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Use of NextGenerationEU plan funds: Investigation of an Italian Region

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Abstract

NextGenerationEU is a € 750 billion recovery plan developed by the European Commission in response to the economic downturn caused by the COVID-19 pandemic. The plan aims to provide financial support to EU Member States (MSs) and help them recover from the economic and social impacts of the crisis. Among MSs, Italy has received the largest funding. This paper proposes an empirical investigation of the projects financed in Italy's Piemonte Region according to the different departments and missions. The study involved collecting and classifying the required project data, followed by the Analysis of Variance (ANOVA), which was carried out to highlight significant differences. The results show that Green Transition projects have received the largest share of funds. By observing the departments, Environment Energy and Territory have more financed initiatives than the others.

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Keywords: NextGenerationEU; Recovery and Resilience Facility; European Union; COVID-19; ANOVA; Italy

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1. Introduction

The COVID-19 pandemic caused an unprecedented global health and economic crisis as it hit all EU countries almost simultaneously. In response to the crisis, the European Commission (EC) has helped Member States (MSs) to cope with the shock by facilitating the reallocation of EU cohesion funds, increasing co-financing rates, and simplifying procedures [1]. The short-term reorientation of Cohesion Policy during the pandemic was inspired by the policy changes adopted by the EC during the Great Recession [2]. The scale of the crisis and its origin (health crisis) led the EC to agree on a strong support package – NextGenerationEU (NGEU) – to help the EU economy recover [3].

The 2021-2027 Cohesion Policy program and the NGEU initiative are expected to provide more than € 1,800 billion to support EU economic growth over the next few years. The maximum NGEU grant allocations to each MS were based on their (i) unemployment rate, (ii) inverse GDP per capita, and (iii) population – the same as those used to allocate Cohesion Policy funds to EU countries. To apply for these funds, MSs must submit a Recovery and Resilience Plan (RRP) describing how the funds will be used and what milestones and targets the plan will achieve. The plan must include reforms and investment projects to be implemented by 2026.

In Italy, COVID-19 consequences were particularly severe due to the two-month lockdown imposed by the central government in 2020. During this period, all economic variables show dramatic decreases. For example, exports and imports fell by 28% and 20%, respectively, compared to the previous year [4].

At the same time, Italy is the biggest beneficiary of NGEU funds, securing maximum grants for its RRP, bolstered by additional government resources. The RRP (€ 194.4 billion) prioritizes green initiatives (39%) and digital transformation (25.6%) with funds split between grants (€ 122.6 billion) and loans (€71.8 billion). The South gets the most funding (45%), followed by the North (33%) and Center (17%) regions. These funds are intended to support Italy's economic recovery, promote sustainable growth, and strengthen the country's resilience [5].

Specific objectives and initiatives included in Italy's RRP plan include: (i) Digital Transformation: Investments in digital infrastructure, broadband connectivity, and digital skills training to boost Italy's digital economy and competitiveness, (ii) Green Transition: Funding for renewable energy projects, energy efficiency measures, sustainable transport infrastructure, and initiatives to combat climate change; (iii) Healthcare and Social Welfare: Investments in healthcare infrastructure, medical research, and social support systems to strengthen Italy's healthcare sector and enhance social resilience; (iv) Economic Reforms: Structural reforms aimed at improving Italy's business environment, enhancing productivity, and fostering innovation and entrepreneurship; (v) Regional Development: Support for regional development projects to reduce regional disparities and promote inclusive growth across Italy.

The successful implementation of Italy's RRP will depend on effective coordination between the Italian government and the local authorities responsible for the appropriate use of the funds, as well as careful monitoring and evaluation of the use of the funds to ensure that they are used efficiently and effectively to achieve the desired objectives [6].

Among the Italian regions, Piemonte faced a dramatic shock, even greater than the one that occurred during the great recession of 2008-2009. Thus, it is interesting to see how this region is dealing with the projects carried out thanks to the NGEU programs in terms of field of application. Thus, this paper is aimed at presenting an empirical investigation of the projects financed in the Piemonte Italian Region. To this end, the data of all the regional projects have been gathered and quantitatively assessed to highlight the most relevant trends. The remainder of the paper is the following. First, an overview of the European financial program is shown, with a focus on NGEU. Then the methodology is presented, together with the data and the main results of the analysis. Finally, the obtained results are discussed, and conclusions are traced.

2. Literature Review

NGEU is a key component of the EU's response to the economic challenges posed by the COVID-19 crisis. This initiative, integrated into the EU's long-term budget known as the Multiannual Financial Framework (MFF), is part of a substantial stimulus package totaling € 2.018 trillion. The 2021-2027 MFF, valued at € 1.211 trillion, serves as the foundation of this effort and provides ongoing support for the EU's key priorities [7]. Complementing these efforts, NGEU injects an additional € 806.9 billion as a temporary measure to support a robust and sustainable post-pandemic recovery.

The establishment of NGEU reflects a transformative approach by the EU to address the socio-economic impacts of the pandemic. This initiative, along with various other policies deployed by EU institutions, aims to mitigate the damage caused by the crisis and reshape the economic governance architecture of the EU [8]. Furthermore, influential voices have advocated using the post-COVID-19 recovery efforts to drive a shift towards a more sustainable and resilient society [9].

Two of the main funding programs implemented through the 2021-2027 MFF are Horizon Europe and the Recovery and Resilience Facility (RRF). Horizon Europe, with a budget of € 95.5 billion until 2027, is the EU's main funding program for research and innovation aimed at tackling climate change, achieving the Sustainable Development Goals, boosting competitiveness and growth, and strengthening collaboration to tackle global challenges [10]. Instead, RRF provides € 723.8 billion in loans and grants to support reforms and investments by EU MSs to mitigate the economic and social impact of the COVID-19 pandemic and enhance the sustainability and resilience of European economies and societies.

EU has been widely criticized in the past for its inability to act in the common interest of its MSs or to provide timely responses to MSs' problems [11]. The inability to address issues effectively has been a point of contention within the EU, raising concerns about its ability to respond efficiently to the needs of its members [12]. Schmidt (2004) [13] discussed the challenges of democratic legitimacy within the EU, particularly when compared to national democracies, such as the United States. This comparison underscores the complexity of governance and decision-making processes within the EU and highlights the difficulties of reconciling different national interests with common EU goals. Kukovec (2012) [12] provided a critical analysis of the rhetoric surrounding the common interest in EU legal discourse. This critique delves into the nuances of how the concept of the common interest is framed and used in the EU context, offering insights into the complexities of decision-making and policy formulation within the Union.

Italy, as a significant beneficiary of the NGEU, is facing challenges due to historical issues with the implementation of European directives and slow spending of cohesion policy structural funds, which have been linked to the weak administrative capacity of its public administration [14]. Studies focusing on Italy's regions, particularly the Southern regions, have highlighted the impact of structural funds on growth rates, with differences related to different regional administrative behaviors in resource allocation [15]. Research emphasizes the influence of political stability, entrepreneurship, and administrative capacity on the implementation of Cohesion Policy in regions, emphasizing the need for tailored institutional arrangements [16]. Investigations into the effectiveness of European Structural Funds in Southern Italy have shown limited success in offsetting negative economic consequences, with varying impacts on employment, population, and house prices [17]. Despite structural funds having a greater impact in the South compared to the Centre-North of Italy, they have not significantly reduced the productivity gap. On the contrary, the NGEU program largely provides funds with all the areas of the Italian territory.

3. Methodology

The research has been conducted according to the following steps. First, data were gathered from NGEU datasets of the Piemonte Region. After that, a descriptive statistical analysis was performed on the total funding for each mission and department. Tables were used to present data on the mean, median, minimum value, maximum value, and standard deviation of total funding for each data group, along with the number of projects per group. Then, an analysis of variance (ANOVA) was conducted to highlight potential significant relationships.

ANOVA is aimed at investigating the differences among two or more categorical groups of data by evaluating and contrasting the variability within each group with the variability among the different groups [18]. For appropriately conducting the ANOVA it is important to have a normal distribution of records and quite a relevant number of observations for each group under study.

In the context of this study, the objective is to explore the average dimension of total funding associated with each category of interest and discern which data groups exhibit statistically significant differences compared to other ones. The dependent variables are quantitative, while the independent variables are categorical. The dependent variable consists of the logarithm of total funding. The logarithm was employed as the examined data population does not follow a normal distribution. Thanks to the Logarithm transformation it is possible to assume a normal distribution of records. Independent variables include missions and departments. The analysis was conducted separately for each independent variable. To complete the analysis, Interval Plots were included for each phase of the investigation,

providing a clear and concise overview of the data distribution and confidence intervals of the means of the different groups.

Italy's NGEU is structured into six missions: each mission includes multiple components, and each component includes multiple measures. Some measures have an additional level of granularity (i.e., sub-measures). Within the same (sub)measure there are projects of different nature but with the same objectives and targets.

The six missions are as follows. M1: Digitization, innovation, competitiveness, culture, and tourism; this mission is aimed to promote and support the digital transition, both in the private sector and in public administration, foster innovation in the production system, and invest in two key sectors for Italy: tourism and culture. M2: Green revolution and ecological transition; this mission is focused on key areas such as sustainable agriculture, circular economy, energy transition, sustainable mobility, building energy efficiency, water resources, and pollution. Its objective is to enhance the sustainability of the economic system while ensuring a fair and inclusive transition towards a society with zero environmental impact. M3: Infrastructure for sustainable mobility; this mission is dedicated to implementing an investment plan aimed at fostering the development of a modern, digitally integrated, and sustainable transportation infrastructure network. M4: Education and research; this mission is aimed to enhance the educational system at all levels of instruction, support research, and facilitate its integration with the production system. M5: Inclusion and cohesion; The goal of this mission is to facilitate labor market participation, including through training, reinforce active labor policies, and promote social inclusion. M6: Health; this mission focused on enhancing the prevention and treatment capabilities of the national healthcare system to benefit all citizens, ensuring equitable and widespread access to care, and promoting the utilization of innovative technologies in medicine.

The departments in charge of the implementation, and the monitoring of Piemonte NGEU projects are the following ones. A1400B: Health; this department manages all projects concerning health. A1500A: Education, training, and employment; this department oversees projects on the strengthening of employment centers, active employment policies, and programs for the enhancement of territorial identity. A1600A: Environment, energy, and territory; this department deals with projects on orphan site remediation, hydrogen production, and sewer interventions. A1700A: Agriculture and food; this department manages innovation and mechanization projects in the agriculture and food sector. A1800A: Public works, land defense, civil protection, transportation, and logistics; this department deals with infrastructure for sustainable mobility, flood risk management measures, and hydrogeological risk reduction. A19000: Regional system competitiveness; this department manages projects related to cybersecurity, enhancing digital services, and providing scholarships to improve the region's competitiveness and education system. A2000B: Culture and commerce; this department oversees interventions for the protection and enhancement of cultural heritage and digital strategies for business. A22000: Welfare; this department manages public housing redevelopment projects to create greener and safer facilities. The labels are defined by the Piemonte Region administration.

The total analyzed funding includes the sum of NGEU funding, PNC (National Complementary Plan) funding, Financing of non-deferrable works, and other funds. NGEU of data with too few observations were discarded. Furthermore, the analyses are based on data updated as of December 31st, 2023.

4. Results

The results of the descriptive analysis carried out on the missions (Table 1) revealed that missions M1, M2, M5, and M6 show a positively skewed distribution of total funding, with the related mean greater than the median. This suggests that most of the projects within these missions received funding below the mean, while some projects obtained higher funding, contributing to an overall increase in the mean. This phenomenon is common when the dataset includes extremely high values that positively influence the mean without impacting the position of the median. The analysis revealed that M6 and M2 received the largest share of total funding, also showing the greatest variability. This might be because these missions have a more diverse portfolio of projects than the other missions. For Missions M3 and M4, the limited number of available projects prevented detailed analysis.

Table 1: Analysis of descriptive statistics of total mission funding.

Mission	N	Total funding	Minimum	Maximum	Average	Median	StDev
M1	367	78.345.359 €	9.920 €	20.929.000 €	213.475 €	140.390 €	1.130.595 €
M2	199	350.584.508 €	25.000 €	29.213.637 €	1.761.731 €	660.000 €	3.934.189 €
M3	2	40.500.000 €	20.000.000 €	120.500.000 €	70.250.000 €	70.250.000 €	71.064.232 €
M4	2	30.777.479 €	15.082.343 €	15.695.136 €	15.388.739 €	15.388.739 €	433.310 €
M5	362	160.782.590 €	1.755 €	12.620.385 €	444.151 €	177.317 €	993.370 €
M6	430	1.005.853.332 €	36.600 €	354.447.895 €	2.339.194 €	538.849 €	17.318.575 €

Table 2 presents the outcomes with a p-value lower than the critical threshold of 5% of the ANOVA. The results show suggesting at least one means is significantly different from the others.

Table 2: Games test results – Howell for Log of total funding – mission.

Mission	Differs from
M1	M2, M5, M6
M2	M1, M5
M5	M1, M2, M6
M6	M1, M5

The individual value plot, depicted in Fig. 1, provides an overview of the overall results, showing that missions M2 and M6 have a higher mean total funding compared with the other missions analyzed and they differ significantly from the averages of the other missions. This discrepancy may indicate a higher priority assigned to these missions in terms of total funding. Additionally, both M2 and M6 exhibit greater data dispersion compared to other groups, suggesting higher variability in funding received. This indicates that missions M2 and M6 will have a more heterogeneous portfolio of projects, including both large and small projects in terms of total funding.

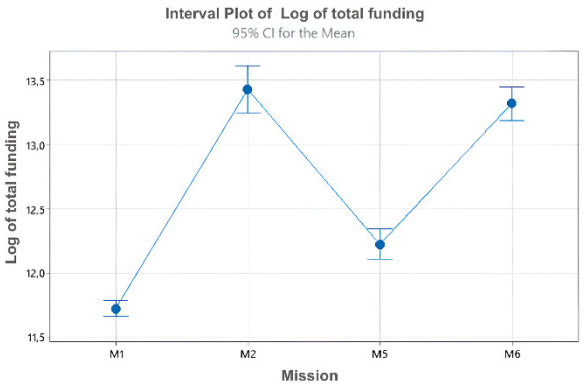

Fig. 1. Interval plot of Log of total funding – mission.

From the results of the descriptive statistical analysis conducted on the different departments, as reported in Table 3, a uniform pattern emerges, except for departments A1700A and A2000B. Specifically, a positively skewed distribution of total funding is observed in the remaining departments, indicated by the mean exceeding the median. This suggests that most of the projects in these departments received funding below the mean, while some projects obtained significant financial support, contributing to the elevation of the directional mean without significantly affecting the median. Conversely, department A2000B was characterized by a negatively skewed distribution of total funding. This suggests that although most projects in this department received funding above the mean, few projects with particularly low funding may influence the overall mean to decrease. However, the difference between the mean

and median is minimal, indicating a relatively balanced distribution of funding. The analysis identified that the departments with the largest share of total funding are A1400B and A1800A, which also show the greatest variability. These departments will be faced with a larger and more diverse portfolio of projects. This implies different monitoring approaches: departments with few high-budget projects will opt for detailed monitoring. On the contrary, departments with many low-budget projects will adopt high-level monitoring by means of project aggregation logic. As for department A1700A, the limited number of available projects precludes a detailed analysis of the financial distribution.

Table 3: Analysis of descriptive statistics of total department funding.

Department	N	Total funding	Minimum	Maximum	Average	Median	StDev
A1400B	430	1.005.853.332 €	36.600 €	354.447.895 €	2.339.194 €	538.849 €	17.318.575 €
A1500A	370	161.381.054 €	1.755 €	12.620.385 €	436.165 €	173.246 €	984.014 €
A1600A	27	132.643.693 €	110.000 €	20.929.000 €	4.912.729 €	3.826.275 €	5.027.119 €
A1700A	1	26.526.600 €	26.526.600 €	26.526.600 €	26.526.600 €	26.526.600 €	*
A1800A	113	267.416.137 €	25.000 €	120.500.000 €	2.366.514 €	440.000 €	11.893.096 €
A19000	42	43.321.231 €	55.831 €	15.695.136 €	1.031.458 €	176.377 €	3.280.564 €
A2000B	318	44.274.143 €	9.920 €	5.406.680 €	139.227 €	140.039 €	298.340 €
A22000	61	85.427.077 €	126.320 €	21.078.514 €	1.400.444 €	850.000 €	2.688.705 €

Table 4 shows the main results of the ANOVA carried out on the departments.

Table 4: Games test results - Howell for Log of total funding – department.

Department	Differs from
A1400B	A2000B, A1500A, A19000, A1800A, A1600A
A1500A	A2000B, A1800A, A1400B, A22000, A1600A
A1600A	A2000B, A1500A, A19000, A1800A, A1400B, A22000
A1800A	A2000B, A1500A, A19000, A1800A, A1400B, A22000, A1600A
A19000	A2000B, A1800A, A1400B, A22000, A1600A
A2000B	A1500A, A19000, A1800A, A1400B, A22000, A1600A
A22000	A2000B, A1500A, A19000, A1800A, A1600A

The interval plot depicted in Fig. 2 provides an overview of the overall results, revealing that departments A1600A and A22000 exhibit higher mean total funding compared to the other directions analyzed. This means that these departments will need to manage a portfolio of projects consisting of projects with higher average funding compared to other directions. Additionally, both A1600A and A22000 show greater data dispersion compared to other groups, suggesting the presence of heterogeneous project portfolios, including both large and small-scale projects.

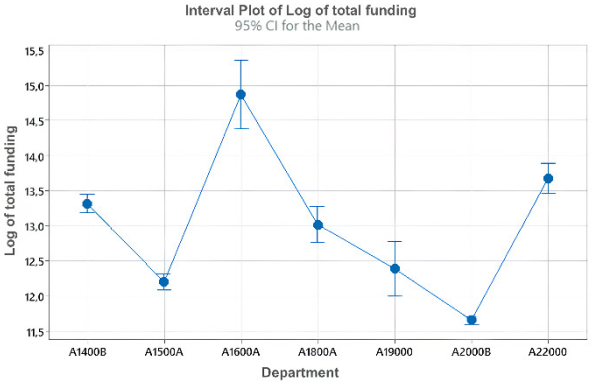

Fig. 2. Interval plot of Log of total funding – department.

5. Discussion and Conclusions

This paper provides an overview of the projects funded through the NGEU in the Piemonte Region in Italy. This program represents a significant step towards closer economic integration within the EU and has been praised for its ambitious goals in addressing both the immediate and long-term challenges facing the European Union.

The overall results show that departmental portfolios are heterogeneous in terms of number of projects, total funding, and average size, suggesting the need to tailor an appropriate monitoring strategy. Instead, focusing on the missions, Green Transition receives a significantly higher amount of funds. This confirms the crucial attention to a more sustainable and environmentally friendly economy and society [19]. All these projects aim to reduce greenhouse gas emissions, promote renewable energy sources, improve energy efficiency, and encourage innovation in clean technologies. The Healthcare mission is also crucial. The objective of the program was to promote public health, prevent diseases, and improve health systems and services throughout Europe, contributing to the well-being and prosperity of EU citizens, especially after the COVID-19 pandemic tragedy. Piemonte will benefit in terms of investments in health infrastructure, medical equipment, and digital health technologies. These results are coherent by observing the ANOVA carried out considering the different regional departments. Environment, Energy and Territory, and Healthcare show the highest values of funds. This orientation could be explained by several reasons. Firstly, the growing awareness of current environmental challenges, exacerbated by climate change, has led the region to consider corrective action as urgent. This was reflected in the increased interest in developing a more sustainable energy sector, with a particular focus on promoting renewable energy and energy efficiency, in line with European objectives to reduce greenhouse gas emissions and ensure energy security. In addition, planned investments in these areas not only addressed environmental challenges but were also seen as an opportunity to stimulate regional economic growth through the development of new technologies, job creation, and investment attraction.

By observing healthcare, investments reflected years of underutilization of resources, reductions of financial support for the national healthcare system, and obsolescence of hospital infrastructure. The pandemic had dramatically highlighted these deficiencies, underlining the urgent need for corrective action. In this context, the NGEU represents a great opportunity to address such issues, which have a significant impact on the quality of life of citizens, and to revitalize the healthcare sector towards greater resilience and sustainability. On the contrary, the lower values for Competitiveness and Culture highlight a different level of need for new initiatives in these fields. This might depend on the fact that Piemonte has quite a well-established manufacturing system with a lot of companies operating in a plethora of sectors not only at a local level but also internationally. Piemonte is a traditionally industry-oriented region and therefore, compared with other areas in Europe, it might need less effort to support competitiveness.

The real challenge, however, is to make NGEU a real game changer. This will depend on the ability of the projects and reforms financed through European funds to stimulate the productivity of the Italian economy in the long term, structurally raising the country's growth profile. However, a lot of challenges have been faced by developing NGEU projects. The potential benefits could be lost in bureaucratic complex procedures. It is worth noticing that due to very narrow time constraints, only the projects that were more mature and already at least designed were included in the

NGEU program. Thus, it is of vital importance to enhance competencies and monitor the progress of all the financed projects not only from a physical point of view but also from procedural and economic perspectives.

This research represents a contribution to a better understanding of the NGEU program at a local level for an Italian Region. The developed analysis proves to be robust as it is based on empirical and well-established approaches and its results might be used by policymakers at different levels: at the local level, for sharing with the citizenship the initiatives that will be undertaken or currently ongoing and in turn to strengthen the importance of being part of the European Community, and at an international level, for more easily communicating how the money received is spent and highlighting expenditure lines.

From an academic perspective, this work enlarges the body of knowledge on the literature dealing with the European financing programs that in the last decades have been analyzed. In addition, it offers an objective perspective based on reliable statistical approaches that can be exploited for other investigations in the field. Similar analysis could be conducted in different regional areas in Italy and in other MSs to carry out comparison, and in turn to figure out relevant trends.

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