



Recovery and Resilience Plan and its impact on Portuguese economic activity

Constança Januário

Dissertation written under the supervision of Professor Geraldo
Cerqueiro

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Abstract

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Author:

Constança Januário

The dissertation investigates, through empirical analysis, the impact of the Recovery and Resilience Plan (RRP) on the Portuguese economy at the municipal level, namely on local economic performance and business dynamics. The RRP is the main public investment mechanism in Portugal for the period 2021–2026, developed to mitigate the economic and social effects of the COVID-19 pandemic and to foster resilience, competitiveness, and territorial cohesion.

The study uses a data panel consisting of the 308 Portuguese municipalities for the period 2015–2024. The intensity of RRP investment is measured relatively, and municipal GDP was obtained from a *downscaling* process of NUTS III regional data. Methodologically, panel models with fixed municipal and temporal effects were applied to both economic indicators and measures of business dynamism, aggregated and by sector of activity.

The results reveal that the effects of the RRP on municipal economic performance and business dynamics in the period analysed are not statistically significant. The structural nature of the program and the existence of time lags between the execution of the investment and the materialization of its economic impacts are consistent with the results. However, the sectoral analysis shows positive effects, mainly associated with climate and environmental transition, reflecting the selective nature of RRP investments.

This study is an initial contribution to the analysis of the economic impacts of the RRP in Portugal, highlighting the need for more consolidated data and extended time horizons.

Keywords: *Recovery and Resilience Plan (RRP), Municipal Economic Impact, Business Dynamics.*

Resumo

Plano de Recuperação e Resiliência e o seu impacto na atividade económica portuguesa

Autor:

Constança Januário

A dissertação investiga, através de uma análise empírica, a repercussão do Plano de Recuperação e Resiliência (PRR) na economia portuguesa ao nível municipal, designadamente no desempenho económico local e na dinâmica empresarial. O PRR constitui o principal mecanismo de investimento público em Portugal no período 2021–2026, desenvolvido para atenuar os efeitos económico-sociais da pandemia COVID-19 e fomentar a resiliência, competitividade e coesão territorial.

O estudo desenvolvido recorre a um painel de dados constituído pelos 308 municípios portugueses no período 2015–2024. A intensidade do investimento do PRR é medida de forma relativa e o PIB municipal obteve-se a partir de um processo de *downscaling* de dados regionais NUTS III. Metodologicamente, modelos de painel com efeitos fixos municipais e temporais foram aplicados tanto a indicadores económicos como a medidas de dinamismo empresarial, agregadas e por setor de atividade.

Os resultados revelam que os efeitos do PRR sobre o desempenho económico municipal e a dinâmica empresarial, no período analisado, não são estatisticamente significativos. O carácter estrutural do programa e a existência de desfasamentos temporais entre a execução do investimento e a materialização dos seus impactos económicos é consistente com os resultados. Porém, a análise setorial exhibe efeitos positivos, sobretudo associados à transição climática e ambiental, refletindo a natureza seletiva dos investimentos do PRR.

Este estudo constitui um contributo inicial para a análise dos impactos económicos do PRR em Portugal, destacando a necessidade de dados mais consolidados e horizontes temporais extensos.

Palavras-chave: *Plano de Recuperação e Resiliência (PRR), Impacto Económico Municipal, Dinâmica Empresarial.*

Table of Contents

1. Introduction.....	7
2. Conceptual and Institutional Framework of the Recovery and Resilience Plan.....	10
2.1 European Framework: NextGenerationEU and Recovery and Resilience Facility	10
2.2 The Portuguese Recovery and Resilience Plan	11
2.3 Governance of the RRP	13
2.4 Dynamics of RRP implementation and current stage of execution	15
2.5 RRP and potential impacts at the municipal level	15
3. Literature Review.....	18
4. Data Description	19
4.1 Data sources and sample.....	19
4.1.1 Time Horizon.....	19
4.1.2 Data Collection	20
4.2 Methodology for Downscaling Regional GDP to Municipal Level.....	22
4.3 Measurement of RRP Investment Intensity at the Municipal Level	23
4.4 Descriptive Statistics	24
4.5 Consolidated Municipality Trends in Economic and Business Indicators	26
5. Methodology	29
5.1 Effects of RRP Investment on Municipal Economic Outcomes	29
5.2 Effects of RRP Investment on Industry-Level Business Dynamics	30
6. Results and Analysis	32
6.1 Assessing the Economic Effects of the RRP at the Municipal Level.....	32
6.2 Consolidated Municipal Trends in Firm Demography	33
6.3 Sectoral Patterns of Firm Creation in the Context of RRP.....	35
6.4 Sectoral Vulnerability and Firm Closures in the Context of RRP.....	36
6.5 Sectoral Net Business Dynamics in the Context of RRP	38
7. Conclusion	40
8. Appendix.....	41
References	44

List of Figures

Figure 1 - Study timeline of RRP implementation.....	20
Figure 2 – Average Evolution of economic and business indicators by RRP Intensity.....	27

List of Tables

Table 1 - Descriptive statistics of economic variables	25
Table 2 - Descriptive statistics of industry-level variables	25
Table 3 - Effects of RRP Investment Intensity on Municipal Economic Outcomes.....	33
Table 4 - Effects of RRP Investment Intensity on Municipality Business Dynamics	34
Table 5 - Effect of RRP Intensity on Business Creation by Sector.....	41
Table 6 - Effect of RRP Intensity on Business Dissolution by Sector	42
Table 7 - Effect of RRP Intensity on Net Business Creation by Sector	43

List of Abbreviations

CSR: Country Specific Recommendation

EU: European Union

GDP: Gross Domestic Product

INE: National Institute of Statistics

NUTS: Nomenclature of Territorial Units for Statistical Purposes

RRF: Recovery and Resilient Facility

RRM: Recovery and Resilient Mechanism

RRP: Recovery and Resilient Plan

1. Introduction

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, constituted a public health emergency that culminated in the most abrupt and widespread economic shock since World War II. The immediate and restrictive health responses adopted from the first quarter of 2020 caused a widespread recession in economic activity. In fact, lockdowns, border closures, and restrictions on commercial operations led to a simultaneous disruption of supply and demand on an unprecedented scale (OECD 2020). This phenomenon has had serious economic and social consequences on a global scale, namely a sudden decline in economic activity, a sharp contraction in investment, and a significant increase in business risk, especially for small and medium-sized enterprises.

The pandemic manifested itself as an exogenous shock to the financial sector. Due to its intensity, scope, and persistence, it created an environment of high uncertainty and challenged financial stability, both internationally and nationally, with a particularly intense and rapid impact.

According to June 2020 Financial Stability Report of the Bank of Portugal (Banco de Portugal 2020), national economic activity and the financial situation of economic agents showed a considerable deterioration, associated with a sharp fall in private consumption and the collapse of service exports, mainly due to the structural weight of the tourism sector in the Portuguese economy.

In parallel, the effects on the business sector were felt intensely. Indeed, the disruption of logistics chains and the extreme decline in external and internal demand were reflected in sharp drops in turnover, reduced business confidence, and strong sectoral disparities. Thus, while the restaurant, accommodation, retail, and transport sectors were the most severely affected, technology-based activities and those with the capacity to operate remotely proved to be more resilient. Operating costs were also affected, given the simultaneous occurrence of logistical constraints and disruptions in global supply chains, factors that resulted in a significant increase (International Monetary Fund 2021).

At the European level, the pandemic shock led to the most significant economic contraction since the creation of the European Union. The European Commission (2020b) highlights that a “symmetrical pandemic shock” has had disparate consequences across Member States, revealing pre-existing vulnerabilities such as differences in industrial intensity, levels of digitalization, and fiscal response capacities.

The depth of the recession in European economies, caused by the severe impacts of the pandemic, required large-scale joint and coordinated action, which culminated in the creation of NextGenerationEU, a European economic recovery program that aims to mitigate the (economic and social) impact of the crisis and promote convergence and resilience in the economies of the European Union. Strictly speaking, this is an extraordinary mechanism that contributes to ensuring long-term sustainable growth and responding to the challenges of the dual transition to a more ecological and digital society. Created by the European Council, NextGenerationEU is the basis for the Recovery and Resilience Facility (RRF), which includes the Recovery and Resilience Plan (Portugal 2021d).

The sudden and unexpected nature of the crisis disproportionately affected economically fragile territories and sectors. Territories dependent on tourism, international production chains, or in-person activities suffered greater declines than others, with the pandemic accentuating territorial asymmetries. The very dynamics of business creation and dissolution were directly affected by these changes, as adverse economic conditions trigger simultaneous phenomena of business retrenchment and business closures (OECD 2021).

In this context, the Member States of the European Union have implemented a wide range of measures to support businesses. This initiative demonstrates the Member States' commitment to the European project, based on shared prosperity. Guaranteed credit lines, moratoriums, simplified layoffs, and economic recovery assistance are some of the measures that have temporarily reduced business insolvencies and prevented a significant part of the economic sector from being destroyed. However, such support measures are no substitute for structural public investment policies capable of stimulating recovery, promoting productive adaptation, and strengthening economic resilience (Baldwin and Weder di Mauro 2020).

It is precisely in this context that the Portuguese RRP emerges, a strategic response at the national level, which aims to implement a set of fundamental reforms and investments so that the country can recover from the economic damage caused by the pandemic, and to correct the long-term structural vulnerabilities that limit national economic growth, with an implementation period between 2021 and 2026 (Portugal 2021d). However, despite the financial scale of the RRP and its reformist dimension, scientific knowledge about its real effects on the economy – especially at the level of the various national territories – appears to be limited.

Therefore, the main motivation behind this research is to contribute to a rigorous empirical assessment of the impact of the RRP on Portuguese municipalities, analysing and assessing: *i)* how the investments made influenced local business dynamics, namely the creation and

dissolution of business units in various sectors, in the context of the *industry-level* measure; *ii*) the study of fundamental economic variables, such as the Unemployment Rate, Population Level, Total Debt, Credit Granted by Banks, and Appraisal Value.

For this purpose, the study uses a panel data set covering the 308 Portuguese municipalities over the period 2015–2024. The empirical strategy combines descriptive analysis with fixed-effects panel estimates, enabling the assessment of the effect of variation in the intensity of RRP investment, particularly on changes in local business dynamics.

This contribution is particularly relevant, as it provides insight into how large-scale public policies adopted to strengthen the resilience of the Portuguese economy and society – which aim to promote resilience, innovation, and territorial cohesion – can effectively translate into tangible improvements in the economic and business structure of the regions that make up the national territory.

Therefore, and with a view to systematically achieving the above objectives, this study will be structured as follows. Chapter 2 presents a contextualization of the conceptual and institutional framework of the RRP. Chapter 3 provides a literature review, discussing the main studies related to the central research question. Chapter 4 then describes the data set used in the empirical analysis, including the processes of data collection, processing, and organization, as well as its characterization through descriptive statistics. The methodology adopted during the study, presented in Chapter 5, includes the econometric specifications that underpin the empirical analysis. Chapter 6 presents and discusses the main results obtained. Finally, Chapter 7 presents the conclusions, including the limitations of the study and pointing to possible perspectives for future research aimed at expanding this dissertation.

2. Conceptual and Institutional Framework of the Recovery and Resilience Plan

2.1 European Framework: NextGenerationEU and Recovery and Resilience Facility

The Portuguese RRP is part of a strategic EU instrument that aims to implement an investment model to respond to the economic and social crisis caused by the COVID-19 pandemic.

Indeed, the public health challenge that profoundly shook Europe and the world and tested structural aspects of our society has left indelible marks. However, we cannot underestimate the fact that crisis situations can potentially act as catalysts for change and innovation.

In this context, the urgent need for joint and coordinated action among Member States has emerged as a crucial factor for the economic recovery sought after the crisis caused by the scourge of COVID-19, with the aim of preparing a better future for the next generations, based on the principles of solidarity, cohesion, and convergence.

In this way, the NextGenerationEU program emerges as a key mechanism that incorporates a vision of collective recovery (both economic and social). In this vein, it has translated into a mechanism that takes the form of an extraordinary financial package of €750 billion, aimed at supporting recovery and promoting the structural transformation of the European economy (European Commission 2020a).

In this context, the Recovery and Resilience Facility (RRF) is enshrined in NextGenerationEU, under the aegis of Regulation (EU) 2021/241 of February 12, 2021, of the European Parliament and of the Council, which is binding on all Member States (European Union 2021b).

The purpose of such an instrument is to provide effective and meaningful financial support to intensify the implementation of sustainable reforms and related public and private investments in Member States, ensuring a sustainable, digital, and resilient (post-pandemic) recovery. To this end, each Member State is responsible for developing its own national plan, aligned with six relevant pillars of Community policy: *i)* ecological transition; *ii)* digital transformation; *iii)* smart growth; *iv)* social and territorial cohesion; *v)* health and institutional resilience; *vi)* policies for the next generation.

Taking into account the aforementioned objectives, the Portuguese RRP was created and approved by the European Commission on June 16, 2021. The initial funding totalled €16.6 billion, of which €2.7 billion was in loans and €14 billion in grants. To this extent, such a system

will ensure the necessary liquidity for the program to function as an effective tool in response to the crisis (Portugal 2021d).

However, the financing of the RRP has undergone several changes over time, adapting to the economic conditions that marked the post-pandemic period.

The first reprogramming, dated 2023, was driven by strong post-pandemic inflationary pressure, given the increase in construction costs, which created the need to boost investment in energy and housing, adjusting the overall value of the plan to around €22.2 billion (Portugal 2023). This reprogramming also incorporated the new REPowerEU chapter, a European plan designed to respond to difficulties and disruptions in the global energy market – arising, in particular, from Russia's invasion of Ukraine – through new energy-saving measures and diversification of suppliers in the European Union (European Commission 2022).

Subsequently, in 2025, the Portuguese government presented a new reprogramming of the RRP financing system: *i)* waiving €311 million in loans; *ii)* eliminating projects with a high risk of not being implemented; *iii)* strengthening the allocation of funds to priority areas (Portugal 2025a).

These measures are intended to ensure that the RRF targets are met by 2026. However, the RRP is a financing mechanism based on performance and verification of results achieved. Before each disbursement, the European Commission analyses whether the objectives (milestones and targets) linked to the measures (reforms and investments) have been met in relation to each disbursement request (Sousa and Dias 2024).

2.2 The Portuguese Recovery and Resilience Plan

The national RRP is the main public investment instrument to be implemented between 2021 and 2026. This mechanism transposes the European strategic guidelines, designed within the framework of the RRF, to the Portuguese context, adapting them to the structural particularities and vulnerabilities characteristic of the national landscape (European Union 2021b).

In accordance with the Portugal 2030 Strategy, established in Council of Ministers Resolution No. 98/2020, and in conjunction with the Multiannual Financial Framework 2021–2027, approved by Council of Ministers Resolution No. 97/2020 – both dated November 13 – the RRP is one of the main sources of financing for the national economy (Portugal 2020a; Portugal 2020b). Within this framework, the RRP responds to four fundamental thematic agendas: *i)* social inclusion, demography, health, and housing (*People First – As Pessoas Primeiro*); *ii)*

competitiveness and strengthening the country's capabilities (*Innovation, Digitalization and Skills as Drivers of Development – Inovação, Digitalização e Qualificações como motores do desenvolvimento*); iii) decarbonization and environmental protection (*Climate Transition and Resource Sustainability – Transição Climática e Sustentabilidade dos Recursos*); iv) territorial cohesion, infrastructure, and international integration (*An Externally Competitive and Internally Cohesive Country – Um país competitivo Externamente e Coeso Internamente*).

In addition, it should be noted that the national RRP was organized into twenty thematic components grouped around three structural dimensions, which guide national investments, namely: i) Resilience; ii) Climate Transition; iii) Digital Transition (Portugal 2021d).

The Resilience dimension, which accounts for two-thirds of the RRP resources, focuses on the ability to overcome crises and the respective current and future challenges, presenting a three-pronged approach centred on reducing economic vulnerabilities, strengthening national productive potential, and promoting a competitive and cohesive territory.

In turn, the Climate Transition dimension aims to promote better use of resources and improve the energy transition of production processes by incorporating innovation and the growing digitalization of economies and societies. Consequently, the climate transition has been integrated into the European Green Deal and the legislative initiative of the European Climate Law, in line with the goal of achieving carbon neutrality by 2050 (European Commission 2019; European Union 2021a).

Finally, the Digital Transition dimension aims at the digital development of society and the economy, reflected in the digitization of businesses, the modernization of public administration, and the promotion of digital skills among the population.

In this sense, the RRP aims to implement reforms to solve national structural economic and social bottlenecks, diagnosed and referenced by the European Commission under the European Semester, through the issuance of CSR (Portugal 2021c).

As such, the investments included in the RRP implement the plan to transform the Portuguese economy, promoting its real convergence with that of its European Union partners and ensuring development in line with climate transition, the reduction of inequalities, and territorial cohesion based on the equitable distribution of resources.

According to the 2021 National Reform Program (Portugal 2021c), the investments and reforms included in the different components of the RRP fall within four broad areas included in the CSR: ensuring financial and institutional resilience (CSR 1), promoting skills and qualifications (CSR 2), fostering public and private investment (CSR 3), and improving conditions for businesses and citizens (CSR 4).

The plan under review focuses both on resolving the immediate effects of the pandemic crisis and on the structural transformation of the country based on a path of competitiveness, sustainability, and cohesion. However, given its comprehensive structure, it is crucial to analyse the mechanisms of governance, implementation, and execution of the RRP, which will be addressed in the following section.

2.3 Governance of the RRP

The governance process of the RRP is based on a model that ensures the efficient and effective implementation and rigorous control of European funds allocated to Portugal for the implementation of the latter, which has its legal basis in Decree-Law No. 29-B/2021 of 4 May, as amended by Decree-Law No. 55/2024 of 9 September (Portugal 2021a).

In this vein, the aforementioned legal instrument immediately establishes, in its preamble, the principles, structures, and procedures associated with the management of the RRP, that is, "it establishes the governance model for European funds, within the scope of the European Union's RRM, framed within Next Generation EU, for the period 2021–2026, namely the organizational, strategic, and operational structure relating to the monitoring and implementation of the RRP for Portugal, specifically the powers of management, monitoring, follow-up, evaluation, control, and audit, under the terms of Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021, establishing the RRM" (Portugal 2021a).

Consequently, the general principles underpinning governance, as defined in the aforementioned law, translate into: *i)* centralization of management and decentralization of implementation; *ii)* a focus on results based on milestones and targets; *iii)* transparency and accountability; *iv)* participation (involvement of all governance bodies in the various phases of the RRP); *v)* segregation of management functions and prevention of conflicts of interest; and *vi)* simplification of any unnecessary procedural complexities. In addition, the governance model has four levels of coordination, namely the strategic level of political coordination, ensured by the Interministerial Commission of the RRP; the monitoring level, under the responsibility of the National Monitoring Commission; the level of technical coordination and monitoring, ensured by the “Recuperar Portugal” mission structure, by the Development and Cohesion Agency, I. P. (Agency, I.P.), and the Office of Planning, Strategy, Evaluation, and International Relations of the Ministry of Finance; and the level of audit and control, ensured

by an Audit and Control Commission, chaired by the Inspectorate-General of Finance. While the Interministerial Commission is responsible for the strategic political management of the RRP, the National Monitoring Commission – made up of independent representatives, social partners, higher education institutions, and civil society organizations – is responsible for scrutinizing, issuing opinions, and verifying the implementation of the RRP, accompanied by recommendations for improvements.

On the other hand, the “Recuperar Portugal” mission structure is responsible for technical and management coordination, ensuring the operationalization of the various components of the RRP. In addition, in order to verify the physical and financial implementation of the interventions undertaken at the RRP level, an internal control system was created for the aforementioned structure (“Recuperar Portugal” mission), which is supervised by the Audit and Control Commission, an entity that also issues opinions on disbursement requests sent to the European Commission and conducts audits of the RRP management and control system (Portugal 2021a).

The Decree-Law also establishes the formal regime for contracting reforms and investments with beneficiaries, as well as the respective financial flows and payments. In fact, RRP investments are “subject to contracting between the ‘Recuperar Portugal’ mission structure and direct or intermediate beneficiaries, and between the latter and their respective final beneficiaries” (Portugal 2021a). In this regard, the information included in the contracts will be transmitted through the information system made available for this purpose, thus ensuring the electronic traceability of data and enabling interoperability with the *European Funds Desk*. In addition, RRP funding, provided by the EU in the form of non-repayable grants, constitutes revenue for the respective State Budget, and its management is assigned to the Agency for Development and Cohesion (Agência, I.P.), with a view to financing projects approved under the program in question. However, RRP funding cannot be combined with other European funds or mechanisms, and systematic analyses must be carried out between European funds, beneficiaries' declarations, and checks by the ‘Recuperar Portugal’ task force to avoid double funding.

On the other hand, it should be noted that information on the funding allocated by the RRP, throughout its implementation phase until its closure, will be made available in an accessible and organized manner by the Information and Transparency Mechanism.

Finally, the mechanisms for recovering funds that are unduly received, or that are not adequately justified, are defined in Article 10.º-A of Decree-Law No. 29-B/2021, with

compensation being made through credits already calculated, or the reimbursement of these amounts.

2.4 Dynamics of RRP implementation and current stage of execution

The final stage of the implementation of the RRP, provided for in the State Budget for 2026, is explicitly integrated into the National Budgetary Framework as an additional financing mechanism at the level of structural public policies (Portugal 2025b). This public investment instrument, which is scheduled to be completed by the end of 2026, is aligned with the timetable established at European level (European Union 2021b).

In fact, the implementation of the RRP has followed a phased approach, highlighting a time lag between the approval of investments, the formalization of contracts, and the actual execution of expenditure. According to the State Budget approved for 2026, although the plan reveals a significant volume of approved and contracted projects, a significant part of the investments is still in the (so-called) initial phase of implementation, i.e., within the scope of administrative procedures, the launch of public tenders, and the physical start of works. It should be noted that this paradigm is especially common for larger financial investments, which are mainly associated with housing, transport infrastructure, sustainable mobility, energy transition, and the modernization of public administration. (Portugal 2025b).

Similarly, it should be reiterated that a significant proportion of RRP resources are executed through central government entities, public companies, and large institutional beneficiaries, which may limit the immediate translation of investment into observable economic effects, even though the plan reveals a spatially and geographically differentiated territorial impact. In general, indirect impacts materialize with slight time lags, which manifest themselves after the completion of the recommended interventions, or at a more advanced stage of the investment implementation phase.

Importantly, the integration of the RRP into the State Budget ensures coordination with other policies and the continuity of investment implementation.

2.5 RRP and potential impacts at the municipal level

The RRP is designed as a comprehensive framework aimed at supporting municipal development and restructuring, across multiple dimensions, namely in the institutional capacity

building of local authorities, territorial cohesion, infrastructure modernization, economic activity, and the quality of public services.

Although the plan is structured around thematic components, most of the measures are territorialized at the municipal level, given the direct role of municipalities in the implementation process and the plan's intervention in municipal resources and structures (equipment, services, and infrastructure).

The municipal level is the preferred operational level for implementing investments under the RRP, particularly given that this is where the respective impacts are expected to materialize more directly. Municipalities are truly the central agents of territorial transformation, i.e., the direct beneficiaries of RRP investments, and those responsible for the decentralized implementation of RRP.

Although it is not structured by administrative regions, the RRP recognizes that strengthening economic, territorial, and social resilience is a fundamental element of the national strategy, anticipating the need to build “a more competitive, more cohesive, and more inclusive economy” (Portugal 2021d). Thus, it should be reiterated that the municipality becomes the privileged space for the implementation and observation of the territorial impacts of the plan.

The infrastructure investments of RRP (namely, the creation of new mobile health units, the expansion of the social facilities network, and the extension of the National Network for Integrated Continuing Care), due to their nature and location, are expected to be implemented in municipal territory, strengthening local public response capacity and contributing to the territorial harmonization of access to essential services, although their economic effects are likely to materialize gradually over time.

On the other hand, the implementation of the housing component of the RRP, which is part of the Housing Access Support Program (*First Right – 1º Direito*), which aims to “help 26,000 families obtain decent housing”, is directly dependent on municipalities, as it requires the development of local housing plans, the purchase or rehabilitation of buildings, and the promotion of new residential projects (Portugal 2021d).

Similarly, the economic dimension of RRP also has a municipal dimension. In this regard, concern for local and regional competitiveness translates into improved connections between areas of activity and the main mobility networks (known as *missing links*). These interventions are intended to enable the modernization of logistics corridors, improve municipal attractiveness, and stimulate private investment. At the same time, the local execution of public works financed by RRP, such as social infrastructure, health facilities, public housing, and urban mobility interventions, generates demand for specialized services and supplies, which

can benefit companies operating at the municipality level. Thus, RRP has the potential to strengthen municipal capacity and competitiveness, although its economic impacts are likely to remain differentiated across sectors and municipalities, in line with pre-existing territorial characteristics (Barca, McCann, and Rodríguez-Pose 2012).

Finally, territorial cohesion is one of the cross-cutting priorities of the plan, as demonstrated in the objective of “promoting the harmonious development of the national territory, ensuring that all NUTS II regions converge” (Portugal 2021d). This objective not only highlights the importance of the municipal level in reducing socioeconomic and demographic inequalities, as well as disparities in access to public services but is also in line with European principles of regional equity (European Commission 2019).

3. Literature Review

Academic research on the impact of the RRP in Portugal is extremely scarce, given the recent nature of the program, the lack of consolidated data, and its multi-year implementation, especially when compared to other European structural programs. Most existing studies use *ex ante*, conceptual, or sectoral approaches, without developing empirical assessments.

In this regard, Valente and Džajić Uršić (2025) is one of the most significant contributions, involving an *ex ante* analysis of the possible effects of the RRP on the sustainability of tourism, particularly in the Algarve and Alentejo regions.

The mentioned work presented here offers a prospective and localized analysis but does not constitute an analysis of the effects of the RRP on the Portuguese economy. Nevertheless, the study highlights the transformative potential of the RRP, emphasizing the need to align public investments, regional institutional capacity, and local development strategies for the plan to be effective.

Given the lack of academic studies on this subject, the main discussions on impact come from institutional analyses. The policy paper “How to measure your impact?”, authored by economists Paulo Trigo Pereira, Steffen Hoering, and João Cortes, represents one of the first public initiatives to structure methodologies for evaluating RRP. Although it does not present statistical models and empirical estimates, the study highlights the lack of systematic indicators to measure the program's impact, the need for comparable indicators, the urgency of disaggregating data territorially, and the high heterogeneity among municipalities in the absorption and execution of funds (Think Tank – Anti-Fraud Initiative 2023).

Although the general structure of the RRP is widely documented in official reports, the systematic assessment of its economic and territorial impact in Portugal is still in its early stages.

4. Data Description

4.1 Data sources and sample

This study develops an empirical, territorial, and temporal analysis of the implementation of the RRP in Portugal, to assess the intensity of investment financed by the plan at the municipal level and its effect on local economic performance and business dynamics. To achieve this scope, a panel study was used, covering all 308 Portuguese municipalities, including mainland Portugal and the autonomous regions of Madeira and the Azores, for the period between 2015 and 2024.

This approach is particularly suitable for identifying structural relationships in contexts where territories differ, both in terms of population and in terms of productive structure and vulnerabilities to economic shocks. Similarly, the heterogeneity that characterizes the national territory is one of the aspects that needs to be explored, given the particularly synchronic nature of this analysis.

4.1.1 Time Horizon

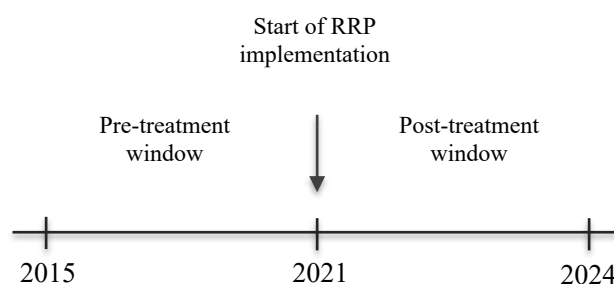
The selection of the 2015–2024 time horizon is justified by statistical availability and methodological criteria that ensure the robustness of the empirical analysis, as well as the rational consistency of the results. This interval allows for a clear distinction between a pre-treatment period, covering the years 2015 to 2020 (before the implementation of the RRP), and a post-treatment period, covering the years 2021 to 2024 (corresponding to the program's implementation phase).

Thus, the pre-treatment period, which occurs before the implementation of the RRP, allows for the detection of structural trends prior to implementation (of the program), reducing the impact of short-term economic fluctuations. In fact, this is a sufficiently long interval to analyse the evolution of economic and business indicators in the absence of any intervention. In addition, the time interval also allows for the identification of economic trends prior to the intervention, increasing confidence that the changes observed after 2021 reflect not only the continuation of previous dynamics, but also the effects of the RRP.

For the purposes of this empirical strategy, 2021 marks the formal launch of the RRP in Portugal, when the approval, contracting, and execution of funded projects began.

Consequently, the post-treatment period, which runs from 2021 to 2024, allows for the initial and intermediate phases of the RRP implementation to be captured. In this context, it should be noted that this time frame, presented in Figure 1, corresponds to the period during which consolidated, homogeneous, and comparable statistical information at the municipal level is available.

Figure 1 - Study timeline of RRP



4.1.2 Data Collection

In addition, it should be noted that the empirical panel broken down by Portuguese municipalities is the result of the integration of various official statistical and administrative sources, enabling a (consistent) analysis of the relationship between RRP investment, local economic performance, and sectoral business dynamics.

First, information on RRP investment was collected, namely regarding the amount of investment approved, contracted, and paid, from the official Recuperar Portugal portal (Portugal 2025c). The extraction comprises the value of all investments organized by municipalities, occurring up to September 10, 2025, which is the most up-to-date and consolidated information available at the time of extraction.

In order to ensure the reliability, consistency, and analytical relevance of the information, only projects with “Contract Closed” status are considered for the purposes of this study, thereby restricting the analysis to investments with a confirmed degree of commitment. This results in a municipal-level database of effectively contracted investments, which is the central explanatory variable of the study.

Accordingly, the RRP variable represents the cumulative amount paid per municipality from 2021 to September 2025. In this context, the financial execution of the RRP is the fundamental variable of the study, as it represents the treatment currently being carried out. Specifically, it

takes a value of zero for the years prior to 2021 and the value of the accumulated investment paid from 2021 onwards.

Next, an annual panel was created at the municipal level, with economic and social indicators obtained from the PORDATA statistical database (PORDATA 2025). In effect, this panel consists of all the dependent variables in the study, used in the analysis of local economic performance, including Total Municipal Debt, Credit Granted by Banks, Appraisal Value, Unemployment, and Population Level.

As such, Total Municipal Debt reflects the municipality's financial capacity and its budgetary margin for action, which may influence the implementation of public policies and the territory's sensitivity to the allocation of investment by the RRP.

In turn, Credit Granted by Banks captures the financing conditions and dynamics of the local banking system, acting as a *proxy* for economic activity and the availability of capital for private investment.

In addition, the Appraisal Value, measured in euros per square meter, is an indicator of the local real estate market, sensitive to housing demand, credit conditions, and the territorial attractiveness of the municipality.

Finally, Unemployment and Population, both measured in terms of number of individuals, are structural variables of the local economic context. Population conditions the size and evolution of the other economic indicators, playing a central role in the normalization of economic variables. It is used, in particular, in regional GDP disaggregation procedures, which will be assessed in the following section.

Given the unavailability of the variables “unemployment rate” and “active population” at the municipal level, an approximate indicator was created for the former index. Thus, the Unemployment variable was normalized by the Population of the respective municipality, resulting in the unemployment per capita measure, hereinafter referred to as the Unemployment Rate. This *proxy* allows for the capture of comparable variations in the intensity of unemployment between municipalities over time, although it does not correspond to the strict definition of unemployment rate based on the active population. In fact, this method is common practice in territorial analyses, particularly when information on the labour market is not available at the desired geographical level, since the core issue is effectively spatial comparability, rather than the strict definition of the unemployment rate, as documented in the literature (OECD 2010).

Finally, to analyse local business dynamics, an annual data panel was created, broken down by municipality, which comprises two *industry-level* measures, Business Creation and Business

Dissolution, both disaggregated by sector of activity and sourced from the INE statistical database (Instituto Nacional de Estadística 2025). While the former refers to the number of companies created in a specific sector by municipality and represents economic dynamism and entrepreneurial capacity, the latter measures the number of companies dissolved by sector in the municipality, constituting an indicator of business closure, as it captures economic weaknesses and restructuring.

In addition, a variable called Net Creation Balance was created, which corresponds to the difference between the annual number of companies created and the annual number of companies dissolved in a given municipality for each sector. As such, this variable will allow for the measurement of net expansion or contraction of businesses by sector.

4.2 Methodology for Downscaling Regional GDP to Municipal Level

The integration of regional GDP into the database required the implementation of a special disaggregation procedure called *downscaling*. To this end, annual GDP data at current prices (base 2021) were collected by NUTS III regions (NUTS 2024 classification) from INE for the period between 2015 and the last available year, i.e., 2023.

The integration of regional GDP into the empirical database initially required the construction of a hierarchical correspondence table between NUTS I, NUTS II, NUTS III, and municipalities, based on information provided by the PORDATA platform. This correspondence allows each municipality to be consistently associated with its respective NUTS III subregion.

Therefore, municipal GDP was estimated using a disaggregated methodology proportional to the resident population, widely used in regional economics literature (Kummu, Kosonen, and Sayyar 2025). Specifically, municipal GDP was obtained from the GDP of the respective NUTS III region, weighted by the municipality's population in relation to the total population of the sub-region, according to the following expression:

$$GDP_{it} = GDP_{rt} \times \frac{Pop_{it}}{\sum_{i \in r} Pop_{it}}$$

where GDP_{it} represents the estimated municipal GDP of municipality i in year t , GDP_{rt} corresponds to the GDP of NUTS III region r in the same year, and Pop_{it} denotes the resident population of municipality i in year t .

This procedure preserves regional GDP totals, ensuring that the sum of the estimated GDP of municipalities matches the value observed at the NUTS III level, allowing for a consistent and comparable measure of municipal economic size, suitable for panel analysis. In this vein, the use of the population variable as a weighting factor is a transparent and replicable solution. In fact, the estimated municipal GDP, based on the *downscaling* procedure, is a fundamental element for the creation of the explanatory variable crucial to this study, that is, the intensity of RRP investment.

4.3 Measurement of RRP Investment Intensity at the Municipal Level

The use of absolute amounts of RRP investment in empirical analysis could potentially introduce significant biases in the results obtained. Therefore, to overcome this limitation, a continuous variable of RRP investment intensity was constructed at the municipal level, i.e., the RRP variable was normalized by an indicator of local economic capacity, namely municipal GDP in 2020. This new measure, which represents the Relative Intensity of the RRP variable, expresses RRP investment in relative economic terms, allowing it to be interpreted as a proportion of the local economic size.

The RRP Intensity variable makes it possible to compare the economic weight of the RRP of municipalities of different sizes, since it controls for structural differences in their economic scale. In addition, it allows for a more accurate assessment of the intensity of the RRP intervention in relation to local productive capacity. In this context, the following expression demonstrates the procedure used to scale the RRP investment:

$$RRP\ Intensity_{it} = \frac{RRP_{it}}{GDP_{i2020}}$$

where $RRP\ Intensity_{it}$ represents the relative intensity of the RRP investment of municipality i in year t , RRP_{it} corresponds to the amount of RRP investment executed in the same municipality and year, and GDP_{i2020} denotes the GDP of municipality i in 2020.

The GDP used as the denominator is set at 2020, one year prior to the implementation of the RRP. This methodology will help to avoid potential problems in terms of the results of the analysis now underway.

Firstly, setting a pre-treatment year ensures that the denominator remains exogenous and independent of the variable of interest. In addition, this procedure guarantees that all differences

arise solely from the implementation of the RRP, ensuring the necessary comparability. In other words, municipalities are compared based on their initial economic structure, not on values that involve them throughout the implementation of the program.

Setting the denominator year also keeps the indicator interpretable, i.e., the ratio represents the euros of RRP paid per euro of the municipality's initial economic capacity. If GDP varied over time, it would be impossible to know the reason for the change in the ratio, i.e., whether it was caused by the RRP or by the local economy.

Finally, choosing the year 2020 avoids problems of availability and comparability, ensuring that all municipalities present consistent data, as it represents a solid base year that is available for the entire country.

4.4 Descriptive Statistics

In a context of high territorial heterogeneity, as exemplified by Portuguese municipalities, the descriptive assessment of the variables used in the study plays a fundamental role in empirical analysis, allowing for the study of asymmetries and extreme values, identifying general data patterns. Indeed, this preliminary analysis is particularly important, as it allows us to characterize the distribution, scale, and heterogeneity of economic and financial indicators, as well as variables associated with business dynamics at the municipal level.

From Table 1, several conclusions can be drawn regarding the sample of economic and financial variables.

The intensity of RRP investment – measured by the ratio resulting from the difference between the amount invested by the RRP in the municipality in a given year and the municipality's GDP in 2020 (see chapter 4.3) – has an average value of 1.38% and a high standard deviation, reflecting a high degree of heterogeneity in the municipalities' exposure to the RRP. In certain municipalities, RRP investment is particularly significant given the size of local GDP, reinforcing the relevance of the study in relative terms.

In turn, the considerable dispersion of the Unemployment Rate shows significant structural differences in local labour market conditions.

In addition, the financial variables – Total Municipal Debt and Credit Granted by Banks – reveal standard deviations significantly higher than the average, with strongly asymmetric distributions. This pattern is reflected in the concentration of economic and financial activity,

given the discrepancy between metropolitan areas and municipalities with less economic activity.

Similarly, the Appraisal Value demonstrates differences in economic activity, urban density, and the dynamics of local real estate markets.

On the other hand, Table 2 presents descriptive statistics relating to municipal business dynamics.

On average, around 137 new companies are created each year, and approximately 69 companies are dissolved, both at the municipal level, resulting in a positive net balance of 68 companies. However, there is a notable heterogeneity in business evolution, characterized by high standard deviations and wide variation in minimum and maximum values, as well as the existence of municipalities where business dissolutions far exceed new creations, a sign of greater local economic fragility.

Table 1 - Descriptive statistics of economic variables

	Obs.	Mean	Std. Dev.	Min	Max
RRP Intensity (%)	3 080	1.378	2.592	0.000	21.331
Unemployment rate (%)	3 080	3.262	1.825	0.000	12.553
Bank credit (million €)	2 464	748.938	5 344.356	0.000	97 914.375
Appraisal value (€/m ²)	3 080	677.978	543.443	0.000	3 826.000
Debt (thousand €)	2 772	13 752.381	31 044.621	0.000	708 012.875

Notes: RRP Intensity is measured in percentage points and reflects initial municipality-level exposure. The Unemployment rate is measured in percentage points. Bank Credit is expressed in million euros, while Debt is expressed in thousand euros. Appraisal values are measured in euros per square meter. The construction and definition of RRP Intensity and Unemployment rate are presented in the Data Description section.

Table 2 - Descriptive statistics of *industry-level* variables

	Obs.	Mean	Std. Dev.	Min	Max
Business Creation	3080	137.120	431.226	0.000	7536.000
Business Dissolution	3080	68.930	221.249	0.000	5137.000
Net Business Creation	3080	68.190	245.711	-616.000	5338.000

Notes: Business Creation refers to the number of newly created firms. Business Dissolution measured the number of firms exits. Net Business Creation corresponds to the difference between firm entries and exists (see methodology section).

Note that the number of observations reported in the tables corresponds to the values observed for the 308 Portuguese municipalities over the ten-year period under analysis. Bank Credit and

Total Debt are available only up to 2022 and 2023, respectively, which explains the lower number of observations for these variables.

The variability observed suggests that the potential impacts of the RRP may manifest themselves differently across Portugal. Given the marked economic, financial, and business heterogeneity among Portuguese municipalities, the most appropriate choice for the study carried out here is to use fixed-effects panel econometric models.

4.5 Consolidated Municipality Trends in Economic and Business Indicators

For the purposes of descriptive analysis of the evolution of economic and business indicators (dependent variables), with different levels of exposure to the RRP, municipalities were classified into two distinct groups – *High Investment* and *Low Investment* – depending on the intensity of the RRP in their respective dynamics. The group of municipalities classified as *High Investment* consists of those with RRP intensity above the median of the distribution (2.3%), while the group of municipalities classified as *Low Investment* consists of the rest.

Figure 2 illustrates the evolution of the average of the dependent variables over the years for the two groups of municipalities. This graphical representation allows for a consolidated comparison of economic trends before and after the start of the RRP implementation, contributing to the contextualization of the econometric results presented in the following sections.

Descriptive evidence reveals systematic differences in levels between municipalities with high and low RRP investment intensity, with the *High Investment* group consistently showing higher average levels for all dependent variables over the time horizon considered. The trends shown in the figure demonstrate the persistence of stable differences between the two groups over time, suggesting that municipalities with higher RRP investment intensity already had more favourable economic conditions before the program was implemented.

In addition, the pre-treatment trends, which are broadly parallel between the two groups of municipalities, provide descriptive evidence favourable to the empirical strategy adopted in subsequent analyses, where municipal heterogeneity that is invariant over time is controlled for through fixed effects.

After implementation of the RRP, no abrupt differences were observed in business dynamics or in the labour market indicator. In fact, average levels in *High Investment* municipalities remain higher, and the difference compared to *Low Investment* municipalities does not increase

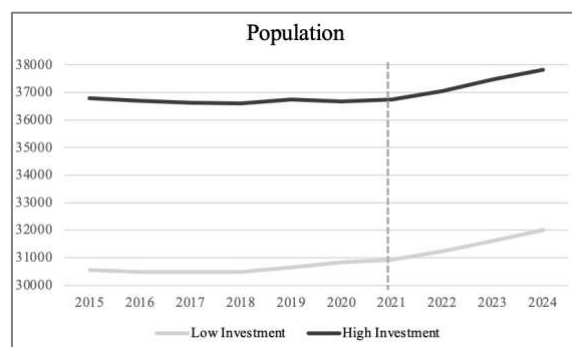
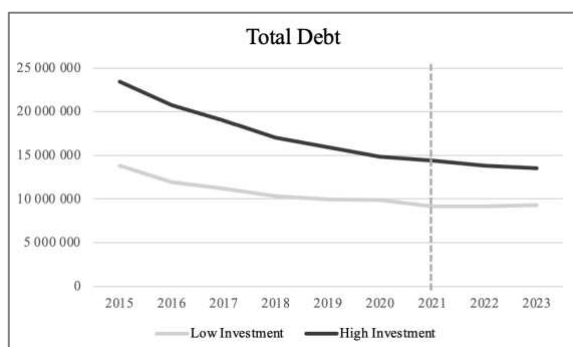
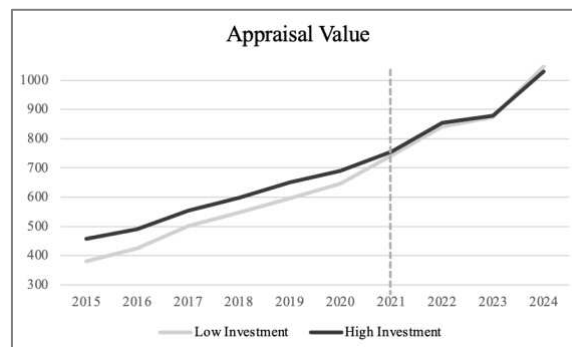
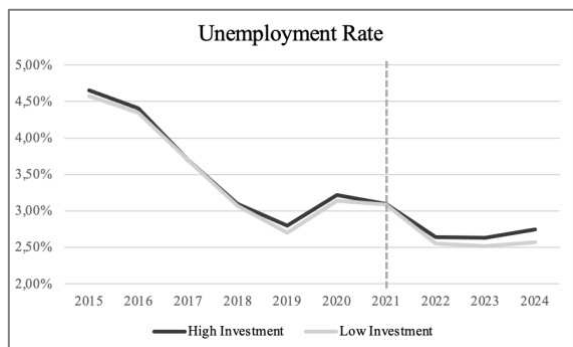
significantly, especially in the post-treatment period, demonstrating that the first years of RRP implementation do not translate into immediate changes of significant magnitude.

Financial indicators show persistent differences between groups, with *High Investment* municipalities consistently having higher levels of Credit Granted by Banks and Total Debt over the given time horizon. These patterns reflect municipal characteristics associated with their economic size and financial depth, and do not represent short-term effects directly attributable to the RRP. In addition, average Appraisal Value show an upward trend in both groups, remaining consistently higher in municipalities with higher investment intensity.

In essence, the descriptive evidence reinforces the need to control for unobserved heterogeneity in econometric estimates, as the intensity of the RRP is strongly associated with pre-existing structural characteristics of municipalities. At the same time, the empirical framework adopted to assess the impact of the RRP on economic outcomes at the municipal level is supported by the absence of significant divergences in pre-treatment trends.

Figure 2 – Average Evolution of economic and business indicators by RRP Intensity





Notes: The figure shows the evolution of annual averages over time for *High-Investment* and *Low-Investment* municipalities. Business Creation, Business Dissolution and Net Business Creation are measured as the number of firms, while Population is measured as the number of individuals. Appraisal Value is measured in euros per square meter, and Bank Credit is expressed in million euros. Total Debt is expressed in euros.

5. Methodology

5.1 Effects of RRP Investment on Municipal Economic Outcomes

Panel econometric models allow for the assessment of the impact of the RRP on municipal economic indicators. In fact, this empirical strategy allows for the exploration of temporal and territorial variation in the data. However, to control for unobserved heterogeneity over time at the municipal level, and shocks common to all municipalities in each year, a model with municipal and temporal fixed effects was estimated, respectively. As such, only intra-municipal variation over time is explored, reducing potential biases arising from the structural characteristics of municipalities.

The general specification of the model can be represented by the following regression:

$$Y_{it} = \beta_1 RRP\ Intensity_{it}^{SR} + \beta_2 RRP\ Intensity_{it}^{LR} + \mu_i + \gamma_t + \varepsilon_{it}$$

where Y_{it} represents the economic indicator observed in municipality i in year t transformed into logarithms (in the form $\log(x + 1)$, except for Unemployment Rate); $RRP\ Intensity_{it}^{SR}$ and $RRP\ Intensity_{it}^{LR}$ correspond to the measures of RRP investment intensity associated with the short-term effect and the long-term effect, respectively; μ_i denotes the municipal fixed effects; γ_t the annual fixed effects; and ε_{it} the idiosyncratic error term.

Recognizing that the effects of public investment may not be immediate, but rather manifest themselves differently over time, the RRP Intensity variable was broken down into two distinct temporal components, capturing potential differences in the temporal dynamics of the effects of the RRP.

The first component, called short-term RRP Intensity, $RRP\ Intensity_{it}^{SR}$, corresponds to exposure to the RRP in the year of implementation and the following year ($t = 0; t = 1$), i.e., in 2021 and 2022.

This variable seeks to capture short-term effects on local economic activity, i.e., immediate effects associated with the initial phase of project implementation.

On the other hand, the second component, called long-term RRP Intensity, $RRP\ Intensity_{it}^{LR}$, corresponds to exposure to RRP in periods after 2022 ($t > 1$), reflecting relatively longer-term effects associated with the completion of projects and their integration into the local economic structure.

This temporal decomposition allows the coefficients associated with each component to be estimated separately, approximating a simplified *distributed lag* logic, adapted to the temporal limitations of the RRP implementation.

The logarithmic transformation of economic variables, apart from the Unemployment Rate, allows for a reduction in asymmetries, as well as a proportional interpretation of the coefficients, mitigating the influence of extreme values.

5.2 Effects of RRP Investment on Industry-Level Business Dynamics

The effect of the RRP on business dynamics at the municipal level was analysed using panel econometric models, with the number of companies created and the number of companies dissolved, observed annually, as dependent variables. The analysis was also developed on the same variables broken down by sector.

This sectoral approach allows us to capture the differentiated effects of the RRP across the local productive structure, given that, depending on technological intensity, exposure to public demand, investment absorption capacity, and structural characteristics, the impact of public investment may vary substantially.

In this context, the econometric specification adopted is based on fixed effects models at the municipal and temporal levels, and the estimated regression can be represented as follows:

$$Y_{its} = \alpha_{1s} RRP\ Intensity_{it}^{SR} + \alpha_{2s} RRP\ Intensity_{it}^{LR} + \mu_{is} + \gamma_{ts} + \varepsilon_{its}$$

where Y_{its} represents a measure of business dynamism observed in municipality i in year t for sector s after logarithmic transformation (in the form $\log(x + 1)$); $RRP\ Intensity_{it}^{SR}$ and $RRP\ Intensity_{it}^{LR}$ correspond to the measures of RRP investment intensity associated with the short-term effect and the long-term effect, respectively; μ_{is} denotes the municipal fixed effects per sector; γ_{ts} the annual fixed effects per sector; and ε_{its} the idiosyncratic error term.

The variables $RRP\ Intensity_{it}^{SR}$ and $RRP\ Intensity_{it}^{LR}$ follow the logic presented in the previous chapter.

In addition, an econometric model was estimated in which the net balance of companies created is presented as the explained variable. The net balance of companies created, referred to as *Net Business Creation*, is obtained by the difference between the number of companies created in a given municipality and the number of companies dissolved in the same municipality, by sector and year, and is represented by the following formula:

$$Net\ Business\ Creation_{its} = Business\ Creation_{its} - Business\ Dissolution_{its}$$

The specification of the estimated model is given by the same regression, previously presented, for the *industry-level* variables. However, a different variable transformation process was adopted, since this variable may have negative, zero, or positive values.

The transformation adopted is called the inverse hyperbolic sine, defined by the following expression:

$$\sinh(x_{its}) = \ln(x_{its} + \sqrt{x_{its}^2 + 1})$$

where x_{its} represents the variable *Net Business Creation*, for municipality i for year t and sector s . This transformation allows negative and zero values to be included – which are incompatible with traditional logarithmic transformations – preserves an approximately logarithmic interpretation for high absolute values, and reduces the influence of extreme values, improving the statistical behaviour of the error term.

Thus, the dependent variable, defined as $\sinh(Net\ Business\ Creation)$, ensures econometric consistency and comparability between municipalities and sectors.

6. Results and Analysis

6.1 Assessing the Economic Effects of the RRP at the Municipal Level

The results of the panel estimates assessing the relationship between the intensity of the RRP and a set of economic indicators, presented in Table 3, show insignificant effects on most variables in both the short and long term. This means that, in the period analysed, RRP investment has not yet translated into clear and systematic municipal economic impacts on the selected indicators.

Regarding the Unemployment Rate, the results indicate a lack of robust and statistically significant evidence that the intensity of the RRP has had a measurable influence on the evolution of unemployment at the municipal level in the period under review. Nevertheless, the coefficient associated with the unemployment rate shows a positive and higher relationship for the long-term explanatory variable. A 1 percentage point increase in the intensity of the short-term (long-term) RRP suggests an increase of about 0.6 (1.65) percentage points in the unemployment rate. This analysis is consistent with the slow nature of many investments financed by the program.

In the case of Credit Granted by Banks, the estimated coefficients (not significant in any case) point to an initially negative and subsequently non-existent impact of the RRP on local financing dynamics. This result may be motivated by the predominance of direct public investments and the limitation of immediate transmission to the local financial system.

Regarding Appraisal Value, the results (without robust statistical significance) suggest that local real estate markets do not reflect the performance of the RRP, as they tend to respond to structural factors and demand dynamics with greater persistence over time. Even so, they present positive coefficients associated with the intensity of the RRP.

The municipal Total Debt variable exhibits positive coefficients (relative to RRP intensity) in both the short and long term, albeit without statistical significance. Given the institutional design of the program, in which a substantial part of the financing does not directly burden municipal budgets, the absence of systematic changes in municipal indebtedness becomes a plausible situation.

Lastly, the result obtained for the municipal Population, i.e., the lack of significance of the coefficients relating to the intensity of the RRP, is to be expected, given that this is a structural variable, where variations occur slowly. In fact, demographic variations would be difficult to

capture in a (so-called short) time horizon such as that of the initial phase of the RRP implementation.

Ultimately, the results under analysis are consistent with the fact that the RRP is still in an intermediate phase of implementation, where there is a lag between the realization of expenditure and the realization of local economic impacts. Therefore, the estimated coefficients should be interpreted as evidence of initial effects, given that more significant impacts may become apparent over a longer time horizon.

Table 3 - Effects of RRP Investment Intensity on Municipal Economic Outcomes

	(1) Unemployment Rate (%)	(2) Bank Credit (log)	(3) Appraisal Value (log)	(4) Total Debt (log)	(5) Population (log)
<i>RRP Intensity_{it}^{SR}</i>	0.595 (1.073)	-3.514 (4.305)	0.594 (3.395)	3.138 (2.041)	-0.024 (0.051)
<i>RRP Intensity_{it}^{LR}</i>	1.664 (1.399)	0.000 (.)	0.006 (3.827)	0.412 (1.028)	-0.036 (0.081)
Observations	3080	2464	3080	2772	3080

Notes: Two-way fixed effects for municipalities and years (absorbed, not shown). Standard errors are clustered at the municipality level and reported in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6.2 Consolidated Municipal Trends in Firm Demography

Table 4 shows the results of the panel estimates regarding the relationship between the intensity of RRP investment and business dynamics at the municipal level, broken down into three distinct dimensions, reflected in the dependent variables considered *industry-level* variables: Business Creation, Business Dissolution, and Net Business Creation. In other words, it presents the impacts of the RRP on the aggregate behaviour of business entry and exit at the municipal level.

The results show an absence of statistically significant effects of RRP intensity on the variables that reflect business dynamism, not only in the short-term but also in the long-term. This means that, in the period under review, the impacts of the RRP on business dynamics are not clear and systematic.

Regarding Business Creation, the estimated coefficients for RRP intensity reflect, in both the short and long-term, a hypothesis that RRP investment may be associated with a slight stimulus

to business creation, although there is no robust evidence of a measurable effect, insufficient to manifest itself in a statistically significant way in the initial phase of the program's implementation.

Similarly, the estimated coefficients for the regression of company dissolution are positive and not significant, suggesting that RRP intensity is not statistically robustly associated with company closures at the municipal level. In fact, company dissolution depends heavily on structural and cyclical factors (namely macroeconomic conditions, financial constraints, and changes in demand) and is not immediately related to predominantly structural public investments, such as the RRP.

Regarding the Net Business Creation, the coefficients associated with the independent variable are not statistically significant, in both the short or long term. However, in the time horizon under analysis, there are no clear net effects of the RRP on aggregate business behaviour, resulting from the combination of business creation and dissolution.

In essence, these results are consistent with the (intermediate) stage of implementation of the RRP and with the predominantly structural nature of the investments financed by the plan, meaning that the effects on the business structure tend to materialize gradually and with significant time lags.

However, it should be noted that the absence of statistically significant effects should not be interpreted as evidence of the program's ineffectiveness, but rather as a reflection of the relatively short period and the disparity between the execution of expenditure and the realization of observable economic impacts at the municipal level.

Table 4 - Effects of RRP Investment Intensity on Municipality Business Dynamics

	(1) Business creation (log)	(2) Business dissolution (log)	(3) Net Business Creation (asinh)
<i>RRP Intensity</i> ^{SR} _{it}	0.003 (0.004)	0.008 (0.006)	-0.013 (0.022)
<i>RRP Intensity</i> ^{LR} _{it}	0.006 (0.004)	0.003 (0.008)	0.002 (0.015)
Observations	3080	3080	3080

Notes: Two-way fixed effects for municipalities and years (absorbed, not shown). Standard errors are clustered at the municipality level and reported in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

6.3 Sectoral Patterns of Firm Creation in the Context of RRP

The effects of the RRP on Business Creation are limited and heterogeneous, revealing differences at the sectoral level. Table 5, in the Appendix, shows the results of econometric estimates that assess the impact of RRP intensity on the number of businesses created at the municipal level, broken down by economic activity sector.

Most of the estimated coefficients, for both the short and long term, do not show robust statistical significance, a situation that can be explained by the fact that a substantial part of the RRP funds is earmarked for public infrastructure, energy transition, digitization of public administration, skills, and structural reforms. In this sense, the economic effects (indirect and medium/long-term) of investments of this nature are not reflected in an immediate increase in the number of firms.

Nevertheless, there are some positive effects, particularly in the electricity, gas, steam, hot and cold water, and cold air sector (row 5 of Table 5) and in the accommodation, restaurants and similar services sector (row 10 of Table 5), reflecting the sectoral focus of the RRP investments. Firstly, the positive impact on the accommodation, restaurants and similar services sector in the short-term is consistent not only with measures to support the recovery of the economic activity most affected by the pandemic, but also with investments associated with the promotion of sustainable tourism, the upgrading of tourism infrastructure, and investment incentive programs, often financed or co-financed by the RRP. On the other hand, the sector in question has high business turnover and low barriers to entry, which facilitates the translation of financial stimuli and expectations of economic recovery into the rapid creation of new companies. Thus, although the investments are not explicitly aimed at entrepreneurship, they can have immediate effects on the entry of companies.

In a similar way, in the electricity, gas, steam, hot and cold water, and cold air sector, the positive long-term significance of the RRP intensity coefficient is aligned with the significant weight of the RRP in investments linked to climate transition, one of the central pillars of the RRP. Projects related to renewable energy, energy efficiency, smart grids, and decarbonization are characterized by high capital requirements and prolonged maturation, and their effects on the creation of new companies are only expected to materialize after some time. In addition, these investments tend to stimulate the emergence of new specialized business entities, often associated with specific projects, local consortia, or the provision of technical services, which explains the emergence of effects in the long term.

On the other hand, the lack of significance in sectors such as manufacturing, trade, or professional services suggests that the RRP may have acted predominantly as a reinforcement of the productive capacity of existing companies. Incentives for digitization, technological modernization, or energy efficiency are measures that tend to improve the productivity of established companies and do not necessarily stimulate the creation of new companies, especially in a context of uncertainty.

It should also be noted that sectors strongly linked to territorial investments – such as energy, construction linked to rehabilitation, or activities associated with tourism – are more subject to local variations in the intensity of the RRP, making the probability of identifying statistically significant effects higher.

Furthermore, the absence of statistically significant negative coefficients suggests that the RRP does not appear to generate significant adverse *crowding-out* effects at the municipal level.

Finally, the RRP should be interpreted as a structural economic policy instrument, whose success is not measured exclusively by the creation of companies, but also includes the transformation of the productive base, increased economic resilience, and improved conditions for medium-term and long-term growth. The limited effects observed in the creation of companies reflect its strategic and reform-oriented nature.

6.4 Sectoral Vulnerability and Firm Closures in the Context of RRP

The results relating to the evolution of firm dissolution at the sectoral level, presented in Table 6 of the Appendix, are consistent with the institutional design and intervention logic of the RRP, distinguishing the latter from traditional policies of direct support to companies. However, the RRP is not expected to change business development patterns across the board, despite its influence on business development dynamics. The impacts of the RRP on business growth should be interpreted as part of a broader process of structural reorganization of the economy, in which the central objectives are resilience, sustainability, and efficiency.

The program under review is essentially geared towards transforming the economy through structural investments and medium-term and long-term reforms, rather than indiscriminately preserving the existing business structure. Thus, the absence of widespread effects on business dissolution is consistent with the nature of the RRP.

However, statistically significant effects are identified in specific sectors, reflecting the selective nature of investments associated with the RRP. The results show that the intensity of

the RRP, in the long term, has a negative and statistically significant effect on the water collection, treatment and distribution, sanitation, waste management, and depollution sector (row 6 of Table 6). In addition, the dissolution of companies in the financial and insurance sector (row 12 of Table 6) and the real estate sector (row 13 of Table 6) are influenced, in a statistically significant way and in the short term, by the intensity of the RRP.

The negative effect on business dissolutions in the water collection, treatment and distribution, sanitation, waste management, and depollution sector is consistent with the fact that public investments financed by the RRP are directly related to such activities, particularly regarding climate transition and the circular economy. As this is a sector heavily dependent on public contracts and large-scale investments, the RRP contributes to strengthening demand stability and reducing the risk of business dissolutions, an effect that is particularly evident over a longer time horizon.

In the financial and insurance sector, the estimated coefficient for the short term, which is negative and significant, suggests an immediate stabilizing effect associated with the RRP. This sector is particularly sensitive to confidence, predictability of public investment, and stability of the economic environment, which explains why the reduction in institutional uncertainty and the improvement in macroeconomic expectations resulting from the launch of the RRP are reflected in the result obtained. In this context, the impact of the RRP materializes quickly through a credible economic policy strategy, albeit indirectly.

On the other hand, in the real estate sector, there has been an increase in business dissolutions, which is associated with the intensity of the RRP in the short term, i.e., the estimated coefficient is positive and statistically significant. In a sector particularly exposed to changes in public investment patterns and more demanding technical and financial requirements, the RRP may have acted as a catalyst for structural adjustment and consolidation processes. This means that the concentration of RRP investments in urban rehabilitation and public works projects, often carried out by larger operators, may have increased competitive pressure on smaller and less capitalized companies, culminating in their exit from the market.

Collectively, these results indicate that the RRP had different effects depending on the degree of sectoral exposure to its intervention instruments, rather than promoting an indiscriminate reduction in business closures. The effects on the business structure result mainly from indirect mechanisms, such as the stabilization of demand, changes in competitive conditions, and the reallocation of resources between sectors.

6.5 Sectoral Net Business Dynamics in the Context of RRP

The results presented in Table 7, shown in the Appendix, assess the impact of the intensity of the RRP on the net number of companies created at the sectoral level, broken down by economic activity sector.

In general, the results indicate that, in most of the sectors analysed, the RRP did not have a cross-cutting and statistically significant impact on the net dynamics of business creation. Thus, the implementation of the RRP did not generally alter the balance of business start-ups and dissolutions at the municipal level, a pattern consistent with the nature of the RRP as an economic policy mechanism aimed at structural investments, institutional reforms, and productive modernization, whose effects on business demographics tend to be indirect and gradual.

Nevertheless, statistically significant effects are identified in specific sectors, namely in the electricity, gas, steam, hot and cold water, and cold air sector (row 5 of Table 7), in the water collection, treatment and distribution, sanitation, waste management, and depollution sector (row 6 of Table 7), as well as in the financial and insurance sector (row 12 of Table 7). These effects reflect the selective nature of RRP investments and sectoral heterogeneity in response to public policies.

In the electricity, gas, steam, hot and cold water, and cold air sector, and in the water collection, treatment and distribution, sanitation, waste management, and depollution sector, the intensity of the RRP is associated with an increase in the net number of companies created in these areas in the long term. In fact, this sector is at the heart of RRP investments in the context of climate and business transition, characterized by high technical requirements, strong regulation, and larger-scale projects. It should also be noted that the capital-intensive nature and long maturation period of investments mean that the positive effects on net business dynamics will only emerge in the long term, reflecting the gradual entry (into the market) of new specialized companies and the consolidation of innovative economic activities.

In addition, the short-term, positive, and statistically significant coefficient associated with the intensity of the RRP in the regression of the financial and insurance sector suggests an initial adjustment in the sector's business equilibrium. Thus, the launch of the RRP led to an improvement in macroeconomic expectations, considering the increased demand for financial services associated with the implementation of projects financed by the RRP and the acceleration of digitization and financial innovation processes. However, such an effect does

not persist in the long term, as it is only an initial adjustment, consistent with the rapid response to changes in the economic environment in this sector.

The results indicate that the impact on net business dynamics is selective and sectoral, focusing on strategic areas where large investments are concentrated, namely energy transition, environmental sustainability, and financial stability. In fact, the RRP is a process of reconfiguring the productive system, in which the effects on business dynamics are part of a broader process.

7. Conclusion

This dissertation develops an empirical analysis of the impact of the RRP on the Portuguese economy at the municipal level, aiming to assess how the intensity of investment financed by the RRP relates not only to municipal economic performance but also to business dynamism. To this end, a panel was used that includes all Portuguese municipalities in the period between 2015 and 2024, distinguishing between the pre-implementation period and a phase after the program's execution.

In the time horizon analysed, there are no statistically robust and generalized effects of the intensity of the RRP on municipal economic indicators and on the so-called *industry-level* aggregate variables, i.e., the variables of business creation and dissolution. Since the structural nature of the RRP is based predominantly on medium-term and long-term public investment and institutional reforms, it is expected that the economic impacts will materialize gradually, with significant time lags.

However, different effects are observed in specific areas when a sectoral analysis is carried out, particularly in sectors related to climate transition and environmental services, reflecting the selective and targeted nature of the plan's investments. In fact, the impact of the RRP is heterogeneous, as it depends on sectoral exposure to priority areas of intervention and the pre-existing structural characteristics of the territories.

The results presented should not be interpreted as evidence of the RRP ineffectiveness, but rather as a reflection of the stage of implementation and the time lag between the financial execution of investments and their translation into observable economic results at the municipal level.

Therefore, a study based on longer time horizons and more consolidated data will be a fundamental future analysis to more fully assess the effects of the RRP at the economic and territorial level, as well as its contribution to the resilience, competitiveness, and cohesion of the Portuguese economy.

8. Appendix

Table 5 - Effect of RRP Intensity on Business Creation by Sector

	$RRP\ Intensity_{it}^{SR}$		$RRP\ Intensity_{it}^{LR}$		Observations
(1)	0.003	(0.004)	0.006	(0.004)	3080
(2)	0.010	(0.007)	-0.012	(0.007)	3080
(3)	-0.003	(0.002)	0.001	(0.002)	3080
(4)	-0.010	(0.006)	-0.003	(0.007)	3080
(5)	0.007	(0.006)	0.016**	(0.007)	3080
(6)	0.004	(0.003)	0.002	(0.003)	3080
(7)	0.006	(0.008)	0.010	(0.008)	3080
(8)	-0.005	(0.006)	0.007	(0.006)	3080
(9)	0.005	(0.009)	0.001	(0.009)	3080
(10)	0.017**	(0.007)	0.011	(0.008)	3080
(11)	-0.007	(0.008)	0.005	(0.007)	3080
(12)	-0.001	(0.005)	-0.001	(0.007)	3080
(13)	-0.003	(0.008)	0.009	(0.008)	3080
(14)	0.001	(0.006)	0.006	(0.007)	3080
(15)	0.001	(0.005)	-0.006	(0.006)	3080
(16)	-0.003	(0.005)	-0.005	(0.004)	3080
(17)	0.004	(0.006)	0.007	(0.007)	3080
(18)	0.006	(0.006)	0.002	(0.006)	3080
(19)	-0.002	(0.005)	0.006	(0.006)	3080

Notes: Two-way fixed effects for municipalities and years (absorbed, not shown). Standard errors are clustered at the municipality level and reported in parentheses. Each row reports estimates from a separate regression. The dependent variable is the log-transformed number of firms created in each sector¹ (see methodology section).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

¹ (1) Total firms; (2) Agriculture, animal production, hunting, forestry and fishing; (3) Extractive industries; (4) Manufacturing industries; (5) Electricity, gas, steam, hot and cold water, and cold air; (6) Water collection, treatment, and distribution; sanitation, waste management, and depollution; (7) Construction; (8) Wholesale and retail trade; repair of motor vehicles and motorcycles; (9) Transportation and storage; (10) Accommodation, restaurants and similar services; (11) Information and communication activities; (12) Financial and insurance activities; (13) Real estate activities; (14) Consulting, scientific, technical and similar activities; (15) Administrative and support service activities; (16) Education; (17) Human health and social support activities; (18) Artistic, entertainment, sporting and recreation activities; (19) Other service activities.

Table 6 - Effect of RRP Intensity on Business Dissolution by Sector

	<i>RRP Intensity</i> ^{SR} _{it}		<i>RRP Intensity</i> ^{LR} _{it}		Observations
(1)	0.008	(0.006)	0.003	(0.008)	3080
(2)	0.004	(0.007)	-0.003	(0.007)	3080
(3)	0.000	(0.002)	-0.001	(0.003)	3080
(4)	0.007	(0.006)	-0.004	(0.006)	3080
(5)	-0.000	(0.002)	-0.000	(0.002)	3080
(6)	-0.005	(0.004)	-0.006*	(0.003)	3080
(7)	0.000	(0.006)	-0.003	(0.006)	3080
(8)	0.006	(0.008)	0.008	(0.006)	3080
(9)	-0.003	(0.006)	0.005	(0.006)	3080
(10)	0.006	(0.006)	0.008	(0.008)	3080
(11)	-0.002	(0.005)	-0.005	(0.005)	3080
(12)	-0.012**	(0.005)	-0.008	(0.005)	3080
(13)	0.011*	(0.006)	0.002	(0.005)	3080
(14)	-0.003	(0.006)	-0.003	(0.007)	3080
(15)	-0.004	(0.006)	0.000	(0.006)	3080
(16)	0.003	(0.005)	-0.001	(0.005)	3080
(17)	-0.002	(0.005)	0.001	(0.005)	3080
(18)	-0.005	(0.005)	0.005	(0.005)	3080
(19)	0.001	(0.004)	0.001	(0.004)	3080

Notes: Two-way fixed effects for municipalities and years (absorbed, not shown). Standard errors are clustered at the municipality level and reported in parentheses. Each row reports estimates from a separate regression. The dependent variable is the log-transformed number of firms dissolved in each sector² (see methodology section).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

² (1) Total firms; (2) Agriculture, animal production, hunting, forestry and fishing; (3) Extractive industries; (4) Manufacturing industries; (5) Electricity, gas, steam, hot and cold water, and cold air; (6) Water collection, treatment, and distribution; sanitation, waste management, and depollution; (7) Construction; (8) Wholesale and retail trade; repair of motor vehicles and motorcycles; (9) Transportation and storage; (10) Accommodation, restaurants and similar services; (11) Information and communication activities; (12) Financial and insurance activities; (13) Real estate activities; (14) Consulting, scientific, technical and similar activities; (15) Administrative and support service activities; (16) Education; (17) Human health and social support activities; (18) Artistic, entertainment, sporting and recreation activities; (19) Other service activities.

Table 7 - Effect of RRP Intensity on Net Business Creation by Sector

	$RRP\ Intensity_{it}^{SR}$		$RRP\ Intensity_{it}^{LR}$		Observations
(1)	-0.013	(0.022)	0.002	(0.015)	3080
(2)	0.017	(0.015)	-0.022	(0.015)	3080
(3)	-0.004	(0.004)	0.001	(0.005)	3080
(4)	-0.026	(0.018)	-0.001	(0.017)	3080
(5)	0.011	(0.009)	0.024**	(0.011)	3080
(6)	0.010	(0.006)	0.012**	(0.005)	3080
(7)	0.022	(0.023)	0.030	(0.024)	3080
(8)	-0.022	(0.021)	0.009	(0.021)	3080
(9)	0.018	(0.020)	0.004	(0.022)	3080
(10)	0.024	(0.016)	0.002	(0.013)	3080
(11)	-0.007	(0.013)	0.013	(0.011)	3080
(12)	0.018**	(0.008)	0.014	(0.016)	3080
(13)	-0.020	(0.016)	0.009	(0.014)	3080
(14)	-0.007	(0.015)	0.011	(0.014)	3080
(15)	0.009	(0.011)	-0.007	(0.012)	3080
(16)	-0.001	(0.009)	-0.011	(0.011)	3080
(17)	0.013	(0.011)	0.015	(0.013)	3080
(18)	0.022	(0.013)	-0.002	(0.013)	3080
(19)	-0.004	(0.010)	0.021	(0.014)	3080

Notes: Two-way fixed effects for municipalities and years (absorbed, not shown). Standard errors are clustered at the municipality level and reported in parentheses. Each row reports estimates from a separate regression. The dependent variable is the log-transformed net number of firms created in each sector³ (see methodology section).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0$.

³ (1) Total firms; (2) Agriculture, animal production, hunting, forestry and fishing; (3) Extractive industries; (4) Manufacturing industries; (5) Electricity, gas, steam, hot and cold water, and cold air; (6) Water collection, treatment, and distribution; sanitation, waste management, and depollution; (7) Construction; (8) Wholesale and retail trade; repair of motor vehicles and motorcycles; (9) Transportation and storage; (10) Accommodation, restaurants and similar services; (11) Information and communication activities; (12) Financial and insurance activities; (13) Real estate activities; (14) Consulting, scientific, technical and similar activities; (15) Administrative and support service activities; (16) Education; (17) Human health and social support activities; (18) Artistic, entertainment, sporting and recreation activities; (19) Other service activities.

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