between the first two principal components of the PCA and the underlying variables, (i) the correlation between PC1 and PC2 with the amount of RRF transfers, and the geographical distrubution of (iii) the RRF and (iv) PC1.

F Project delays: mission-specific regressors

This appendix reports the results about the drivers of project delays, replacing the cross-sectoral regressors with the mission-specific covariates.

Table B1: The drivers of project delays: Mission-specific regressors.

	Dependent Variable: Project delay				
	(1) All	(2) Digital	(3) Green	(4) Education	(5) Social
Broadband coverage		−0.363*			
		(0.189)			
Firms pc		−2.169***			
		(0.825)			
Museums visitors		−0.038			
		(0.062)			
Touristic hotspot		−0.246***			
		(0.058)			
Landslide risk			−0.010		
			(0.015)		
Idraulic risk			−0.003		
			(0.014)		
Soil consumption			0.032		
			(0.031)		
Waste recycling			0.078***		
			(0.021)		
PM 2.5			0.102***		
			(0.019)		
Education employees				0.062**	
				(0.030)	
Research employees				−0.053	
				(0.039)	
University students per municipality of residence				−0.011	
				(0.062)	

University students per municipality of university				0.057***	
				(0.018)	
Active population					0.153***
					(0.040)
Employment rate					−0.029
					(0.034)
Foreign people					0.049
					(0.037)
Crimes					−0.029
					(0.048)
Deprivation index					0.069*
					(0.038)
Inequality index					0.025
					(0.029)
Observations	4307	4294	4185	2420	1701
Adjusted R^2	0.249	0.485	0.581	0.213	0.450
Note:	Robust standard errors in parentheses: *p<0.1; **p<0.05; ***p<0.01				

THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

EIQ Europe in Question
Discussion Paper Series at LSE

Europe in Question - *Discussion Paper Series*
European Institute
London School of Economics
Houghton Street
WC2A 2AE London
Email: ei.eiq@lse.ac.uk
lse.ac.uk/ei/eiq