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Navigating Funding Selection. A Comprehensive Study of Company Selection Processes for the National Recovery and Resilience Plan Funding in Portugal

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NAVIGATING FUNDING SELECTION. A COMPREHENSIVE STUDY OF COMPANY SELECTION PROCESSES FOR THE NATIONAL RECOVERY AND RESILIENCE PLAN FUNDING IN PORTUGAL

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Abstract

This thesis examines the European Recovery and Resilience Program (RRP) with a focus on Portugal's National Recovery and Resilience Plan and the Mobilizing Agendas for Business Innovation (MABI). Initially, it offers a historical overview of the RRP and analyzes Portugal's socio-economic challenges pre-Covid-19. Through sector-specific case studies, the research identifies key determinants influencing entity eligibility for funding, showcasing dynamics in several thematic areas such as Cross Cutting Technologies, Industries and Production Technologies, Mobility, Space and Logistics, Natural Resources and Environment and Health, Well-Being, and Territory. Finally, the study introduces a comprehensive evaluation methodology for the program, combining empirical data, theoretical insights, and recommendations, to provide a thorough understanding of MABI, its hurdles, and future potential.

Keywords

European Union (EU); National Recovery and Resilience Plan (NRRP); Portugal Economy; Natural Resources and Environment; Mobility, Space and Logistic; Health, Well-Being, and Territory; Cross Cutting and Their Applications.

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Contents

1. Introduction - (Group Part)

In recent years, the global panorama of economic development and innovation has undergone considerable changes. Governments across the European Union have launched ambitious projects aimed at boosting recovery, resilience, and innovation in response to changing challenges. The European Recovery and Resilience Program (RRP) is one such program, a massive undertaking aimed at rebuilding economies and boosting member states' resilience in the aftermath of the COVID-19 pandemic.

This paper carries on an in-depth examination digging into the complexities of the RRP, with a focus on its implementation process in Portugal. It investigates how this program was channelled through the Mobilizing Agendas for Business Innovation (MABI), a strategic initiative meant to promote innovation and transformation across five different economic sectors. The core of this analysis comprises case studies that delve into specific economic sectors, each presented by a dedicated contributor.

These case studies specifically examine the sectors of Cross-Cutting Technologies and Their Applications; Industries and Production Technologies; Mobility, Space, and Logistics; Natural Resources and Environment; and Health, Well-being, and Territory in depth. This work explores the complexities of program selection and rejection through these case studies, investigating the underlying financial indicators, possible variables influencing selection, and drawing conclusion over the overall future impact of the project. In parallel, qualitative data are collected through a survey and administrative data via specific governmental and financial

platforms, obtaining information from stakeholders and respondents to further define the program's performance. This detailed research concludes with the program possible improvements and recommendations, and a guideline for evaluation of forecast program effectiveness.

2. The Recovery and Resilience Program (RRP) and the Mobilizing Agendas for Business Innovation (MABI) - (Group Part)

2.1. Background and context of the RRP in EU

The first news of the virus that was spreading rapidly in Asia, later known as "COVID-19", came out in November 2019. On January 30, 2020, The World Health Organization (WHO) declared the outbreak a public health emergency of international concern (PHEIC) and on March 11, 2020, began to refer to it as a pandemic.

Governments around the world began to establish restrictions to prevent the spread of the virus. The EU countries were not the exception as they had to enact measures to close the borders, limit the movement of people, and halt business operations in non-essential sectors. The deep restrictions put in place threatened to send the world into the greatest economic shock since the Great Depression of the 1930s. To prevent a catastrophic economic collapse, this circumstance forced the leaders of the EU to immediately implement urgent steps in the shape of stimulating packages (Fedajev, et al., 2022).

In this context, **NextGenerationEU** (NGEU) was born as an unprecedented response to the crisis. Under this strategy, "the Commission is empowered to borrow up to €806.9 billion between 2021 and 2026 to drive Europe's recovery from the pandemic via a combination of loans and grants to Member States and centrally managed EU programs" (European Commission, 2022, pag. 4).

The cornerstone of NextGenerationEU is the **Recovery and Resilience Facility (RRF)**. This is an instrument "that offers grants and loans to support reforms and investments in the EU Member States for a total of €723.8 billion in current prices" (European Commission, 2023). Part of the funds (up to 47%) are provided to Member States in the form of grants, another part (up to 53%) in the form of funds loans to individual Member States. These funds are provided to member states in accordance with their **National Recovery and Resilience Plans (NRRP),** which are guidelines for reforms and investments focused on three dimensions: Resilience, Climate Transition and Digital Transition.

2.2. Portugal before the European RRP

Portugal has been hit hard by the pandemic crisis compared to other EU members, with a GDP decline of 7.6% in 2020 compared to 2019. The government implemented a fiscal package that was intended to support households (1% of GDP), employment (0.6% of GDP), and healthcare (0.6% of GDP) in response to the sharp decline in economic activities related to tourism, a sector that accounts for 10% of the total workforce and 8% of the nation's GDP (Corti, Nuñez, Ruiz, & Regazzoni, 2021, pag. 49).

The steps taken to address the Covid-19 problem, except for those concerning liquidity, had a significant influence on the public deficit, which was predicted to be negative until 2025 (-1.1% of GDP) (Corti, Nuñez, Ruiz, & Regazzoni, 2021, pag. 49). In fact, it was predicted that Portugal will experience high fiscal sustainability risks in the short and medium terms (European Commission, 2020, pag. 26). The situation is aggravated as even before the pandemic, Portugal faced significant structural challenges.

2.3. Portuguese structural challenges before Covid-19

According to the Country Report Portugal 2020 (European Commission, 2020), there are some structural country-specific challenges that must be addressed.

Firstly, in the context of **labor market,** despite a decline in unemployment, Portugal has unused labor market reserves (PT 3.2% of the active population, vs. 2.9% in the EU) and youth unemployment is still comparatively higher (PT 18.2% in Q3-2019, vs. 14.4% in the EU) (European Commission, 2020, pag. 38)

Secondly, although there has been improvement in the Portuguese educational system over the past ten years (between 2009 and 2018, the rate of early leavers from education and training decreased from 30.9% to 11.8%, and tertiary education attainment grew from 21.3% to 33.5%), there are still significant issues about **education and skills** that need to be resolved. Examples include high levels of grade repetition and high dropout rates as well as high percentage of adults who have not completed their upper secondary studies (European Commission, 2020, pag. 46). Education inequality remains a concern and there is a lack of digital skills which is a significant barrier for Portugal: 48% of Portuguese people lacked even the most fundamental digital abilities in 2019, while 26% had none (European Commission, 2020, pag. 49).

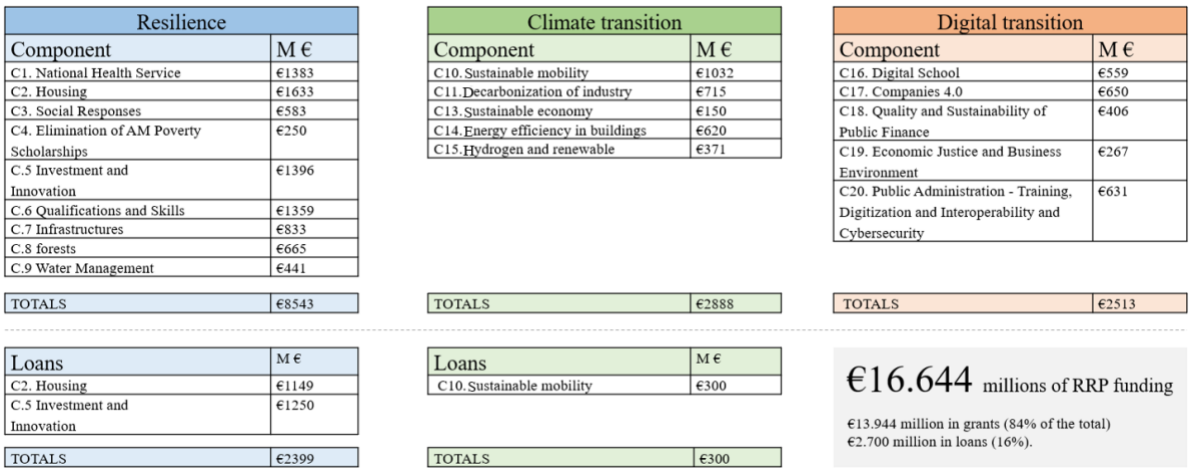
Thirdly, Portugal is considered a moderate innovator since the **research and development** intensity is below the EU average. The low investment in intellectual property, intangible assets, R&D, and economic and digital competencies directly affect productivity. Portugal's economy is still grounded in conventional low and medium-tech industries (European Commission, 2020, pag. 52).

Finally, regulations continue to restrict **competition for business and professional services.** The framework law of 2013, which was part of a financial assistance program, aimed to

simplify rules for highly regulated professions. However, this law was not completely put into effect, leaving certain barriers in the legal services sector. Restrictions on multidisciplinary practices, legal form, shareholding, management, and advertising in the legal market could harm competition by limiting access to capital and reducing economies of scale. In addition, the lack of reforms in other regulated professions, such as architects and engineers, and the prohibition of business groups in regulated professions hinder competition and business growth in Portugal. For several professions, regulation is more restrictive than the EU average (European Commission, 2020, pag. 55).

2.4. The Portuguese NRRP overview

Considering the structural challenges and the problems caused by the measures to control the COVID-19 pandemic, Portugal prepared its NRRP and was the first member state to present it to the European Commission (Corti, Nuñez, Ruiz, & Regazzoni, 2021). The NRRP was organized into 20 Components which integrate a total of 37 Reforms and 83 Investments. The components are grouped into three main dimensions: *resilience* (9 components), *climate transition* (6 components) and *digital transition* (5 components) as seen in figure 1 (República Portuguesa, 2021).



Resilience	
Component	M €
C1. National Health Service	€1383
C2. Housing	€1633
C3. Social Responses	€583
C4. Elimination of AM Poverty Scholarships	€250
C.5 Investment and Innovation	€1396
C.6 Qualifications and Skills	€1359
C.7 Infrastructures	€833
C.8 forests	€665
C.9 Water Management	€441
TOTALS	€8543

Climate transition	
Component	M €
C10. Sustainable mobility	€1032
C11. Decarbonization of industry	€715
C13. Sustainable economy	€150
C14. Energy efficiency in buildings	€620
C15. Hydrogen and renewable	€371
TOTALS	€2888

Digital transition	
Component	M €
C16. Digital School	€559
C17. Companies 4.0	€650
C18. Quality and Sustainability of Public Finance	€406
C19. Economic Justice and Business Environment	€267
C20. Public Administration - Training, Digitization and Interoperability and Cybersecurity	€631
TOTALS	€2513

Loans	M €
C2. Housing	€1149
C.5 Investment and Innovation	€1250
TOTALS	€2399

Loans	M €
C10. Sustainable mobility	€300
TOTALS	€300

€16.644 millions of RRP funding

€13.944 million in grants (84% of the total)
€2.700 million in loans (16%).

Figure 1. RRP Components and Associated Investments (Values at current prices)

Source: Own elaboration based on Plano de Recuperação e Resiliência 22 April 2021 (2021) República Portuguesa.

As shown in figure 2, in terms of the reforms, Portugal greatly accelerates the completion of the structural reforms. However, in terms of investment, projects will be completed mostly by the end of the programming term, between 2025 and 2026 (Corti, Nuñez, Ruiz, & Regazzoni, 2021).

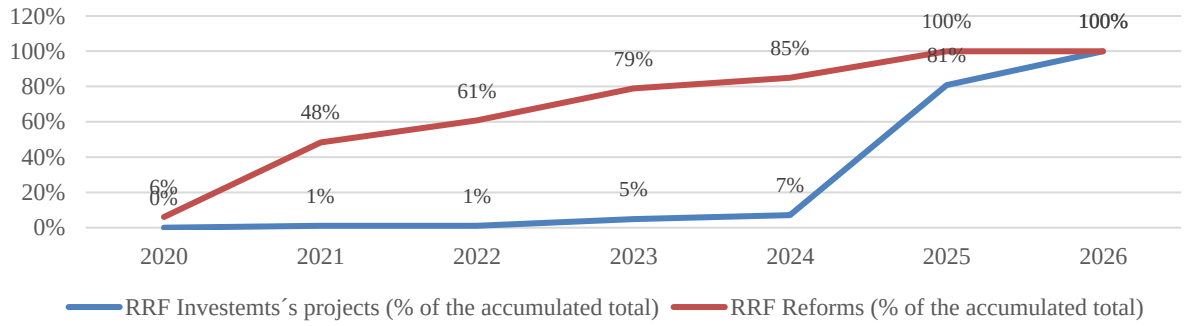


Figure 2. Timeline for completion under Portuguese NRRP, by year (% of the total)

Source: Own elaboration, based on Plano de Recuperação e Resiliência 22 April 2021 (2021) República Portuguesa

2.5. Component 5: Capitalization and Business Innovation

As mentioned earlier, the 20 components of the NRRP in Portugal are grouped into the dimensions of resilience, climate transition and digital transition. In the present study we will focus on component 5 belonging to the first dimension. This dimension "concentrates 60% of the overall amount of RRP grants and reflects the strong priority given to the objective of preparing for overcoming crises and structural challenges" (República Portuguesa, 2021, pag. 106).

Reforms

- Promoting Research, Development and Innovation (R&D&I) and innovative investment in enterprises
- Creation and development of the Banco Português de Fomento
- Expanding and Consolidating the Network of Interface Institutions
- Research and innovation agenda for sustainability in agriculture, food and agro- industry
- Development of the capital market and promotion of capitalization of non-financial companies

Investments

- Mobilizing Agendas/Alliances for Business Innovation (558 M€)
- Green Agendas/Alliances for Business Innovation (372 M€)
- Interface mission - renewal of the scientific and technological support network and orientation towards the productive fabric (186 M€)
- Research and innovation agenda for the sustainability of agriculture, food and food security
- Agro-industry [Innovation Agenda for Agriculture 20|30] (93 M€)
- Recapitalize the Business System of the Azores (125 M€)
- Economic Recovery of Azorean Agriculture (30 M€)
- Corporate capitalization and financial resilience/ Banco Português de Fomento (1,550 M€)

Figure 3. Reforms and investments withing component 5

Source: Own elaboration, based on Plano de Recuperação e Resiliência 22 April 2021 (2021) República Portuguesa

In accordance with the above, it is possible to see in Figure 4 how the different components described above and the amount of investment for each of them are "hierarchically" related.

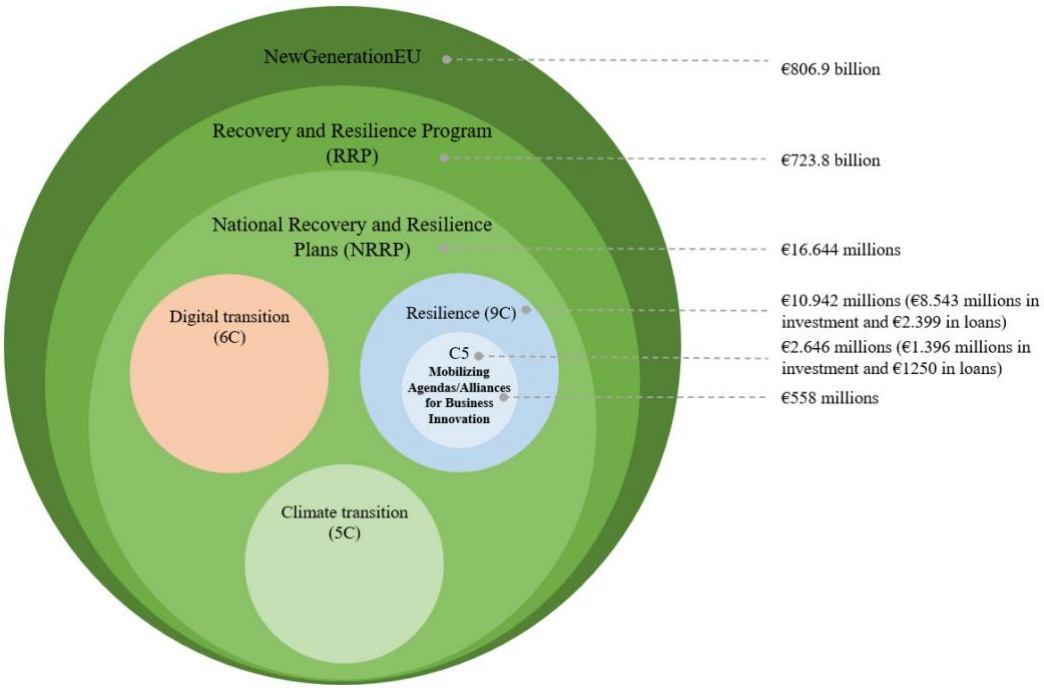


Figure 4. Summary Diagram of the Strategies with amount of investment information

Source: Own elaboration, based on Corti, Nuñez, Ruiz, & Regazzoni, 2021 and Plano de Recuperação e Resiliência 22 April 2021 (2021).

2.6. Mobilizing Agendas for Business Innovation (MABI)

As mentioned before, component 5 includes MABI. Through the definition, support, and promotion of a set of agendas in innovative strategic areas, the MABI has the goal of accelerating the structural transformation of the Portuguese economy while also improving its specialization profile. In particular, MABI expect to contribute to Portugal achieving strategic objectives by 2030 such as contributing to change the specialization profile of the Portuguese economy, increase exports of goods and services, increase investment in R&D, ensuring 3% of GDP by 2030 and reduce CO2 emissions by 55% by 2030.

The call was for the creation of mobilizing agendas aiming to identify investment opportunities and implementation capabilities, as well as the innovation pacts and the mobilizing projects to be supported, through an open and competitive consultation process in which all relevant business entities could participate, taking on different roles: leaders of the consortia, co-promoters and partners (República Portuguesa, 2021).

The identification of the true investment prospects and implementation capabilities requires the active participation of many possible actors. Therefore, "the proposals may be promoted by companies, R&D institutions and non-business entities of the research and innovation system, municipal entities and higher education institution" (República Portuguesa, 2021, pag. 110).

The collaborative projects supported by the strategy should leverage the development of new, higher-value products and services with an eye toward potentially increasing export and the hiring of qualified human resources in conjunction with an increase in business investment in R&D which has the potential to transform the Portuguese economic landscape. Also, the projects should lead to the successful implementation of green technology towards a broader environmental sustainability.

The strategy establishes thematic areas and subareas (see figure 5) “aligned with the strategic priorities defined in the National Research and Innovation Strategy for Smart Specialization (ENEI), combining the country's competitive and comparative advantages with those for which it has growth potential” (República Portuguesa, 2021, pag. 111).

Figure 5. Thematic areas and subareas for the Mobilization Agendas for Business Innovation

Source: own elaboration, based on Notice of Bid Opening No. 01/C05-i01/2021 Re-C05-I01.01 (República Portuguesa, 2021)

NRRP Implementation Indicators so far

As of July 5, 2023, 100% of the contracts have been signed between "Recuperar Portugal", which is an entity created to negotiate, contract and monitor the execution of NRRP, and the entities responsible for the implementation of investments. In relation to the resilience dimension, 100% of the contracts have been signed, for a value of 11.125 million euros, 82% have approvals of the investments and 11% of the payments to the direct and final beneficiaries have been made (Recuperar Portugal, 2023, pag. 1).

3. Literature Review - (Group Part)

3.1. Overview of EU Funding Programs and Policy Evaluation

The EU provides a variety of funding programs to help projects and initiatives that benefit the EU and its citizens. These initiatives are intended to promote economic growth and development, social cohesion and solidarity, environmental protection, and cultural and educational advancement. EU funding programs seek to address common challenges, foster collaboration, and promote development throughout Europe. They usually involve the allocation of a large budget for a specific period, which can last several years. The European Commission, the EU's executive branch, manages these programs in collaboration with other EU institutions, agencies, and national authorities.

The European Union offers various types of funding to support a wide range of initiatives and projects. These funding opportunities include grants, loans, guarantees, equity, prizes, awards, and public contracts.

- **Grants**: financial contributions provided by the EU to organizations and occasionally individuals to support projects that align with EU policies and objectives. Grants do not require repayment, but the recipient may need to contribute a percentage of the project's funding.
- **Loans, Guarantees, and Equity**: Loans involve the provision of financial resources that need to be repaid with interest. Guarantees reduce the risk for lenders or investors, facilitating access to finance for specific projects. Equity financing involves the EU taking partial ownership or shares in a company in exchange for capital.

- **Prizes and Awards**: The EU bestows prizes and awards on contest winners under various EU initiatives. These awards recognize accomplishments and innovations in specific fields or industries.
- **Public Contracts**: The EU uses public contracts to procure market services, works, and goods for internal use. These contracts are awarded through competitive bidding processes and are not considered EU funding. (European Commission, s.d.)

The EU funds are distributed in three ways:

- **Shared Management** (approximately 70% of EU funding programs): Under shared management, the European Commission and national governments in EU countries work together to administer specific programs. This shared responsibility includes program implementation, monitoring, and evaluation.
- **Direct Management**: EU funding is sometimes managed directly by EU institutions. From program design to project implementation and financial disbursement, these organizations handle the entire process.
- **Indirect Management** (10% of the overall EU budget): Indirect management entails the partial or complete implementation of funding programs by third parties such as national governments or international organizations. These entities are responsible for executing projects and adhering to the funding program's guidelines after receiving subsidies through national-level applications.

EU funds are managed in a variety of ways. Indeed, the funding programs vary in their objectives, target sectors, and eligibility criteria. Approximately the main part of EU budgetary funds is allocated in collaboration with national and regional authorities through a shared management system, primarily through, and resilience of the members states in EU (EU Funding programms, s.d.).

3.2. Importance of EU funding programs for economic development, innovation, and resilience

EU funding programs play an important role in promoting economic growth and development throughout the European Union. These programs provide critical financial assistance to projects that have the potential to create jobs, stimulate innovation, and improve infrastructure. As a result, the EU's economy stands to gain in terms of prosperity and sustainability.

Also, EU funding programs promote social cohesion and solidarity among member countries and contributes to the creation of a more united and equitable society by allocating funds to reduce regional disparities and promote social inclusion. This commitment to social cohesion contributes to ensuring that all citizens can actively participate in and benefit from collective progress. To continue, the EU funding programs prioritize environmental protection and long-term sustainable development. EU funding actively contributes to mitigating environmental challenges by providing financial resources for environmental projects such as renewable energy initiatives and sustainable transportation endeavors. This dedication to environmental sustainability ensures that future generations will inherit a healthier and more livable planet.

While EU funding programs have played a key role in promoting development and fostering collaboration within the European Union, they are not without difficulties. Behind the guise of financial assistance and noble goals, there are several drawbacks and issues that must be addressed. These challenges can impede the smooth implementation and effectiveness of EU funding programs, ranging from bureaucratic complexities and limited accessibility to concerns about unequal distribution and delays in fund disbursement. We delve into the more complicated corners of EU funding in this investigation, shedding light on issues that need closer examination to pave the way for more streamlined and efficient funding mechanisms. (European Comission, s.d.)

3.3. Role of policy evaluation in assessing the effectiveness and impact of EU programs

Evaluation is an important part of the policy cycle because it promotes evidence-based policy design and implementation, increases accountability and transparency, demonstrates progress toward policy objectives, and assesses policy effectiveness, efficiency, results, and impacts.

There are numerous types of evaluation (ex-ante evaluations, mid-term evaluations, evaluations during the implementation period, thematic evaluations, and ex-post evaluations), each of which serves a specific purpose in the policy cycle. In the context of EU programs, policy evaluation is critical. It can measure the outputs, results, and impacts of these programs to determine their effectiveness in achieving their goals. Furthermore, it can aid in the identification of factors that contribute to the success or failure of EU programs, which can then be used to improve the design and implementation of future programs. Finally, by making evaluation results public, policy evaluation can improve the transparency and accountability of EU programs. This ensures that these programs are accountable to the public and that they meet citizens' needs. (European Commission, s.d.)

There are several different methods that can be used to evaluate EU programs. Some common methods include:

- **Output evaluation**: This type of evaluation measures the output of a program, such as the number of people who have been trained or the number of new businesses that have been created.
- **Result evaluation**: This type of evaluation measures the results of a program, such as changes in behavior, attitudes, or outcomes.

- **Impact evaluation**: This type of evaluation measures the long-term impact of a program, such as changes in the social, economic, or environmental context. (EU Evaluation reports, s.d.)

3.4. Theoretical Frameworks and Models

The section provides an in-depth analysis of prominent theoretical frameworks that examine the relationship between EU funding programs and their impact on innovation, competitiveness, and resilience. The main objective is to gain a comprehensive understanding of the mechanisms through which these programs facilitate innovation, enhance competitiveness, and foster resilience. This analysis further involves exploring how previous approaches and methods employed in EU funding programs have influenced these desired outcomes. By thoroughly reviewing these frameworks, we can shed light on the dynamics and effects of EU funding programs on the mentioned areas without incorporating personal perspectives.

3.4.1. Theoretical framework behind the EU funding programs

The principles and structure governing the Next Generation EU (NGEU) funding programs negotiations, based on the rules and regulations outlined in the EU Treaties, provide a framework for decision-making within the European Union. The involvement of member states and their representatives in the negotiation process reflects a system where unanimous agreement is required, granting each member state veto power. This approach emphasizes achieving acceptable outcomes rather than pursuing optimal solutions (Stenbæk & Jensen, 2016).

The policy conditionality relates to specific policy requirements linked to the commitment of funds under the NGEU, specifically concerning the macroeconomic environment, climate

policy, and digitalization. The theoretical concept of actor constellation describes the positions of actors and coalitions concerning conflicts.

During the negotiation period, which is time-bound, actors have limited time and incomplete information (Stenbæk & Jensen, 2016). Certain member states form explicit coalitions on specific issues to sway the outcome, while others refrain from forming formal alliances leading to a weaker negotiation stance. As part of the analysis, we will evaluate the level of coordination among actors and how it may affect the outcomes of the implementation and effectiveness of the selection criteria for the funds in Portugal.

The final element to consider is the mode of interaction, determined by the institutional setting under which the result is decided (Scharpf, 1988). The method of exchange in our context comes through distributive bargaining, with actors concentrating on allocating resources in the negotiation process (Stenbæk & Jensen, 2016).

EU funding programs facilitate research and development, foster stakeholder collaboration, and provide financial resources to governments, research institutions, and businesses. By understanding the relationship between EU funding programs, innovation, competitiveness, and resilience, we can fully harness their transformative potential and drive sustainable economic growth (Jiménez-Rodríguez, 2012). Several theoretical frameworks offer valuable insights into understanding the intricate relationship between these factors.

One prominent framework is the Resource-Based View (RBV) of the firm proposed by Wernerfelt (1984) and later developed by Barney and colleagues (1991) (Barney, Wright, & Ketchen, 2001). According to RBV, a firm's sustainable competitive advantage hinges on its capacity to deploy valuable, rare, inimitable, and non-substitutable resources at its disposal. In the context of EU funding programs, they are considered crucial resources firms can employ to enhance their competitiveness and innovation. The availability of funds can enable

businesses to undertake high-risk, high-reward innovative projects they otherwise couldn't consider, improving their capacity to compete in a volatile marketplace (Lubis, 2022).

Another influential framework is the innovation system theory; according to this theory, innovation results from a systematic phenomenon where different institutional actors and their reciprocal relationships play a significant role in the process. The System of Innovation (SoI) emphasizes the interconnections between players, the influence of the institutional background, knowledge exchange flows, and dynamics that impact innovation (Galician Innovation Agency & Norte Regional Development and Coordination Commission, 2015).

Applying this framework to EU funding programs reveals their critical role as financial tools aiding the complex environment of innovation. They serve as catalysts in an innovation system composed of government institutions, universities, research institutions, and firms. Funding research and development activities enhance firms' innovative capacities, contributing to competitiveness (Giordano & Dubois, 2019).

3.4.2. Models & theories: Design and Implementation of EU funding programs

Designing and implementing EU funding programs can be complex, requiring strategic evaluation of economic, political, and societal priorities. The EU is home to diverse regions and member states, each with distinctive financial capacities, socio-cultural factors, and development trajectories. Creating effective funding programs requires a thorough understanding of Europe's myriad contexts and a detailed strategy that can capitalize on each region's unique strengths, ensuring that all areas have the necessary tools and opportunities to thrive (Melecky, 2018).

EU funding programs, such as the European Regional Development Fund (ERDF), are instrumental in implementing the Smart Specialization Strategy (S3). This strategy embraces a

bottom-up approach that accounts for regional diversity and unleashes latent potential in the European Union landscape. The process involves a comprehensive analysis of regional assets, capabilities, and opportunities to identify priority areas in technology, research, or industry for targeted investments (Patel & Pavitt, 1994).

Cohesion policy is another cornerstone of EU policymaking and is indispensable in shaping the allocation and deployment of EU funding. This theory reduces economic and social disparities among EU regions, creating a more balanced and harmonious union. Its main principle is to promote equal opportunities for all citizens, regardless of their geographical location, and to ensure that every region is included regarding growth and development (European Commission, 2023)

In Spain, for instance, the ESF supported the "Operational Program of Youth Employment in Andalusia" as part of the Youth Employment Initiative. This project focused on addressing high youth unemployment rates and social exclusion among young people in the region. It offered targeted support to those facing difficulties in accessing the labor market, such as long-term unemployed youth and school dropouts (European Commission, 2023).

The project aligned with the principles of Cohesion policy by targeting a specific group (young people) that faced higher unemployment rates and lacked access to opportunities. Through its support, the ESF aimed to level the playing field by providing resources and interventions to bridge the gap and create equal access to employment opportunities. The initiative aimed to reduce social inequalities, promote cohesion and create a more inclusive society by empowering young individuals and equipping them with the necessary skills and support (European Commission, 2023).

3.5. Comparison with Similar EU Programs

To provide a comprehensive analysis of EU funding approaches for economic resilience, competitiveness, and innovation, it was decided to go further with the study of another unique and exceptional program established in response to a European crisis: the European Economic Recovery Plan (EERP).

The idea to study the EERP stems from the need to understand the evolution and effectiveness of European funding programs that share characteristics with the NRRP. Indeed, contrarily to other European funding programs that are part of the EU's multiannual budget, the EERP was introduced ad hoc in response to the global financial crisis of 2008-2009. Thus, by looking at this specific EU initiative, this study aims to assess the advancements and changes in policy priorities, funding allocations, and objectives. By doing so, this analysis seeks to provide insights into the effectiveness of these ad-hoc programs, to identify successful strategies, and to ensure the optimal allocation of resources to foster economic recovery and sustainable development in Portugal.

Lessons learned from the implementation of the EERP can provide valuable insights for designing and implementing the NRRP. The EERP experience highlighted the importance of targeted investments, strategic planning, and coordination between member states and EU institutions. Insights on project selection, monitoring, and evaluation can be applied to ensure effective utilization of funds, maximize impact, and facilitate the recovery and resilience of economies in the post-pandemic context. Indeed, this comparison provides the means to analyze MABI through insights into the impact of the EERP, highlighting the evolution of the strategy and offering practical implications for the Portuguese initiative.

3.5.1. Previous studies on the European Economic Recovery Plan

As a response to the global financial crisis of 2008-2009, the primary objective of the EERP was to stimulate economic growth, create jobs, and support investment across the EU member states. The plan was characterized by several key features, among these and like the RRP: infrastructure investments, research and innovation, support for SMEs and green investments (European Commission, 2008).

The impact of the EERP varied across different beneficiaries and member states, it helped create job opportunities, stimulate economic growth, and enhance competitiveness in various sectors. The plan's emphasis on green investments also contributed to the transition towards a more sustainable and low-carbon economy (European Commission, 2023).

Different studies take in consideration the effects of the EERP as one of the main large-scale fiscal stimulus packages following the financial crisis of 2008. Among these studies, two in particular seem to provide important insights on the effectiveness of the ad-hoc European fundings and will be analyzed in the next section.

3.5.2. Assessing the impact of the EERP

The first study taken into consideration to evaluate the effects of the EERP mentions that the fiscal stimulus measures for the euro area countries amounted to 1.1% and 0.8% of GDP in 2009 and 2010, respectively (Coenen, Straub, & Trabandt, 2012). These measures primarily targeted support for households' purchasing power, investment, businesses, and labor-market measures. Reductions in value-added tax (VAT), direct taxes, social security contributions, and direct aid for households were implemented to support purchasing power. Investment was primarily focused on public infrastructure, while business support measures aimed to reduce

costs and promote export promotion. Labor-market measures included wage subsidies and active labor-market policies (Coenen, Straub, & Trabandt, 2012).

The paper further discusses the simulation of the likely economic effects of the EERP, with the fiscal multipliers and output effects compared to the model's baseline. It mentions that the fiscal multipliers of the EERP were positive in the first two years, converging to a long-run multiplier of around 0.73. Yet, the effects on real GDP fade away quickly once the fiscal stimulus measures are lifted (Coenen, Straub, & Trabandt, 2012).

Second, an article by the European Central Bank (ECB) discusses the effectiveness of fiscal policy and the implementation of counter-cyclical fiscal stimulus measures within the framework of the EERP in response to the global financial and economic crisis. It highlights the conditional nature of the efficacy of such fiscal policy, considering factors like the fiscal instrument chosen, the persistence of the fiscal stimulus, government indebtedness, interest rate policies, and price flexibility (European Central Bank, 2010).

The ECB suggests that the fiscal measures implemented within the EERP have been broadly supportive for output, with a focus on short-lived fiscal stimulus. However, it also acknowledges the high cost of accommodating automatic stabilizers and implementing counter-cyclical fiscal policies, which has led to significant deficits and rising debt-to-GDP ratios in euro area countries. The ECB's paper emphasizes once again the importance of restoring fiscal balances and implementing fiscal exit and consolidation strategies to ensure long-term fiscal sustainability. Also, it notes that some countries have been slow to undertake fiscal consolidation, posing increased risks to financial stability and undermining confidence in public finances (European Central Bank, 2010).

Finally, it is important to underline that the article by the ECB suggests that fiscal adjustment should primarily occur on the expenditure side, as empirical evidence points to a higher degree

of success for expenditure-based fiscal consolidation. It also suggests that the additional budgetary room created by consolidation efforts can be used to lower taxes that are detrimental to labor supply and capital accumulation in the long run, such as labor and capital income taxes.

Overall, the two studies emphasize the need for fiscal consolidation, long-term fiscal sustainability, and the benefits of restoring sound fiscal positions in the euro area, while considering the trade-offs and challenges associated with fiscal policy effectiveness. Hence, both studies stress the crucial importance of maintaining confidence in longer-term fiscal sustainability when designing fiscal stimulus programmes.

Considering what has been outlined, in the case of the MABI, its fiscal sustainability to maintain long-term benefits can be ensured through a targeted approach, aligned with broader economic strategies and sustainability objectives, and by including constant and transparent monitoring and evaluation of outcomes. As a matter of fact, component 5 of MABI aims to invest in economic areas by combining the country's competitive and comparative advantages with those for which it has growth potential.

Keeping this in mind, the study proposes a thorough analysis of the five above mentioned areas included in the MABI.

4. Case studies per economic sector – (Individual Parts)

This section of case studies aims to comprehensively investigate the MABI’s acceptance dynamics on five different sectors: cross-cutting Technologies and their Applications, Industries and Production Technologies, Mobility, Space and Logistics, Natural Resources and Environment as well as Health, Wellbeing and Territory. This, by focusing on three main objectives.

Firstly, identifying the characteristics that significantly influence program acceptance or rejection for companies independently of the presented project. Although the call for proposals establishes certain criteria for acceptance, the idea of this work is to be able to determine which of these criteria really weighs most heavily on the decision, and if in fact it is a proxy for evaluating a leader or consortium as the most suitable for accessing investment funds from the strategy.

This analysis is based on data from ORBIS, a database developed by Bureau van Dijk that contains comprehensive information on companies worldwide. By analyzing a range of variables selected as proxies of the selection criteria for the projects (see table 1), the study seeks to uncover what are the specific characteristics, if any, that have a substantial impact on an applicant's likelihood of being accepted or rejected.

Criteria for Companies	Variable	Why working as a proxy
Degree of innovation or differentiation	Added value	This variable measures the value added by a company to its inputs during the production process, which can indicate its ability to differentiate its products or services.
Business competitiveness and potential for specialization	Operating revenue (Turnover)	This variable reflects the project's impact on the company's revenue generation, which can indirectly indicate its impact on business competitiveness.
	Added value	This variable measures the value added by the company to its inputs during the production process, which can indicate the project's ability to enhance the competitiveness and specialization of the country's overall economy.
Capacity to leverage the investment	Total assets	This variable represents the total value of assets held by the company, which can indicate its capacity to leverage those assets for investment purposes.
	Shareholders funds	This indicator reflects the amount of capital contributed by shareholders, which can be an important factor in determining the company's ability to leverage additional investment.
	Cash flow [Net Income before D&A	This variable represents the cash generated by the company's operations, which can indicate its ability to generate sufficient cash flow to support and leverage investment opportunities.
	Profit margin	This indicator measures the profitability of the company by calculating the percentage of profit generated from its operating revenue. A higher profit margin may indicate a greater capacity to generate returns and leverage investment.
	gearing (%)	Debt-related ratios: Indicators such as gearing (%), solvency ratio (liability based) (%), and interest coverage can provide insights into the company's debt levels, ability to service debt, and capacity to leverage additional debt financing.
	solvency ratio (liability based) (%)	
	interest coverage (x)	
Potential economic value of innovation and scalability	Operating revenue (Turnover)	This indicator measures the revenue generated by the company, which can provide insights into its economic value and potential scalability.
	Profit margin (%)	This variable represents the percentage of profit generated relative to revenue, which can indicate the economic value generated by the company's operations.
	Added value	This variable measures the value added by the company to its inputs during the production process, which can indicate its potential economic value and scalability.
Contribution of the project to carbon neutrality and energy resilience	Trucost	information about a company's greenhouse gas emissions or carbon footprint can provide insights into its contribution to carbon neutrality.
Quality of the Companies	Number of employees	This indicator can provide insights into the size and human resources capacity of the promoters and consortium members, indicating their competence and capability to execute the project.
	Profit per employee (th)	This indicator provides an indication of the company's efficiency in generating profits based on its workforce.
	Operating revenue (Turnover)	This variable reflects the revenue generated by the promoters and consortium members, which can indicate their business performance and level of competence.
	Profit margin (%)	This indicator represents the profitability of the promoters and consortium members, reflecting their ability to generate profits and manage financial aspects effectively.
	Total assets	This indicator represents the total assets of the promoters and consortium members, providing insights into their financial strength and resources available to support the project.
	Shareholders funds	This variable reflects the equity invested by the promoters and consortium members, indicating their financial commitment and stake in the project's success.
Economic and financial viability of the projects and of the proponents	P/L before tax	This indicator represents the profit or loss before tax, which provides insights into the financial performance of the proponents and their ability to generate income.
	Cash flow [Net Income before D&A]	This variable reflects the cash flow generated by the proponents, which is crucial for evaluating their financial viability and ability to meet financial obligations.
	Total assets	This indicator represents the total value of assets held by the proponents, which can provide insights into their financial strength and ability to support the projects.
	Profit margin (%)	This indicator measures the profitability of the proponents and can indicate their financial viability.
	ROE using P/L before tax (%)	Return on Equity (ROE) using Profit (Loss) before tax measures the profitability generated in relation to the equity invested, providing insights into the financial efficiency of the proponents.
	Working capital	This indicator reflects the liquidity and short-term financial health of the proponents, indicating their ability to cover short-term obligations.
	Gearing (%)	Although not explicitly listed, the gearing (%) indicator can provide insights into the financial structure of the proponents by measuring the proportion of debt to equity, which affects their financial stability and viability.
	Operating revenue (Turnover)	This variable represents the revenue generated by the proponents, indicating their ability to generate income and sustain their operations.
	Profit per employee (th)	This indicator measures the profitability generated per employee, providing insights into the efficiency and productivity of the proponents.
	CRIF	The score is designed to assess the financial stability and creditworthiness of companies.The Financial stability score aims to provide insights into a company's ability to meet its financial obligations, manage its debts, and sustain its operations.

Table 1. Description of the Variables and their relation to each Assessment Criteria

Source: own elaboration based on the MABI´s criteria to select projects

Secondly, it seeks to assess the potential benefits associated with program participation by examining outcomes such as expected benefits in terms of efficiency, growth, innovation, among others. It aims to quantify and understand the positive and negative impacts that program participants can experience. This assessment will help determine the program's value and effectiveness in delivering desired outcomes for participating companies beyond leaders.

Thirdly, it explores the real and potential constraints or bottlenecks that may impede strategy implementation and effectiveness. These constraints can be related to the own processes of MABA in the different stages (application and selection, implementation, monitoring, collaboration dynamics) as well as external, resulting from market dynamics. The aim is to provide insights that can guide program administrators and policymakers in mitigating obstacles and optimizing program delivery in the early implementation stage that can avert possible setbacks, inefficiencies, among others.

The last two objectives are analyzed based on a survey elaborated by the research team and applied virtually and with free participation both to consortium leaders and to the co-promoters of these consortia (see annex 11).

The findings from this research will contribute to evidence-based decision-making, enabling program administrators and policymakers to optimize program design, improve participant outcomes, and overcome barriers to program success.

4.1. Sector: Cross-Cutting Technologies and Their Applications – (by Bruno Miguel Gomes de Lima)

4.1.1. Overview of the thematic area

Situated at the intersection of Europe's technological innovation, Portugal is a burgeoning hub for the development and implementation of Cross-Cutting Technologies and their Applications. This sector, encompassing a broad range of multidisciplinary technologies including data analytics, artificial intelligence (AI), machine learning, and the Internet of Things (IoT), showcases the imperative role of advanced technological solutions in today's rapidly evolving digital landscape (Portugal Government, 2023).

The cross-cutting technologies sector in Portugal is set in a particularly dynamic locus due to the country's dedication to digital transformation and innovation. Serving as a critical conduit across diverse industries such as manufacturing, healthcare, renewable energy, financial services, and transportation, these technologies represent the backbone of Portugal's industrial and societal shift towards a more integrated, digitized future. (*About Us - Portugal Digital*, n.d.) At the core of cross-cutting technologies in Portugal is the country's robust information and communication technology (ICT) infrastructure. Enabled by strong ICT, sectors ranging from agriculture to tourism are increasingly implementing cross-cutting technologies to augment efficiency, enhance sustainability, and remain globally competitive (Honig & Pritchett, 2019).

4.1.1.2. Information and Communication Technology

The economic evolution Portugal has undergone since the mid-1980s has been instrumental in shaping the growth and enhanced autonomy of the Information and Communication Technology (ICT) sector. This transformation was spurred by Portugal's entry into the European Economic Community in 1986, starting a prolonged period of economic expansion characterized by substantial foreign direct investment and a modernization drive in the corporate landscape. This appealing business environment attracted major multinational players in the tech industry, including hardware, software, and consultancy firms, as they solidified their presence within the country(Campos, n.d.).

An intriguing trend has surfaced, with prominent corporations across various industries opting to outsource their technological services from the market, resulting in a shift away from internal production within their organizations. This trend has led to significant interconnections between major corporations spanning seven distinct business sectors and independent firms within the ICT industry (Loh & Venkatraman, 1992). These connections encompass entities

both domestically owned and foreign-owned, strongly emphasizing the widespread and mutually beneficial collaboration between the corporate realm and the thriving Portugal cross-cutting technologies. This symbiotic relationship is a testament to Portugal's prowess in harnessing its economic progress to foster a dynamic and innovative technologies landscape, setting the stage for further advancements in the years ahead.

Portugal technology adoption is seen as essential for staying updated rather than innovative. With the increasing digitalization of society, companies strive to maximize results and streamline processes. Cross-cutting technologies are pervasive across various sectors in Portugal, including government, public and private enterprises, transportation, education, and individuals. The internet is the most widely used technology, facilitating communication, information access, and global sharing. In 2020, approximately 84.5% of Portuguese households had internet access, with 81.7% having broadband. Furthermore, around 97% of companies with 10 or more employees and 42.8% of employed individuals used computers with internet access for professional purposes (*Portal Do INE*, n.d.).

This sector can be further categorized into three main subsectors:

- Information Systems: This subsector encompasses software development companies, providers of information systems, and consulting firms specializing in business solutions and information technology.
- Telecommunications: This subsector includes companies engaged in manufacturing telecommunications equipment as well as those providing telecommunications services.
- Electronics and Hardware: Companies within this subsector are involved in the production of hardware components, such as computers, servers, storage systems, and other electronic devices.

4.1.1.2. Energy

In 2015, when considering the EU-19 and EU-28 nations, Portugal's energy dependence ranked seventh highest, as depicted in Figure 6b. Interestingly, no EU-19 countries exhibited a negative energy dependence during that year (as illustrated in Figure 3b). Instead, they all relied on imports of primary energy to meet their energy requirements (*National Geographic Human Footprint. Mapping Our Human Footprint. 2022-10-14*, n.d.).

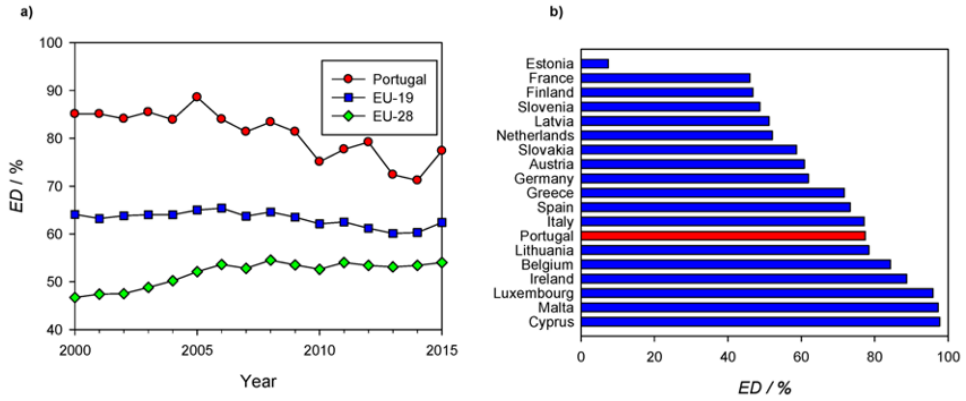


Figure 5. Energy Dependence in Portugal: (a) Trends in recent years (b) Comparison with EU-19 countries in 2015

Data source: Eurostat online database

The Energy Dependence (ED) parameter serves as an indicator that elucidates the degree to which an economy's energy requirements are met through imports. This metric is derived by computing the net imports of primary energy, which involves subtracting the energy exports (EXP) from the energy imports (IMP). The resulting value is then divided by the summation of the gross inland energy consumption (GIC) and the energy used for international maritime bunkers (IMB), as shown in Equation (2) (Miguel et al., 2018).

Expressed as a percentage, the Energy Dependence (ED) is calculated using the formula:

$$ED(\%) = \frac{IMP - EXP}{GIC + IMB} \times 100$$

By using this method, the Energy Dependence parameter sheds light on a nation's reliance on external energy sources to satisfy its energy demands without resorting to direct replication of existing work.

Portugal had the seventh highest energy dependence among the EU-19 and EU-28 countries in 2015 (cf. Figure 7b). None of the EU-19 countries had a negative energy dependence (cf. Figure 3b), all depending on primary energy imports to satisfy their energetic needs (Miguel et al., 2018).

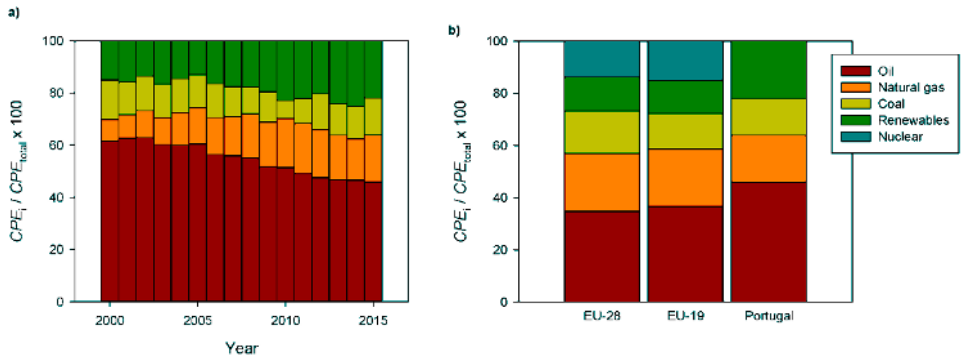


Figure 6. Normalized Primary Energy Consumption by Source Type in Portugal: (a) Trends from 2000 to 2015 (b) Comparision with EU Groups in 2015

Source: Eurostat online database

In 2005, the Portuguese Government ratified the National Energy Strategy, which laid down pivotal policies such as energy market liberalization, the promotion of renewable energy sources, and the adoption of more efficient technologies. This strategic approach brought about a noteworthy shift in energy composition over the ensuing decade. Specifically, the proportion of oil in the energy mix experienced a significant decrease (amounting to 14.6%), while natural gas and renewable energy sources underwent respective increments of 4% and 9%. Over the same period, the utilization of coal remained relatively constant, with only a marginal increase of 1.6% (as indicated in Figure 4a) (*National Geographic Human Footprint. Mapping Our Human Footprint. 2022-10-14*, n.d.).

Although fossil fuels continued to constitute a substantial portion of the consumed primary energy in 2015, accounting for 78%, this proportion slightly surpassed that of the EU-19 (72%) and EU-28 (73%) group nations, which exhibited closely aligned patterns (as depicted in Figure 4b). The remaining primary energy share was exclusively attributed to renewable sources, making Portugal stand out as the fifth-ranking country within the EU-28 nations with the highest proportion of energy derived from renewables (*Renewable Energy Statistics - Statistics Explained*, n.d.).

The significance of renewable energy becomes even more pronounced when focusing solely on primary energy consumption for electricity generation. Remarkably, in 2015, a substantial 45% of the electricity produced originated from renewable sources. Notably, within the EU-19 and EU-28 groups, the nuclear energy share closely approximates that of renewable sources (around 13-15%). However, it's important to highlight that nuclear energy is absent in certain member countries, including Portugal (*Electricity from Renewable Sources on the Rise - Products Eurostat News - Eurostat*, n.d.).

4.1.2. Information on the projects

An analysis of data provided by IAPMEI reveals that out of the 149 strategies submitted across a wide range of sectors, a noteworthy 56 applications were distinctly centered on cross-cutting technologies.

A comprehensive examination of these 56 applications revealed a broad spectrum of assessments. Initial evaluations registered 8 projects as non-favorable, accounting for approximately 14% of the applications in this sector. This indicates a segment of proposals that falls short of satisfying the rigorous requisite thresholds defined by Phase I selection criteria for advancing in the selection process.

A substantial 24 projects emerged as eligible, meeting the predefined criteria satisfactorily. These accounted for roughly 43% of the technology cross-cutting submissions, suggesting a strong presence of viable initiatives with the potential to drive impactful advancements in various sub-sectors of the Portuguese economy.

However, a closer look at the data reveals that 12 of these thus deemed eligible proposals were not selected for progression to the next phase. This equates to 21% of the cross-cutting applications, a significant fraction that, despite meeting criteria, were not chosen, presumably due to the high competition or scarce resources for implementation.

In addition to this, an equal number, 12 projects, were determined to be non-eligible. These applications, comprising another 21% of the cross-cutting project pool, indicate areas in the sector where further growth and development are necessary.

4.1.3. Analysis of companies accepted in the selection phase

The outcomes of this selection phase revealed that a notable 24 companies were granted acceptance, while two submissions faced rejection. This translates to a 96% acceptance rate within the Cross-Cutting Technologies and Applications sector, indicating a high level of alignment between the proposals and the stringent criteria set by the program.

While the two companies that did not advance displayed potential, certain aspects of their submissions raised concerns during the evaluation process. The primary challenges centered around the clarity of their financial projections and the demonstration of feasibility in their proposed projects. These impediments ultimately led to their exclusion from the program.

ACCEPTED
UNBABEL UNIPESSOAL, LDA
MEDWAY - MAINTENANCE & REPAIR, S.A.
PETROGAL, S.A.
ATEP - AMKOR TECHNOLOGY PORTUGAL, S.A.

PETROGAL, S.A.
SENSEIDATA, S.A.
DEFINEDCROWD CORPORATION UNIPESSOAL LDA
SOLANCIS - SOCIEDADE EXPLORADORA DE PEDREIRAS S.A.
POLOPIQUE - COMÉRCIO E INDÚSTRIA DE CONFECÇÕES,S.A.
APS - ADMINISTRAÇÃO DOS PORTOS DE SINES E DO ALGARVE, S.A.
ATLANTIC PORTUGUESE APPLE - CLUBE DA MAÇÃ, ACE
VOID SOFTWARE, S.A.
IMPETUS PORTUGAL - TÊXTEIS S.A.
WOWSYSTEMS - INFORMÁTICA LDA
LOGOPLASTE INNOVATION LAB, LDA
ACUINOVA - ACTIVIDADES PISCICOLAS, S.A.
EFACEC ENERGIA - MÁQUINAS E EQUIPAMENTOS ELÉCTRICOS S.A.
FUSION FUEL PORTUGAL, S.A.
COMPTA - EMERGING BUSINESS, S.A.
PRIO BIO, S.A.
EFACEC ENGENHARIA E SISTEMAS, S.A.
REN, GÁS, S.A.
REJECTED
REN PRO , S.A.
BYSTEEL FS, S.A.

Table 2. Results after the selection process for the 24 leader - Cross-Cutting Technologies and Their Applications Sector

For the companies that secured acceptance, their collective potential investment in the Cross-Cutting Technologies and Applications sector amounts to a substantial €5,390,910,866. This significant budget allocation serves as a strong testament to the dedication and commitment to fostering the growth and advancement of this dynamic sector in Portugal. The distribution of accepted companies across sub-sectors reveals distinct patterns within the Cross-Cutting Technologies and Applications landscape. Out of the 24 accepted companies, 7 are focused on Information and Communication Technologies (ICT), 12 are centered in the Energy sector, and 3 are related to Raw Materials and Materials.

The financial data covering the span from 2021 to 2022 will serve as the foundation for this analysis, providing valuable insights into the trajectory and resilience of the participating entities within this essential sector. Through this thorough analysis, our objective is to uncover

patterns, trends, and opportunities that can further enhance the growth and competitiveness of the Cross-Cutting Technologies and Applications sector in Portugal.

4.1.4. Analysis of companies rejected in the selection phase

Out of the two submissions that did not advance, one fell within the Energy sector, and the other was related to Raw Materials and Materials. These rejections represent a combined potential investment of €106,173,208.

The exclusion of these two projects underscores the program's commitment to stringent evaluation criteria. By maintaining a high standard for feasibility, clarity of financial projections, and alignment with program objectives, the selection process aims to ensure that accepted projects have the greatest potential to drive growth and innovation within the Cross-Cutting Technologies and Applications sector in Portugal.

4.1.5. Factors influencing the selection process

For the thematic area “cross-cutting technologies and their applications”, 26 leaders and 25 Compromotores were evaluated, with 13 being accepted and 13 rejected each. The type of company composition varied from two branches, five One-person companies with limited liability (LDA), 39 Public Limited Companies (SA), and 11 Limited Liability Companies (LDA). The investment allocation targeted two principal sectors; the energy domain received a funding of 602,661,736 €, involving 167 entities, representing 13.54% of the total investment. Simultaneously, the Information and Communications Technology (TIC) sector was granted an investment of 588,003,989 €, constituting 13.21% of the overall investment and involved 180 entities.

It is crucial to mention that the analysis employed the proprietary Orbit database. This extensive, historical information from 2021 was used, including data from both accepted and

rejected project leaders and the rest of the co-promoters for the year 2021. This sample of entities, both those accepted and rejected, was deemed representative of the total applicants for that period. Inclusion of leaders in both categories (accepted and rejected) in the analysis was an integral part of maintaining statistical consistency and ensuring a balanced examination. This methodology avoided potential biases and upheld data credibility, factoring these leaders in both acceptance and rejection circumstances.

4.1.5.1 Degree of innovation and differentiation

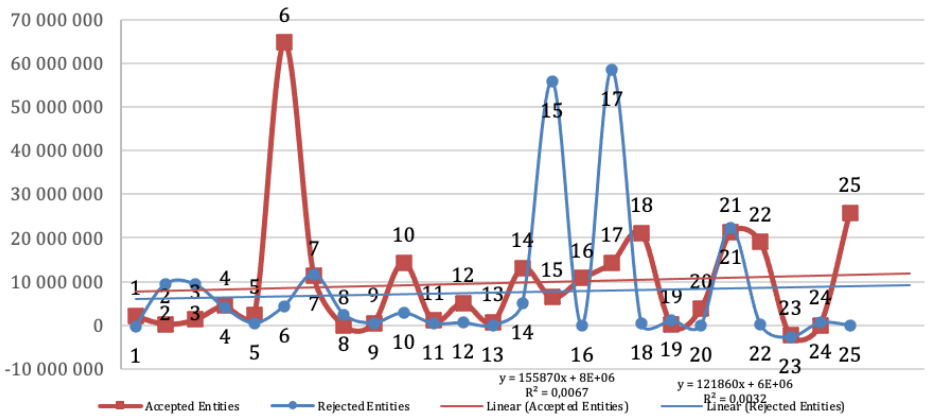


Figure 7. Added Value 2021 - Cross-Cutting Technologies and Their Applications Sector

Upon analyzing the "added value" variable, a pattern emerges. The accepted entities display generally higher "added value" figures than the rejected entities, indicating their proficiency in generating additional value within their respective production processes. This trend underscores the potential of accepted entities to create more value from their inputs, thereby contributing to their differentiation and competitiveness.

4.1.5.2 Business competitiveness and productive specialization

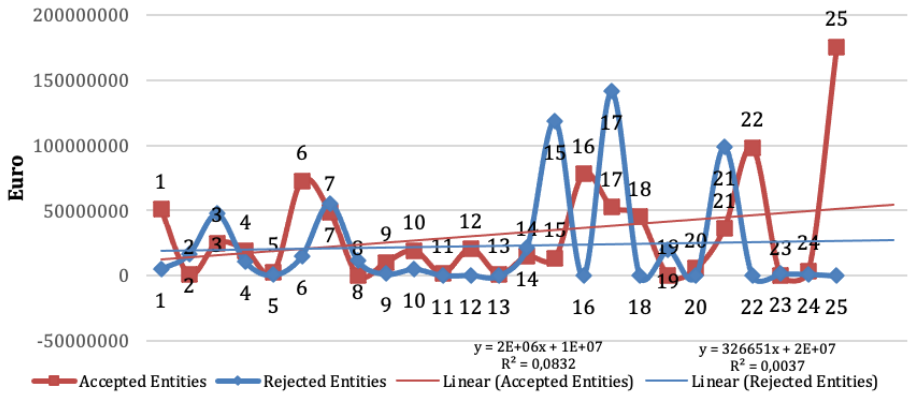


Figure 8. Operating Revenue 2021 - Cross-Cutting Technologies and Their Applications sector

The Operational Revenue signifies the project's influence on the company's capacity to generate revenue, indirectly indicating its effect on business competitiveness.

Examining the operational revenue dynamics within the context of this sample and comparing accepted and rejected entities offers valuable insights into the selection criteria and their impact on financial outcomes. Accepted entities consistently demonstrate a higher level of operational revenues, a pattern that resonates with the anticipated correlation between strong financial performance and project acceptance. This correlation underscores the practical wisdom of prioritizing projects that contribute significantly to revenue. However, it's crucial to dissect this trend further to comprehend the subtleties at play. A notable anomaly in this pattern emerges with the inclusion of leader Primo Bio S.A., an entity that commands an exceptional operational revenue of 175,363,689 euros. This outlier significantly distorts the standard pattern, prompting a reevaluation of the broader implications. It becomes evident that while most accepted entities contribute positively to the higher operational revenue tendency, the influence of Primo Bio S.A. is potent enough to alter the trajectory of this tendency.

On the contrary, the rejected entities collectively nudge the operational revenue tendency upwards. This nuanced observation signifies that within this group, there exists a subset of

entities that possess substantial revenue-generating potential, thereby impacting the overall tendency. However, the presence of numerous firms with lower operational revenues among the rejected entities introduces an intriguing layer of diversity to this group's financial outcomes.

When analyzing these trends, it's evident that while accepted entities possess a consistent advantage in operational revenues, the influence of outliers and the diverse range of results among rejected entities paint a more intricate picture. This dynamic underscore the multifaceted nature of project evaluation and selection, where financial prowess is a critical factor but must be balanced against outlier impacts and the potential of projects with relatively lower revenues.

4.1.5.3. Capacity to leverage the investment

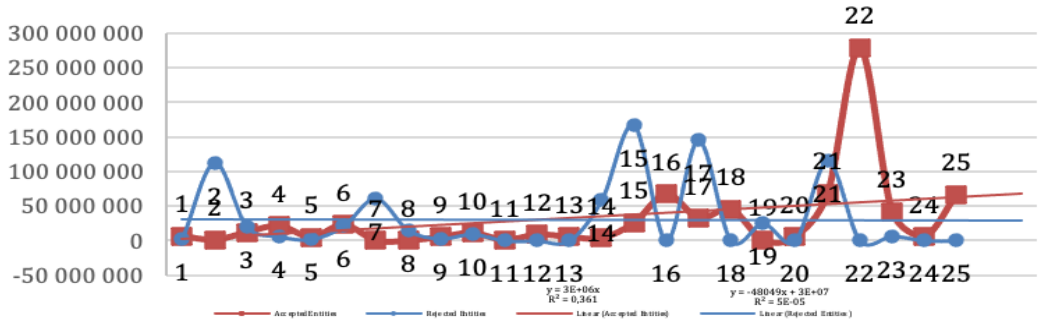


Figure 9. Total Assets 2021 - Cross-Cutting Technologies and Their Applications sector

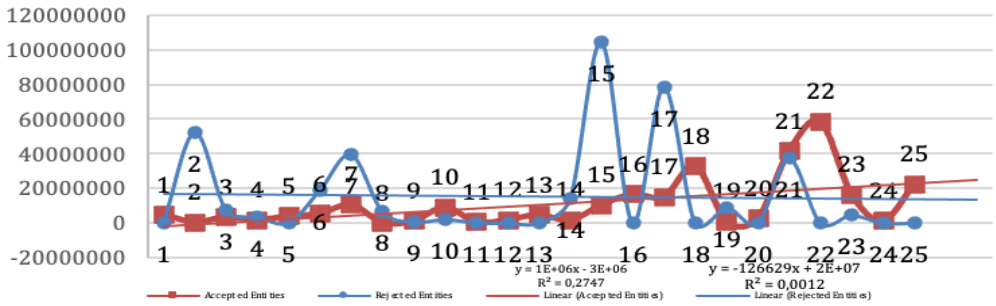


Figure 10. Shareholders´ Funds 2021 - Cross-Cutting Technologies and Their Applications sector

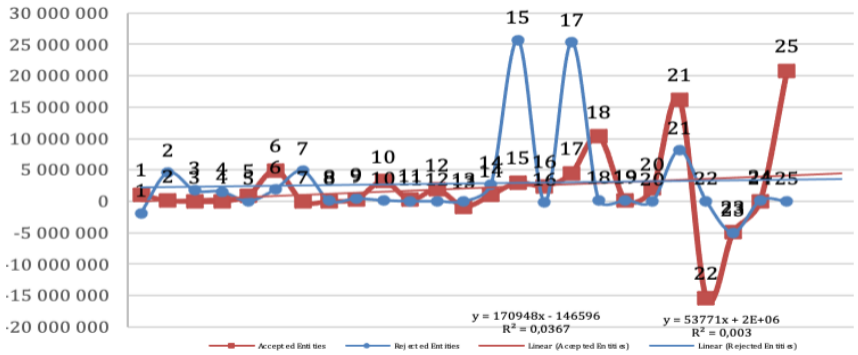


Figure 11. Cashflow 2021 - Cross-Cutting Technologies and Their Applications sector

Examining the capacity to leverage investment across the metrics of total assets, shareholders' funds, and cash flow offers intriguing insights into the financial dynamics between accepted and rejected entities. Counterintuitively, the rejected entities, as observed in the sample, exhibit consistently higher average values across all three indicators.

Starting with total assets, the rejected entities' average value of 31,102,525 euros supersedes the accepted entities' average of 31,022,780 euros. This peculiarity challenges conventional expectations, as one might assume that accepted entities would possess larger asset bases due to their stronger financial position. This discrepancy beckons a deeper exploration into the factors driving this trend.

A similar pattern emerges in the case of shareholders' funds, where the average value for rejected entities stands at 15,244,446 euros, surpassing the accepted entities' average of 10,677,656 euros. The higher shareholders' funds among rejected entities suggest a potential alternative financial strategy that emphasizes equity capital, possibly contributing to their elevated capacity to leverage investment.

Furthermore, the phenomenon extends to cash flow, a vital indicator of an entity's financial health. The rejected entities exhibit an average cash flow of 2,820,814 euros, outperforming the accepted entities' average of 2,075,725 euros. This contrast contradicts the intuitive assumption that accepted entities, with their favorable financial status, would possess higher

cash flows. Upon closer examination, three specific entities - IMPRENSA NACIONAL - CASA DA MOEDA S.A., SIBS FORWARD PAYMENT SOLUTIONS S.A., and AMORIM CORK COMPOSITES S.A. - emerge as outliers, boasting the highest values across the mentioned indicators among the rejected entities. These outliers play a significant role in driving the higher average values for the rejected group.

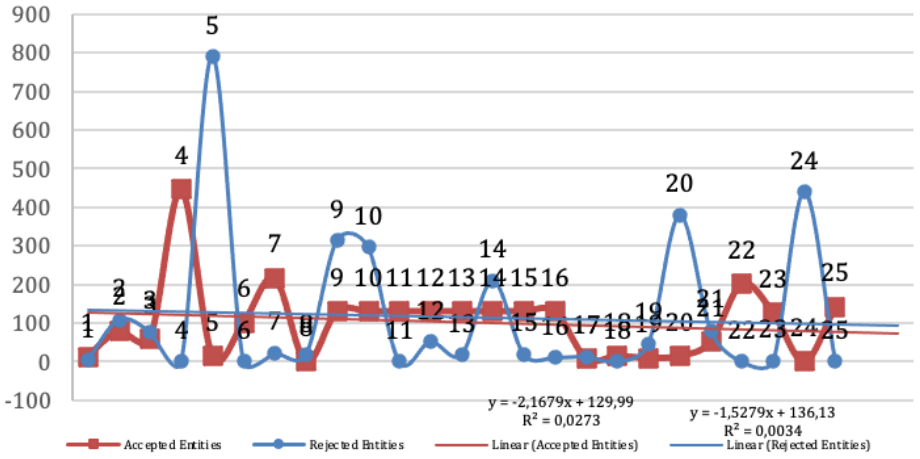


Figure 12. Gearing 2021 - Cross-Cutting Technologies and Their Applications sector

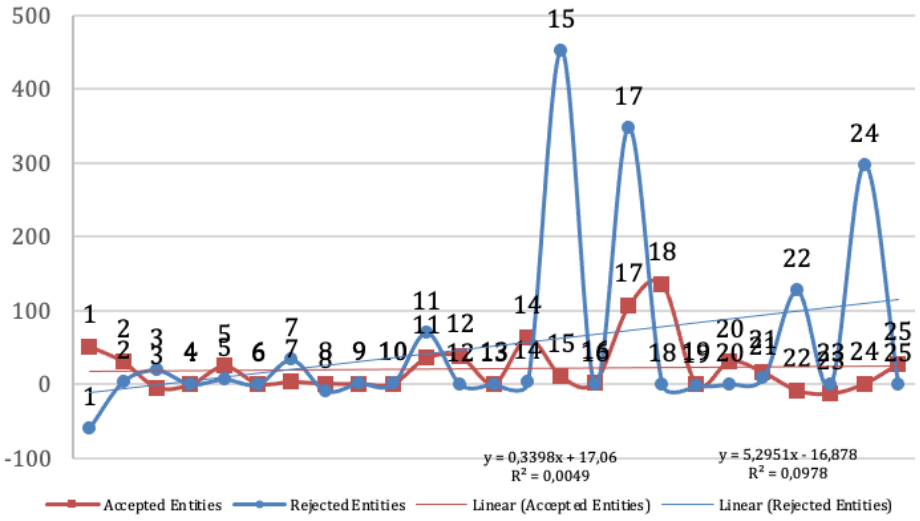


Figure 13. Interest Coverage 2021 - Cross-Cutting Technologies and Their Applications sector

For the accepted entities, the line of coverage follows y = -2.1679x + 129.99, with an average coverage ratio of 110.656087. This pattern suggests that these entities tend to have a more conservative approach, emphasizing lower debt relative to equity. This aligns with the

perception that accepted projects will likely be associated with a more stable financial stance. On the other hand, the rejected entities exhibit a coverage line of y = -1.5279x + 136.13, with an average coverage ratio of 116.272. This seemingly divergent trend indicates a slightly less conservative approach regarding debt-to-equity balance among the rejected group. However, it's important to note the presence of outliers within the rejected group possess significantly higher coverage ratios, notably 439.4, 790.64, and 379.59. These values appear excessively high and may have contributed to compromising the overall performance of the rejected entities.

The impact of these outliers underscores the need for a nuanced analysis. While the average coverage ratio for the rejected group is relatively higher, these extreme values among a subset of entities raise questions about their financial health and risk management strategies. These entities may have adopted an aggressive leveraging approach, potentially affecting their overall financial stability.

4.1.5.4. Potential economic value of innovation and scalability

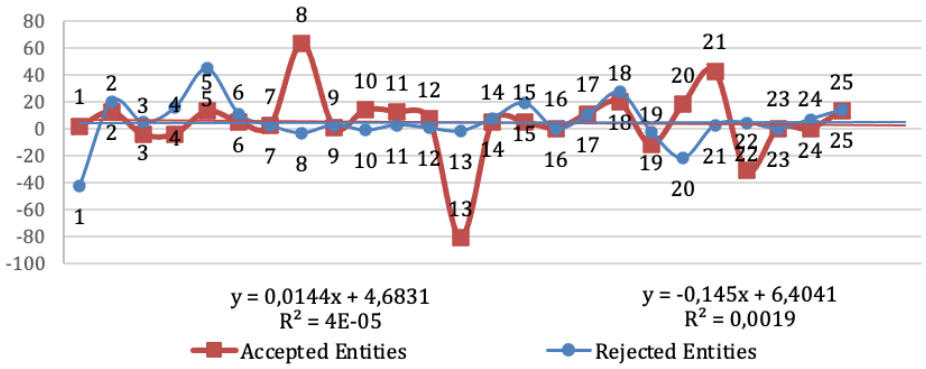


Figure 14. Profit Margin (%) 2021 - Cross-Cutting Technologies and Their Applications sector

For the rejected entities, the profit margin exhibits a trend represented by the equation y = 0.0144x + 4.6831, with an R^2 value of 4E-05 and an average profit margin of 4.912173913. This indicates a relatively moderate upward slope, suggesting that these entities maintain a consistent profit margin across varying revenue levels. The low R^2 value signifies that the

variability in profit margin explained by revenue is minimal, indicating potential influence from other factors.

Conversely, the accepted entities display a profit margin trend outlined by the equation y = -0.145x + 6.4041, with an R^2 value of 0.0019 and an average profit margin of 5.293913043. The negative slope suggests a declining profit margin as revenue increases, which might seem counterintuitive at first glance. However, this could be attributed to the complex interplay of costs and investments associated with larger revenue-generating projects. The low R^2 value implies that revenue alone does not strongly explain the variations in profit margin among accepted entities.

The contrasting trends in profit margins between accepted and rejected entities underscore the multifaceted nature of financial performance. The accepted entities' declining profit margin could be indicative of strategic decisions to prioritize long-term growth and expansion, potentially resulting in higher expenses and investments. Conversely, the more stable profit margin among rejected entities could reflect a cautious approach to managing costs and preserving profitability.

4.1.5.4. Quality of the consortium in terms of the promoters´ competences

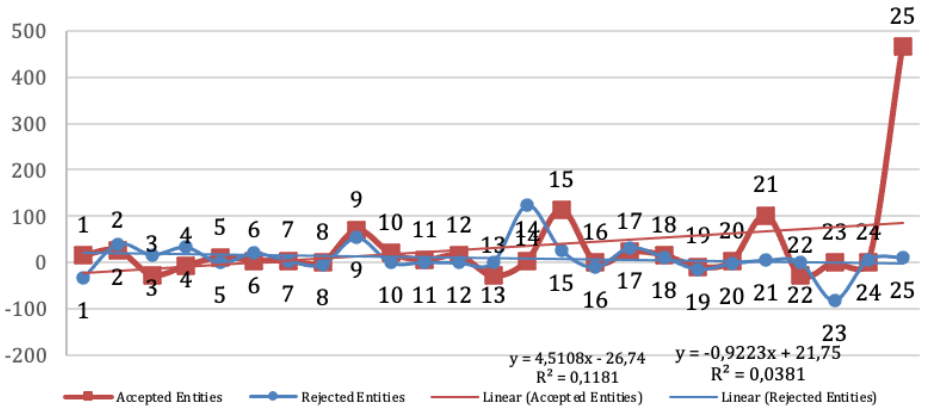


Figure 15. Profit per Employee % 2021 - Cross-Cutting Technologies and Their Applications sector

This metric offers a more nuanced perspective on financial performance by considering the contribution of each employee to the overall profit generation.

For accepted entities, the profit per employee trend is represented by the equation $y = 4.5108x - 26.74$, with an R^2 value of 0.1181 and an average profit per employee of 36.25. The positive slope indicates that, on average, accepted entities achieve higher profit per employee as the number of employees increases. The relatively moderate R^2 value suggests that there is a degree of variability in profit per employee that the number of employees can explain, but other factors likely contribute as well.

The rejected entities, on the other hand, display a trend in profit per employee that is described by the equation $y = -0.9223x + 21.75$, with an R^2 value of 0.0381 and an average profit per employee of 10.16666667. The negative slope suggests that as the number of employees rises among the rejected group, the profit per employee tends to decline. According to the R^2 value, the association between the number of workers and profit per employee is less clear for rejected firms. The contrasting trends in profit per employee between accepted and rejected entities underscore their operational efficiency and ability to generate profit with their workforce. The positive relationship for accepted entities suggests that they effectively leverage their human resources to achieve higher profit per employee as their team grows. On the other hand, the negative relationship for rejected entities indicates that their profit per employee decreases as their workforce expands, which might signal potential inefficiencies in resource utilization.

4.1.5.5. Economic and financial viability of the proponents

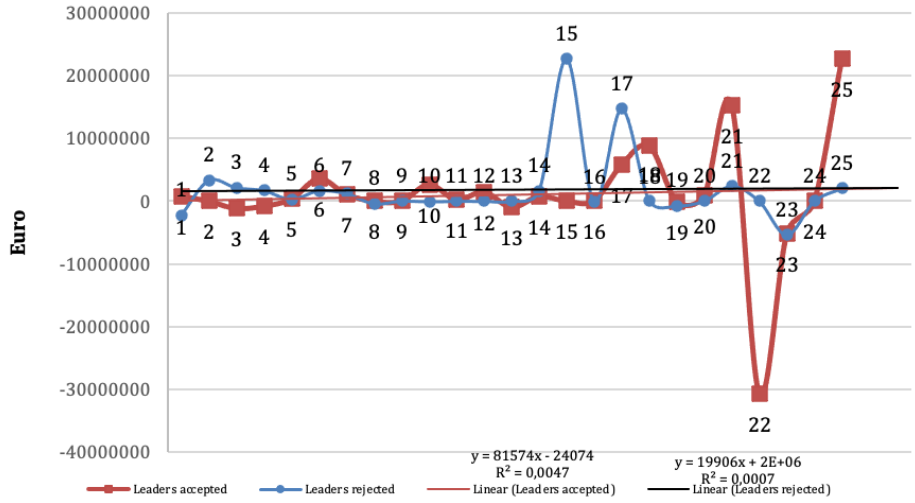


Figure 16. P/L Before Tax 2021 - Cross-Cutting Technologies and Their Applications sector

For accepted entities, the profit/loss before tax trend is described by the equation y = 81574x - 24074, with an R^2 value of 0.0047 and an average profit/loss before tax of 1,079,568.333. The positive slope suggests that as the independent variable (presumably revenue or another relevant factor) increases, the pre-tax profit tends to rise. However, the low R^2 value indicates that the variability in profit/loss before tax explained by the independent variable is limited, signifying the potential influence of other factors.

Conversely, the rejected entities exhibit a similar trend outlined by the equation y = 81574x - 24074, with an R^2 value of 0.0047 and an average profit/loss before tax of 1,805,846.995. The parallel equations and R^2 values between the two groups suggest a comparable relationship between the independent variable and pre-tax profit/loss. This consistency in trends emphasizes the comparable patterns of financial performance before tax across the two groups.

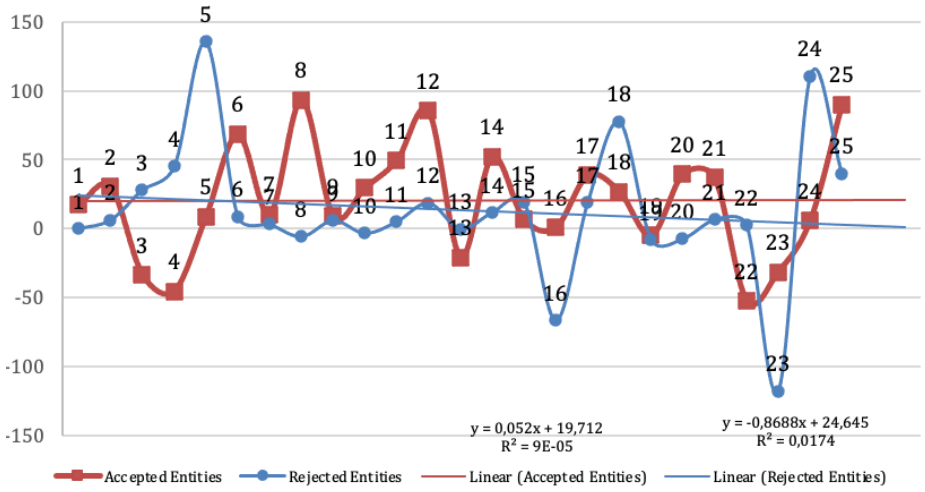


Figure 17. ROE Using P/L Before Tax 2021 - Cross-Cutting Technologies and Their Applications sector

For accepted entities, the ROE trend is defined by the equation y = 0.052x + 19.712, accompanied by an R^2 value of 9E-05. This equation illustrates that as the P/L before tax percentage increases, the ROE tends to rise. The very low R^2 value implies that the variability in ROE explained solely by the P/L before tax percentage is minimal. This suggests that other factors not accounted for in this equation contribute significantly to the variations in ROE.

The equation y = -0.8688x + 24.645, with an R2 value of 0.0174, describes the distinct ROE trend for rejected entities, on the other hand. In this situation, the ROE tends to decline as the P/L before tax percentage rises. The P/L before tax % may have a marginally greater ability to explain differences in ROE among rejected firms, according to the slightly higher R2 value than accepted entities. Analyzing the data holistically, the average ROE for accepted entities is 20.3888, while the average for rejected entities is 13.9075. This observation highlights that, on average, accepted entities are more effective in translating their profitability into returns for shareholders, as evidenced by their higher average ROE. This aligns with the intuitive notion that successful projects contribute positively to shareholder value.

4.1.6. Acceptance into the program based on entities' financial indicators.

Derived from the all-encompassing analysis from the Orbit databases, the prior segment presents an intricate profile of participating companies over a five-year span. This foundational groundwork sheds light on various dimensions of these entities, encompassing innovation metrics and financial resilience. Transitioning to a more targeted method, facilitated by Stata, the study seeks to establish a potential connection between a company's financial indicators and its likelihood of acceptance.

In this context, we delve into how much a company's financial stability impacts its position within the selection process. This investigation adopts a deeper analytical perspective. The chosen methodology involves a binary logistic regression model, where a value of '1' is assigned to accepted companies, while a value of '0' is applied to their rejected counterparts.

4.1.6.1 Data Preparation and Cleaning.

Extracted from a dataset encompassing 75 entities, a distinct pattern emerges as 10 entities were eliminated due to their identical nature, while an additional 15 entities were excluded for being identified as outliers.

In the context of this analysis, the handling of missing data encapsulates the complexity stemming from various entities, leading to divergent data availability. This reflects the real-world intricacies of data collection and underscores the unique attributes of each entity. The deliberate retention of missing values safeguards the integrity of the dataset's representation, enabling precise insights into the broader population. On the other hand, excluding cases with incomplete data carries the danger of creating bias, which may limit how broadly the results may be applied to various organizations.

4.1.6.2. The Binary Logistic Regression Model

A preliminary model was launched, drawing on virtually all variables chosen for the analysis. After an intensive evaluation, a decision was made to eliminate Interest Coverage and Solvency Ratio from the variable list. The absence of these variables in the data for some companies could adversely impact the number of observations in the model. Moreover, another debt-related variable, Gearing, was found to cover the debt detail within the model sufficiently.

Careful attention was given to the diverse relationships between the variables chosen for this model. Variables like Operating Revenue (Turnover), P/L Before Tax, Cash Flow [Net Income before D&A], Total Assets, Shareholders Funds, and Added Value seemed to share significant correlations, which could hint at underlying economic correlations.

Notably, Total Assets and Shareholders' Funds displayed a high degree of correlation. Given that the latter makes up a portion of the former, Shareholders' Funds were removed from the variable list to avoid potential redundancy and better isolate the effects of the remaining variables. Also, a sizeable correlation was discovered between Total Assets and Cash Flow [Net Income before D&A], where an increase in total assets corresponded to a surge in cash flow. Thus, to avoid overlap, Cash Flow [Net Income before D&A] was excluded from the model.

With the preceding adjustments, the remaining variables within the model, encompassing Operating Revenue (Turnover), P/L Before Tax, Total Assets, Added Value, Profit Margin, Gearing, Profit per Employee, and Number of Employers, have been integrated into a revised model.

$$\begin{aligned} Outcome = {} & \beta 0 + \beta 1 \times Operating\ revenue\ Turnover + \beta 2 \times ROE\ using\ PL\ before\ tax \\ & + \beta 3 \times PL\ before\ tax + \beta 4 \times Cashflow + \beta 5 \times Total\ Assets \\ & + \beta 6 \times Shareholdersfunds + \beta 7 \times Added\ Value + \beta 8 \times Profit\ margin \\ & + \beta 9 \times Gearing + \beta 10 \times Profit\ per\ employee \\ & + \beta 11 \times number\ of\ employers \end{aligned}$$

4.1.6.3. Model Interpretation

The model's LR chi-square value of 10.95 represents our overall measure of how well the model fits the dataset. It reflects the likelihood that changes in the independent variables (or predictors) could lead to changes in the outcome. However, with a p-value of 0.4476, this informs us that the improvement the model provides over a null model is not statistically significant, given this dataset. A log likelihood value of -22.932666 was returned, which offers an indication of our model's goodness-of-fit. The closer this statistic is to zero, the better our model is assumed to fit the data. In this instance, we might benefit from future optimization.

The Pseudo R-squared value was determined to be 0.1927. In this context, this indicates our model currently explains about 19.27% of the variation in the outcome variable. In other words, while the model provides some insight into the outcome, a substantial proportion of the outcome's variability is still left unexplained. This can suggest potential room for improvement, possibly by exploring other relevant variables or employing a more complex modeling approach.

Upon assessing the individual coefficients, none passed the standard 0.05 threshold for statistical significance (all p-values were above this threshold). What this indicates is that, within this sample, none of the selected predictors had a significant impact on the outcome variable. However, it's important to note that each of our predictors' influence may not be as straightforward as they appear. Economic, financial, and operational environments are complex constructs, with interlinked dependencies which can be challenging to capture fully within a model.

Operating Revenue (Turnover), though seemingly unaffected by the outcome variable in this dataset, could potentially have non-linear relationships, temporal shifts, or interactions with other variables. ROE using P/L before tax might have high sensitivity to changes in the company's financial condition, which the model may not sufficiently capture. The role of P/L

before tax could be seen through other aspects of economic performance, such as profit margin or gearing. Regarding Shareholders' Funds and Total Assets, their complex relationships with a company's financial and economic conditions can create intricate dynamics within the data which may be challenging to capture fully within our model. Moreover, Profit per Employee and Number of Employers might be contingent upon a host of factors, such as industry norms, economic conditions, and operational strategies, which can add an additional layer of complexity to our analysis.

Given these considerations, it's crucial to treat these results as one piece of a broader analytical framework. More extensive qualitative and quantitative analysis, combining this logistic regression with economic research, and company studies, might lead to a more comprehensive understanding. These can pave the way for potential improvement of the model, not just by statistical precision, but by overall relevance and depth of insight.

4.1.6.4 Model Assessment

Upon completing the logistic regression analysis, a critical step involves assessing the model's goodness of fit, aimed at evaluating the extent to which the model aligns with the observed data. This assessment provides essential insights into the validity of the logistic model in capturing the underlying relationships between predictor variables and the binary outcome variable, denoted as "Outcome."

In this specific analysis, the dataset consists of 41 observations, each contributing to the evaluation of the model's fit. To conduct the goodness-of-fit test, the data was divided into 10 distinct groups, allowing for an examination of how well the predicted probabilities from the logistic model correspond to the actual observed outcomes within these groups.

The Hosmer-Lemeshow chi-squared statistic, calculated at 9.86, serves as a measure of the overall difference between the predicted probabilities generated by the logistic model and the

observed outcomes across the defined groups. A higher value of this statistic would indicate a larger divergence between predicted and observed outcomes. The accompanying p-value associated with the chi-squared statistic is 0.2747. This p-value gauges the probability of observing a chi-squared statistic as extreme as 9.86, or even more extreme, assuming that the logistic model fits the data well. It is important to note that a p-value exceeding the conventional significance threshold of 0.05 indicates that there is no compelling evidence to suggest a significant lack of fit between the model's predicted probabilities and the actual observed outcomes.

In essence, the results of the goodness-of-fit test provide no substantial grounds to reject the assumption that the logistic model fits the data in a satisfactory manner. This implies that the model's predictive capabilities appear to align reasonably well with the observed binary outcomes for the given dataset.

4.1.6.5. Model limitations and future research

In examining the logistic regression model's outcomes, it is essential to consider the limitations that may affect the breadth and depth of its insights. These limitations can help pave the way for future research endeavors to enhance the model's accuracy and applicability.

Firstly, while the LR chi-square value of 10.95 provides a measure of overall model fit, the associated p-value of 0.4476 suggests that the improvements the model offers over a null model may not be statistically significant in the context of this dataset. This prompts us to explore potential confounding variables or unforeseen influences that might be contributing to this outcome. Additionally, the Pseudo R-squared value of 0.1927 indicates that the current model accounts for approximately 19.27% of the variability in the outcome variable. This suggests that a substantial portion of the outcome's variation remains unexplained. As such, the pursuit of future research could involve identifying additional relevant predictors or employing

advanced modeling techniques to enhance the model's predictive power. A crucial observation emerges from assessing the individual coefficients: none of them achieved statistical significance at the conventional threshold of 0.05. This implies that, within the parameters of the sample, the selected predictors do not seem to exert a significant impact on the outcome variable. This finding underscores the intricate interplay of economic and financial factors within the dataset.

Considering these limitations, there are promising avenues for future research to explore. Expanding the dataset to include a broader array of industries, economic contexts, and operational scenarios can lead to a more comprehensive understanding of the model's generalizability. Incorporating variables that were not initially included—such as industry-specific indicators, external market dynamics, and geopolitical influences—may enrich the model's explanatory capacity.

4.2. Sector: Industries and Production Technologies - (by Camilla Pasquali)

4.2.1. Overview of the thematic area

In academic discourse, the term "manufacturing industry" encompasses business activities that utilize machinery, tools, and labor to transform raw materials into finished goods. These activities involve a comprehensive set of economic, technological, and organizational measures directly involved in the processing and machining of materials, leading to the production of goods (Segreto & Teti, , 2014).

Before the Industrial Revolution, the manufacturing industry primarily comprised skilled artisans who specialized in crafting specific products. Knowledge of the trade was acquired solely through apprenticeship from experienced craftsmen.

However, the advent of the Industrial Revolution brought significant changes, driven by technological advancements and a surge in consumer demand. Consequently, manufacturing industries emerged as the primary drivers of wealth in developed societies, and they continue to serve as the foundation of the global economy, both historically and in contemporary times (Selco, 2021).

The industrial sector in Portugal plays a crucial role in the country's economic development, serving as a fundamental driver of growth and a key factor in correcting external imbalances since the 2008 financial crisis. Accounting for approximately 16% of Portuguese GDP, the industrial sector's significance is comparable to that of Spain, higher than that of France, and marginally lower than the euro area average, reported at 23.54 % in 2022, according to the World Bank collection of development indicators (The World Bank , 2022). Within the broader industrial sector, the manufacturing industry holds a pivotal role. The industry alone contributes to 21% of the gross value added generated by non-financial corporations and 12.5 % of GDP and employs around 720,000 people as reported in Table 3 (Pinheiro, 2019).

	Industrial sector total	Extractive industry	Manufacturing industry
% of GDP	16.0	3.5	12.5
Gross value added (EUR millions)	22,315.7	461.8	21,853.9
% of the industrial sector total		2.1	97.9
% of the total of non-financial corporations	21.4	0.4	21.0
Turnover (EUR millions)	91,370.0	1,059.2	90,310.8
% of the industrial sector total		1.2	98.8
% of the total of non-financial companies	23.0	0.3	22.7
Weight of exports of goods and services (excl. tourism)	60.8	0.8	60.0
Employees (thousands)	721.1	9.5	711.7
% of total employment	15.2	0.2	15.0
Apparent labour productivity (EUR thousands)	30.9	48.8	30.7

Table 3. Portugal: industrial sector.

Source: Caixa Bank Research, based on data from the National Statistics Institute of Portugal, the Bank of Portugal and Eurostat.

Figure 19 shows the trend of manufacturing added value as a percentage of GDP in Portugal from 1995 to 2022. In 1995, the manufacturing sector accounted for 16% of the country's GDP, reaching a peak of 17% in 1996-97. However, the graph depicts a gradual decline in the contribution of the manufacturing industry to the economy, with a notable decrease in 2011. From there, the percentage of manufacturing value added experienced a slight upward trend, culminating at 12.5% in 2022. This data highlights the sector's varying significance over the years and underscores the need for continued attention and strategic policies to foster its growth and resilience in Portugal's economy.

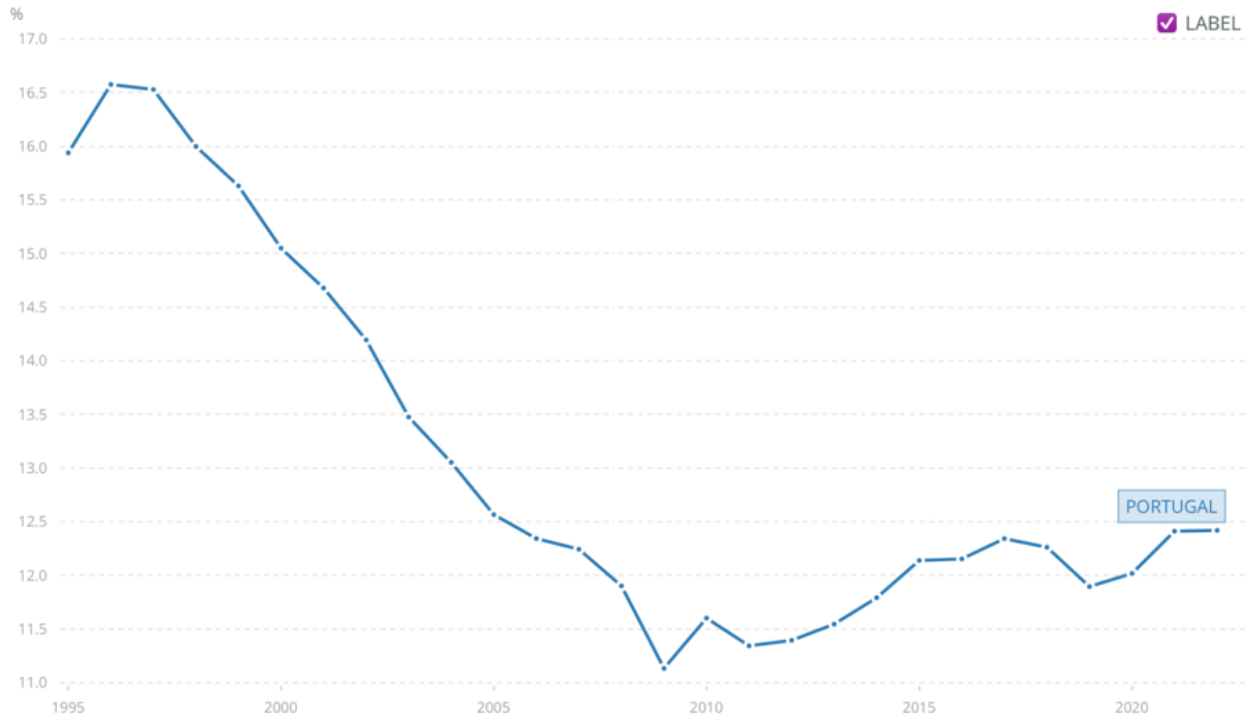


Figure 18. Manufacturing, value added (% of GDP)

Source: World Bank national accounts data, and OECD National Accounts data files

The manufacturing industry, comprising 99% of the gross value added in the industrial sector, exhibits a remarkable orientation towards international markets (Pinheiro, 2019). Notably, about 60% of all exports of goods and services (excluding tourism) from Portugal are

attributable to the foreign sales and services provided by this industry, reflecting its significant role in boosting the country's economy (OECD, 2019). Moreover, the presence of companies with an exporting profile in the manufacturing industry (16.2%, which is equivalent to around 6,500 companies) surpasses that of non-financial corporations (6%), with such companies accounting for 71.9% of the entire manufactory industry's turnover, 68.5% of its gross value added, and 53.2% of its employment (Pinheiro, 2019).

	Number of companies (2016)					Total sales (2014)					Investment (2014)				
	DE	SI	PL	EE	PT*	DE	SI	PL	EE	PT*	DE	SI	PL	EE	PT
High + medium-high	23.4	11.9	11.0	10.0	10.0	55.2	44.2	30.0	32.1	25.0	56.9	58.6	31.9	15.3	20.9
High	3.8	2.0	1.8	1.8	1.0	6.0	9.9	4.6	16.1	4.0	7.2	17.5	3.0	4.7	3.4
Medium-high	19.5	9.9	9.2	8.1	9.0	49.3	34.3	25.4	16.0	21.0	49.7	41.1	28.9	10.5	17.5
Medium-low	38.6	43.1	43.7	34.4	32.0	26.3	32.9	36.2	22.9	30.0	23.6	28.5	32.3	38.2	31.4
Low	38.1	45.0	45.3	55.6	59.0	18.4	22.5	33.8	45.0	45.0	19.5	15.4	35.8	46.5	47.7

Table 4. Manufacturing industry: structure according to technological intensity

Source: Caixa Bank Research, based on data from the National Statistics Institute of Portugal, the Bank of Portugal and Eurostat

Note: Data from 2016

Figure legend

1) ***Letters represents countries abbreviations**: DE (Germany), SI (Slovenia), PL (Poland), EE (Estonia), PT (Portugal).*
2) ***Categories (High, Medium-high, Medium-low, Low)**: These categories represent the technological intensity of the manufacturing industry. It's a way to classify industries based on their technological sophistication or R&D intensity.*
3) ***Numbers are percentages associated with each category for the corresponding country and data column** (e.g., For Germany (DE) in the "High + medium-high" technological intensity category: 23.4% of the companies were classified as "High + medium-high" in 2016; these companies accounted for 55.2% of the total sales in 2014 and were responsible for 56.9% of the investments in 2014.*

Moreover, technological intensity is an important aspect of the manufacturing industry in Portugal, but the country is trailing behind leading nations like Germany (country known for its cutting-edge advancements) in this regard, as well as other nations with a GDP per capita similar to Portugal's in purchasing power parity terms, as shown in Table 4. A considerable proportion of companies in the manufacturing sector exhibits low-medium technological intensity, generating around 75% of its turnover, while companies with high and medium-high

technological intensity, though fewer in number, contribute 25% of the turnover and 20% of the total investment. The rise of companies incorporating high technological intensity processes in recent years indicates potential for fostering economic growth and innovation (Pinheiro, 2019).

As the industrial sector expands and evolves, investment in research and development (R&D) has become a vital aspect, contributing to long-term growth and value-added activities (Pinheiro, 2019). Investments in R&D have seen steady growth since 2012, and the emphasis on digital skill development has further bolstered the industry's potential for innovative production models (OECD, 2019).

The dynamics of businesses in Portugal, especially in the manufacturing industry, are influenced by various challenges, such as demographic changes, skill development, corporate debt, and judicial inefficiencies (OECD, 2019). These factors directly impact employment and business trends, warranting attention from policymakers to address structural and regulatory impediments (OECD, 2019).

The COVID-19 pandemic has added a new layer of complexity to these existing challenges. Its impact on businesses has led to a surge in corporate debt, as many companies struggled to stay afloat during lockdowns and reduced economic activity. The accumulation of non-performing loans (NPLs) has become a pressing concern, hindering the ability of businesses to invest, grow, and innovate. Therefore, the sudden and dramatic changes brought about by the pandemic have underscored the need for agile and adaptive policies that can respond to rapidly evolving economic conditions.

In the given context, the PRR plays a crucial role in addressing the diverse challenges faced by the Portuguese economy. Particularly in the case of the manufacturing industry, which holds

significant importance in Portugal's economic landscape, the PRR aims to improve the sector's ability to adapt to the changing economic landscape and promote sustainable growth.

To achieve these objectives, the PRR emphasizes the importance of supporting businesses, especially small firms, in adopting digitalization and technological advancements, and enhancing workforce development to meet the evolving demands of the job market.

This section of the study will delve into the projects selected to receive the European grant under the MABI' s thematic area of "Industries and production technologies". It will provide comprehensive information on the chosen projects and undertake a comprehensive analysis of both accepted and rejected entities to gain an in-depth understanding of the underlying selection criteria and the possible factors influencing the selection process.

4.2.2. Information on the projects

Within the thematic area of Industries and Production Technologies, two sub-areas can be identified. Namely, Production Technologies and Product Industries (Tecnologias de Produção e Indústrias de produto), and Production Technologies and Process Industries (Tecnologias de Produção e Indústrias de processo).

Among the initial 143 consortia that submitted their application, 36 proposals were centered around the thematic area of Industries and Production Technologies, with 25 specifically focusing on Production Technologies and Product Industries, and 11 dedicated to Production Technologies and Process Industries. Following an evaluation of these submissions, 64 consortia successfully advanced to the second phase, among which 21 belonged to the thematic area of Industries and Production Technologies.

During the conclusive selection round, the number of qualified consortia was further narrowed down to 53, and among these, 18 belonged to the aforementioned thematic domain. Recent

developments concerning the final phase, involving the endorsement of seven additional mobilizing agendas by Prime Minister António Costa have substantiated the thriving pool of business innovation projects, leading to a cumulative total of fifty already signed projects with a total 384 million euros disbursed. Nevertheless, the process faced certain challenges, as three mobilizing agendas by consortia led by Galp, REN and Bondalti respectively, await finalization (Jornal de negocios, 2023)

4.2.3. Analysis of agendas accepted and rejected in the selection phase

The 18 endorsed projects within the thematic area are subject to in-depth analysis with the aim of evaluating their characteristics, relevance, and feasibility in the domain of Industries and Production Technologies (Annex III)

4.2.4. Factors influencing the selection process

In the pursuit of technological advancement and innovation, a substantial aggregate investment of 1,888M € was dedicated to the refinement of production technologies and product industries. This was further supplemented by an allocation of 647M € specifically designated to enhance production technologies and process industries (IAPMEI, 2023). As mentioned above, the cumulative outcome of this allocation materialized in the selection and subsequent financial endorsement of a total of 18 distinctive projects. It is pertinent to note that this analysis is conducted through the lens of an extended time frame, capturing an average of annual data spanning from 2017 to 2021.

i. Degree of innovation

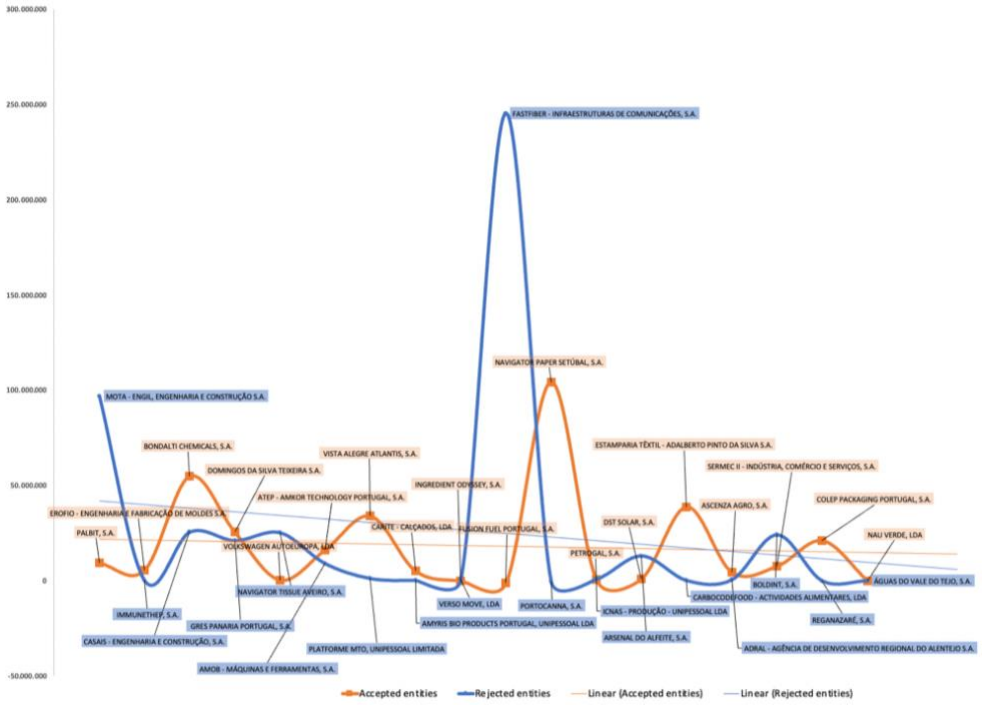


Figure 19. Added Value in Euro - Industries and Production Technologies

The graphical representation, as depicted in Figure 20 presents a distinct scenario in which the trajectories of accepted and rejected companies slightly diverge. The line tracing the progress of rejected companies exhibits a solitary peak, which correspond namely to the entity FASTFIBER - INFRAESTRUTURAS DE COMUNICAÇÕES, S.A. This particular entity demonstrates an average of €245,443,248.5 in added value spanning the temporal domain of 2017 to 2022, standing in contrast to the relative consistency observed in the accepted companies' line. Notably, this elevated point represents a unique instance of heightened performance among the rejected firms. However, beyond this exceptional peak, the rejected companies' line reveals a trend of generally lower levels (from €96.979.437 to €106.294), residing below the average demonstrated by the accepted companies (from €104.323.942 to € 330.351). Additionally, worth noting is that within the realm of acceptance, two entities register added values below zero, respectively FUSION FUEL PORTUGAL, S.A. (€-1.203.433) and INGREDIENT ODYSSEY, S.A. (€-80.450) paralleled by an equivalent observation within the

rejected companies, exhibited namely by REGANAZARÉ, S.A. (€-37.784) and PORTOCANNA, S.A. (€-380.351), thereby underscoring the complex range of trajectories within this analysis.

ii. Business competitiveness and productive specialization

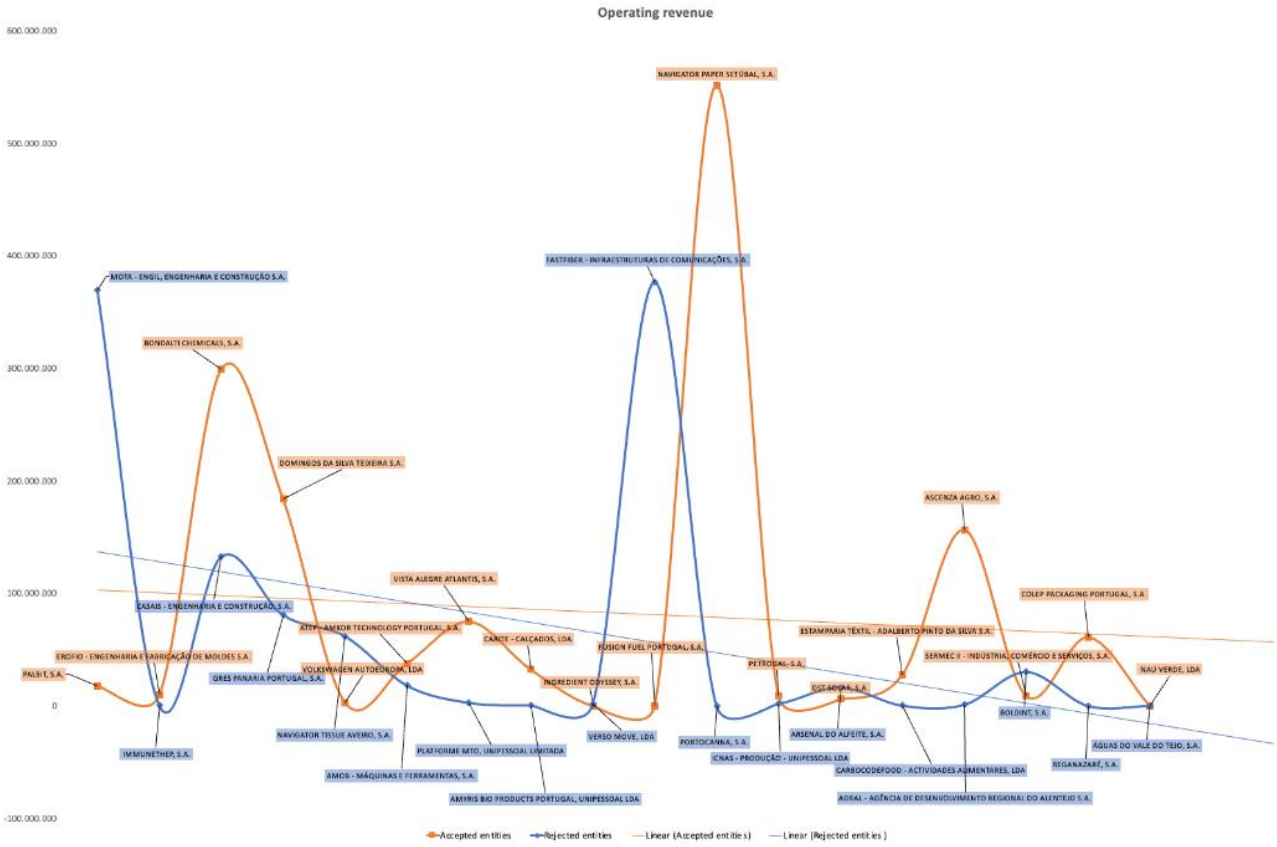


Figure 20. Operating Revenue (Turnover) in Euro - Industries and Production Technologies

The graphical representation under scrutiny (Figure 21) serves to investigate the nuanced dynamics surrounding the assessment of Business Competitiveness and Productive Specialization. The entities considered for the grant's allocation manifest divergent trajectories. Notably, the accepted companies' trajectory is marked by an apex, emblematic of an instance of elevated performance of NAVIGATOR PAPER SETÚBAL, S.A., exhibiting an average of €551.376.236 of turnover between 2017-2022. This ascendant peak is thereafter followed by an analogous apex, representative of a rejected entity, namely FASTFIBER - INFRAESTRUTURAS DE COMUNICAÇÕES, S.A. with an average operating turnover of

€376.671.072. By contrast, the overarching accepted companies' trend is characterized by an upward trajectory. This ascent not only substantiates their inherent competitiveness but also underscores the efficacy of their productive specialization efforts. In contrast, the rejected entities' trend line traces a descending arc, indicative of a diminishing momentum in the realm of productive specialization. A cross-sectional observation reaffirms this disparity, the accepted entities, on a general basis, command higher operating revenue.

iii. Capacity to leverage the investment.

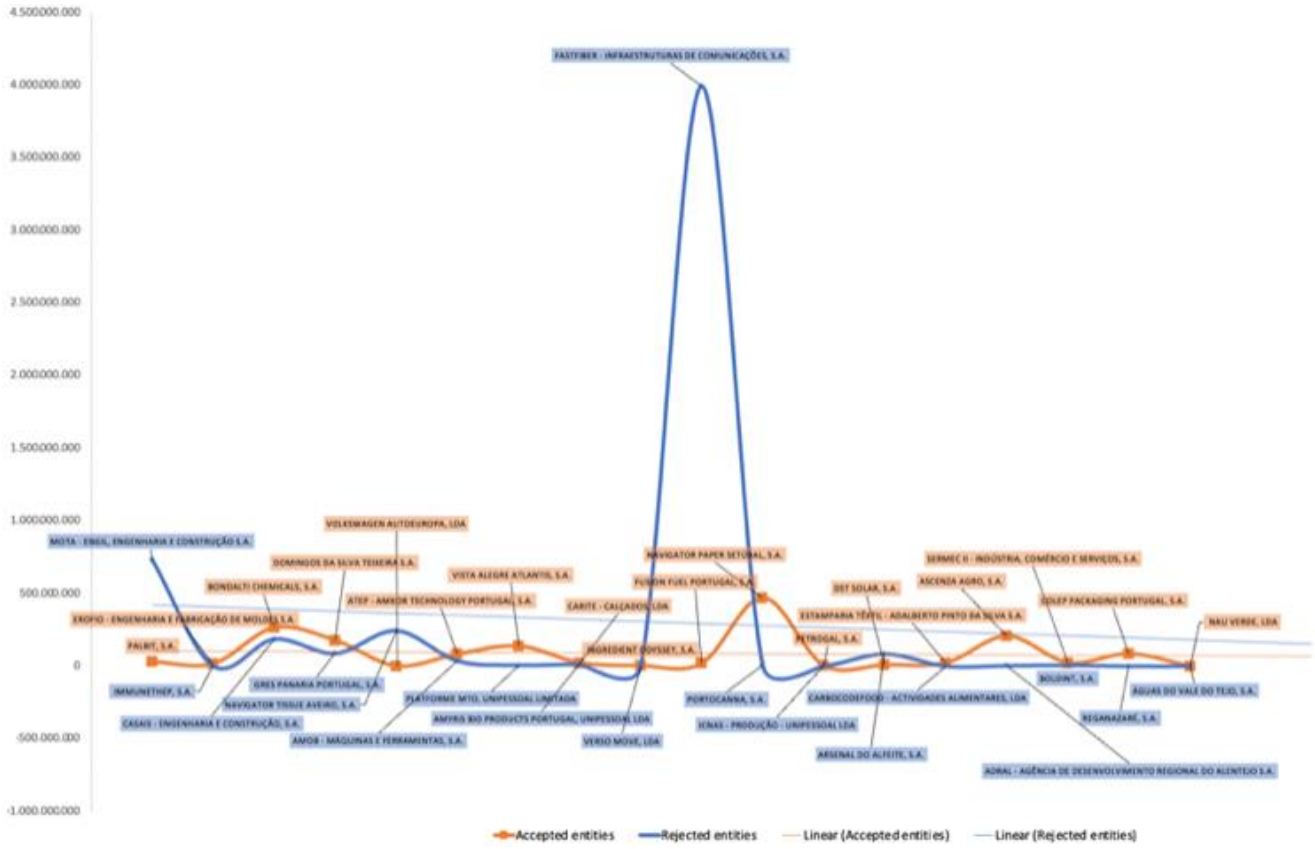


Figure 21. Total Assets in Euro - Industries and Production Technologies

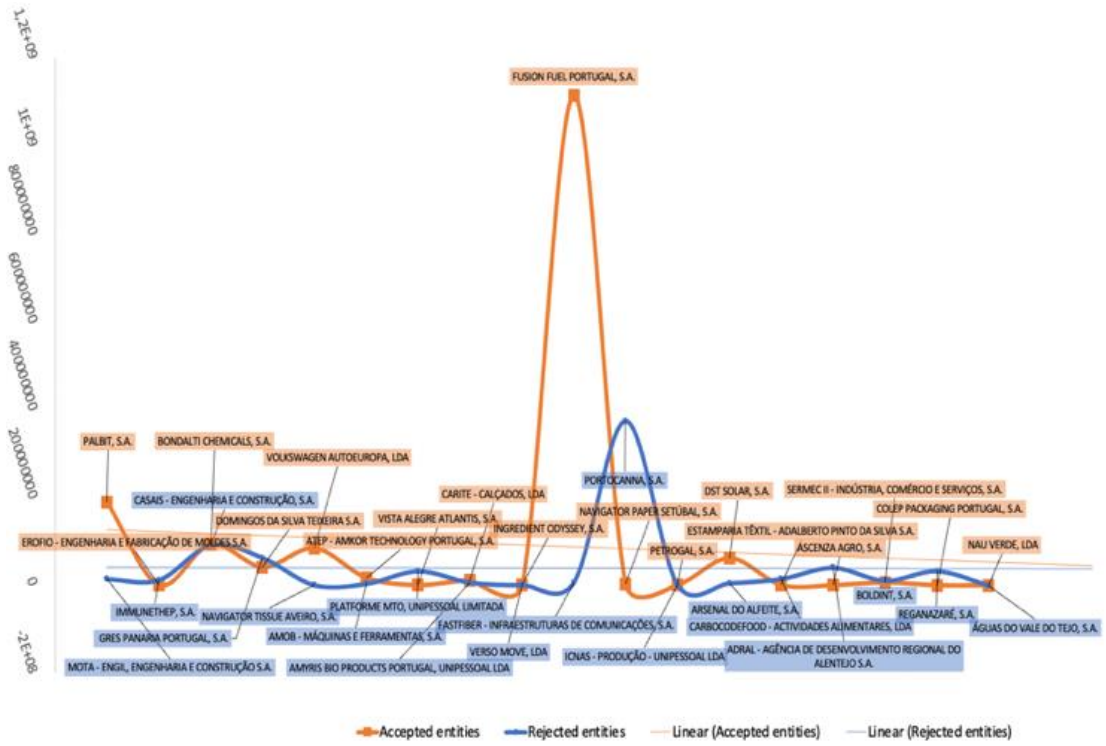


Figure 22. Shareholders´ Funds in Euro - Industries and Production Technologies

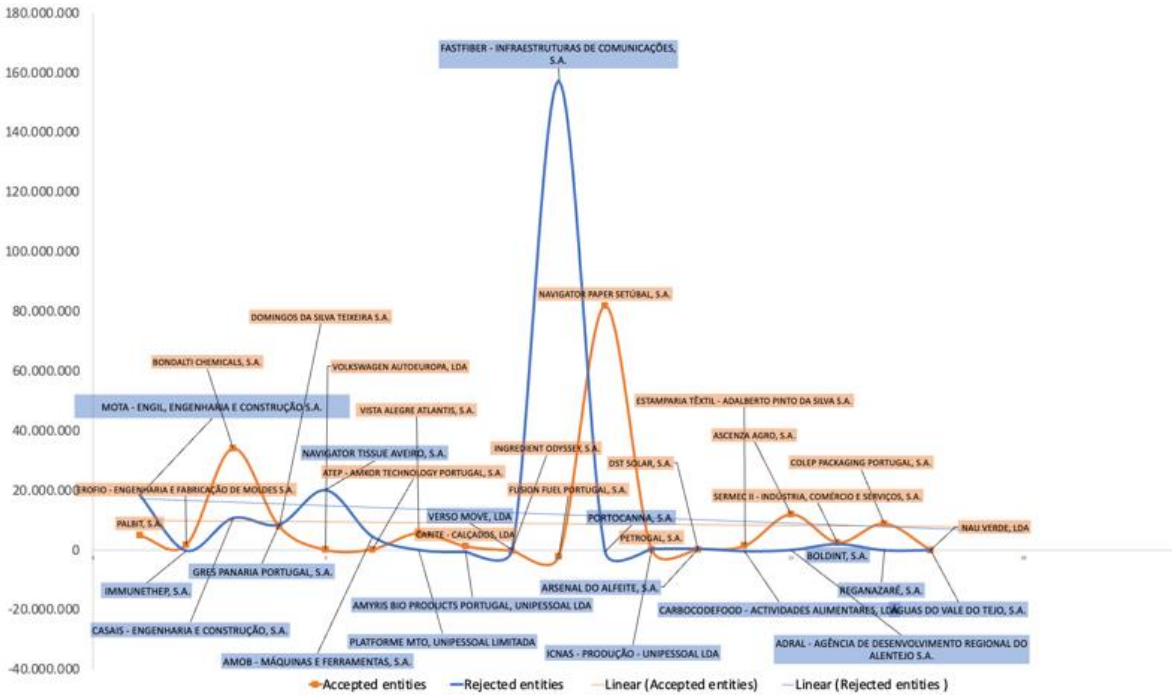


Figure 23. Cashflow in Euro - Industries and Production Technologies

The set of graphical representations unveiled herein serves as a platform for the exploration of the intricate dynamics underlying companies' efficacy in capitalizing on investment opportunities. This exploration is facilitated through a comprehensive evaluation of three

pivotal financial metrics—namely, total assets, shareholders' funds, and cash flow—each averaged over the period spanning from 2017 to 2022.

Of particular note is the portrayal of total assets (Figure 22), which reveals an intriguing pattern. Entities that were denied the grant exhibit a discernible peak in their total assets. This peak is not just a measure of asset accumulation, but more importantly, it demonstrates how these entities, especially FASTFIBER - INFRAESTRUTURAS DE COMUNICAÇÕES, S.A., have efficiently utilized their resources to either reinvest in the business, acquire valuable assets, or reduce liabilities, thereby optimizing their financial position. In essence, a surge in total assets, in this context, signifies efficient capital allocation and resource management. Conversely, except for this peak, both accepted and rejected entities display parallel trajectories, indicating a degree of concordance in their financial management approaches

Shareholders' funds (Figure 23) offer insights into the company's investor-attracting prowess (Parrini, 2017). A pronounced peak in this metric among accepted companies (FUSION FUEL PORTUGAL, S.A.) implies their skill in garnering investor support. Even the smaller peak observed within the rejected companies' trajectory signifies their efforts in enhancing investor confidence.

Lastly, the trajectory of cash flow (Figure 24) sheds light on a company's proficiency in managing its finances. The substantial peak (FASTFIBER - INFRAESTRUTURAS DE COMUNICAÇÕES, S.A.) within the rejected companies' trajectory underscores their proficiency in effective cash management. On the other hand, accepted companies exhibit a marginally higher trajectory, underscoring their competence in financial resource management.

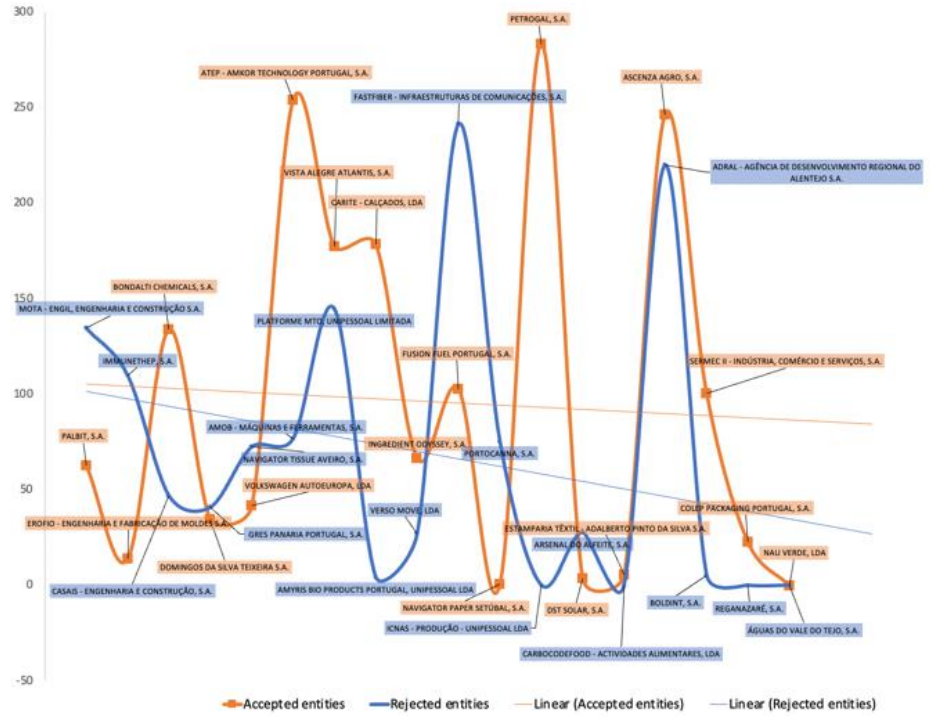


Figure 24. Gearing in % - Industries and Production Technologies

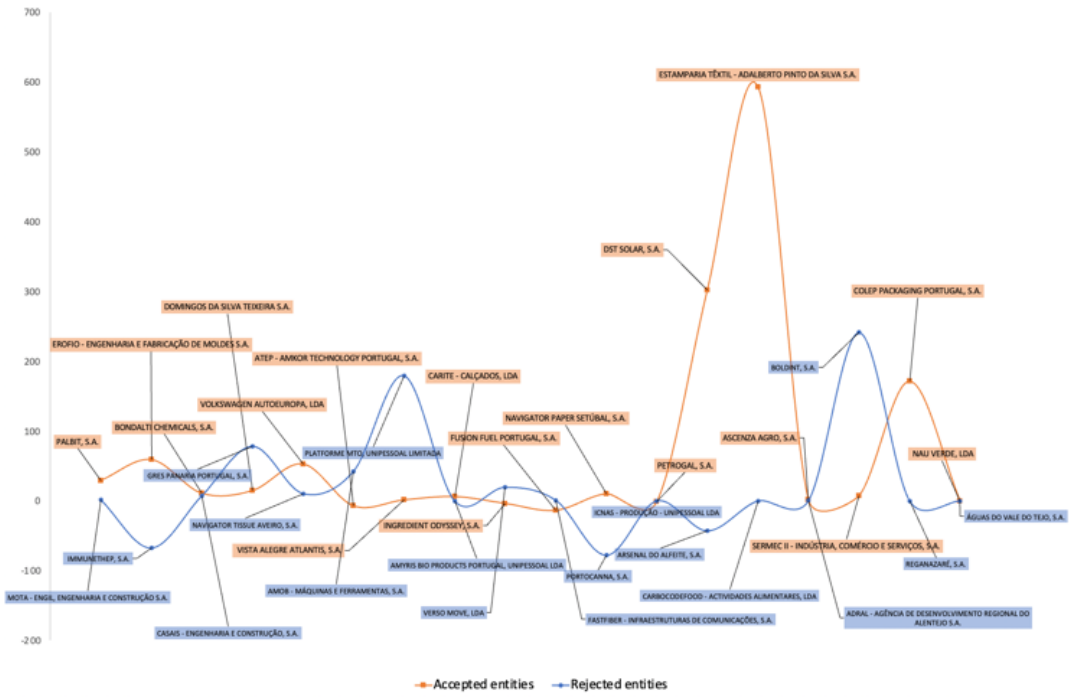


Figure 25. Interest Coverage - Industries and Production Technologies

The understanding of how companies harness investment opportunities can be facilitated by other two distinctive metrics: gearing (Figure 25) and interest coverage (Figure 26).

Starting from the concept of gearing, both accepted and rejected trajectories exhibit multiple peaks. It's noteworthy that the average for accepted companies corresponds to 101,61%, whereas for the rejected ones, it's relatively lower at 72,15%. This suggests that accepted companies have generally maintained a higher level of financial leverage compared to their rejected counterparts.

Shifting to the interest coverage, accepted entities display a significant peak (ESTAMPARIA TÊXTIL - ADALBERTO PINTO DA SILVA S.A.), followed by smaller peaks among the rejected ones. The average value for accepted companies is 72.7, while for the rejected companies, its 30.25. The contrast in averages emphasizes that accepted entities have demonstrated a more robust ability to meet their interest obligations (Maverick, 2023).

iv. Potential economic value of innovation and scalability

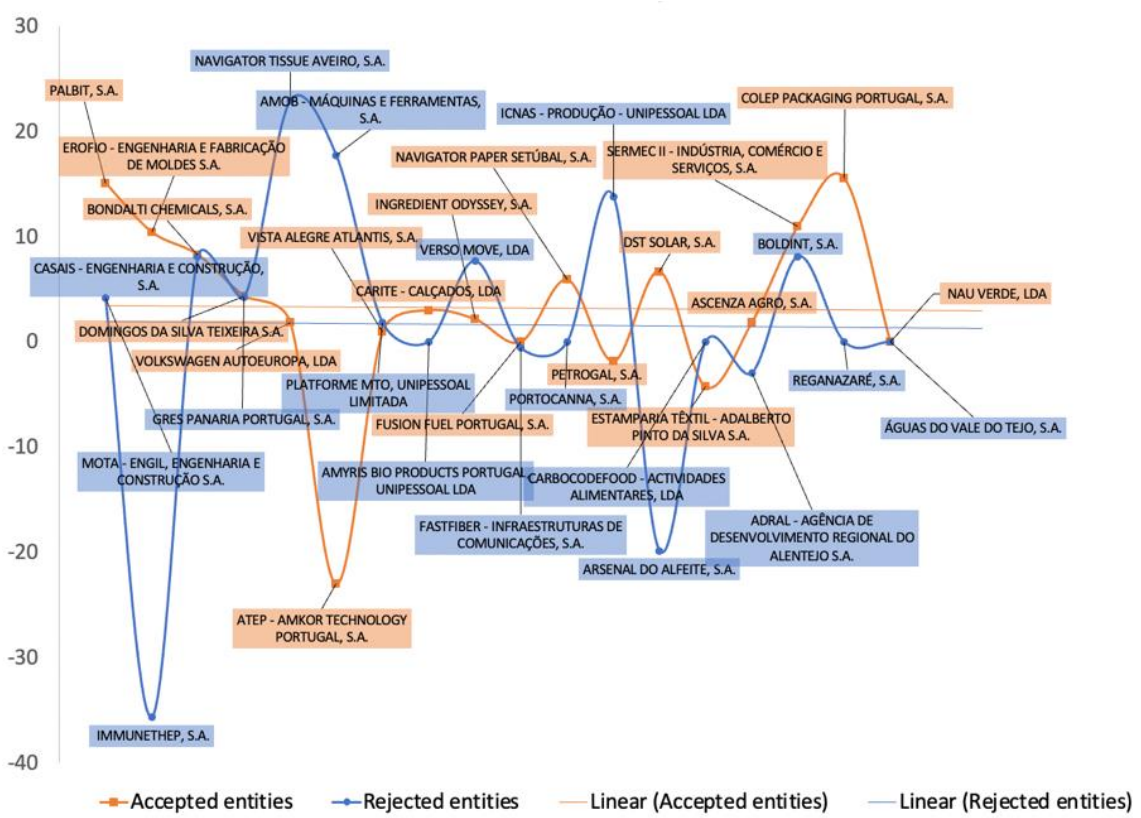


Figure 26. Profit Margins in % - Industries and Production Technologies

This graph explores how companies handle their innovation and growth potential. To do this, it's possible to use a key financial measure called profit margin, which looks at how much profit a company makes relative to its revenue (Segal, 2023).

It is noteworthy that both accepted and rejected trajectories exhibit numerous peaks. A closer examination reveals an intriguing aspect: within the accepted companies, three entities showcase profit margins below zero (ATEP - AMKOR TECHNOLOGY PORTUGAL, S.A., PETROGAL, S.A., ESTAMPARIA TÊXTIL - ADALBERTO PINTO DA SILVA S.A., respectively) mirroring a similar count among the rejected group (IMMUNETHEP, S.A., FASTFIBER - INFRAESTRUTURAS DE COMUNICAÇÕES, S.A., ARSENAL DO ALFEITE, S.A., ADRAL - AGÊNCIA DE DESENVOLVIMENTO REGIONAL DO ALENTEJO S.A.) Notably, the average profit margin for accepted entities stands at 3.6%, in contrast to the corresponding average of 2.26% for the rejected entities. Peaks within the trajectories spotlight instances where these attributes translate into favorable financial results. The variations in profit margins show that both the accepted and rejected groups face challenges, but the accepted ones generally manage to generate a bit more profit compared to the rejected ones.

v. Contribution of the project to carbon neutrality and energy resilience

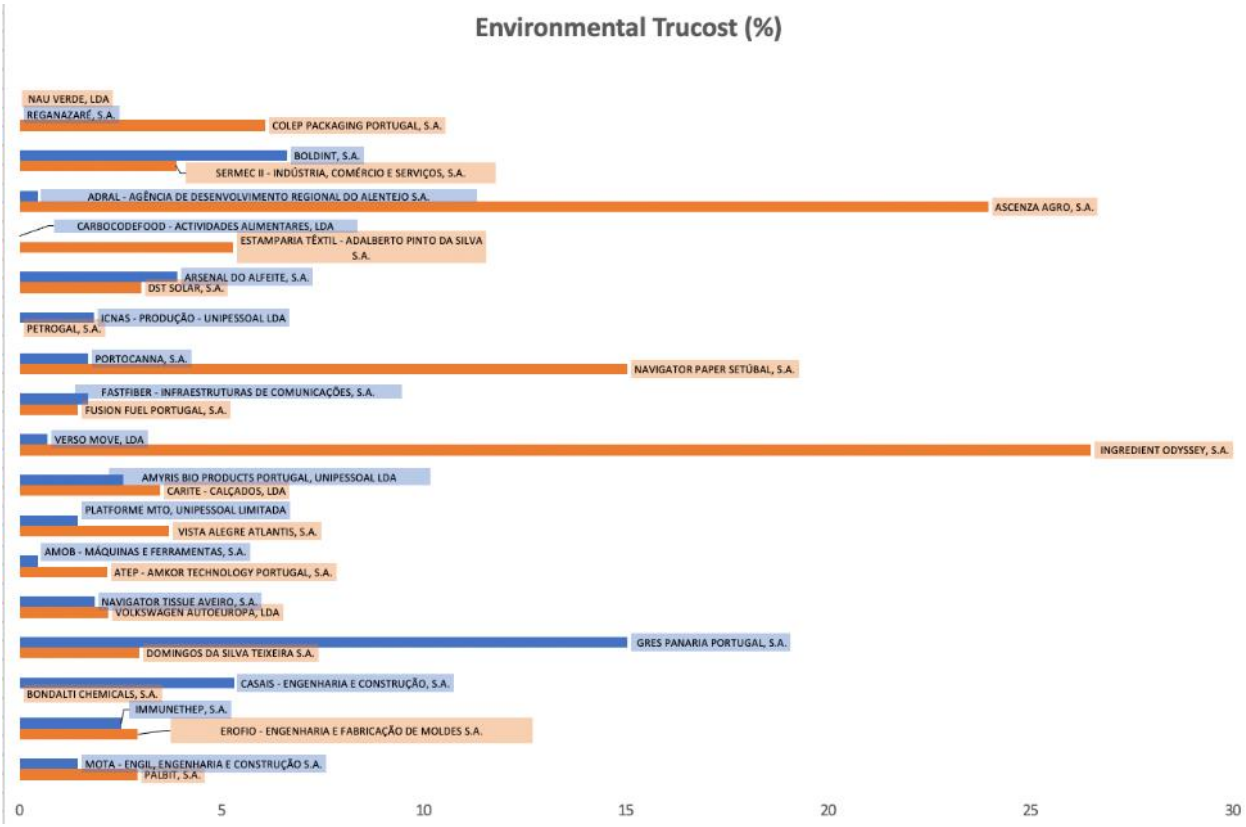


Figure 27. Environmental Trucost score in %- Industries and Production Technologies

The presented horizontal bar chart illustrates the analysis of the Environmental Risk Score by Trucost (%). The focus of this analysis lies in understanding the contribution of these projects to carbon neutrality and energy resilience, as reflected in their Environmental Risk Scores. A higher Trucost score indicates that a company could potentially lose a larger portion of its revenue due to environmental damages, threats to its supply chain, and its dependency on natural resources (S&P, 2020). The most evident observation from the graph is the discernible difference in the Environmental Risk Scores between accepted and rejected companies. Accepted companies exhibit higher scores on average. A deeper analysis of the data reveals that the average Trucost percentage for accepted companies stands at 7%, whereas that for the rejected companies is notably lower, at 3.12%. This stark difference underscores the emphasis placed on environmental considerations during the project evaluation process, targeting

companies that have a higher environmental risk exposure to provide these companies with the means to improve their environmental impact.

vi. Quality of the consortium in terms of the promoters´ competences

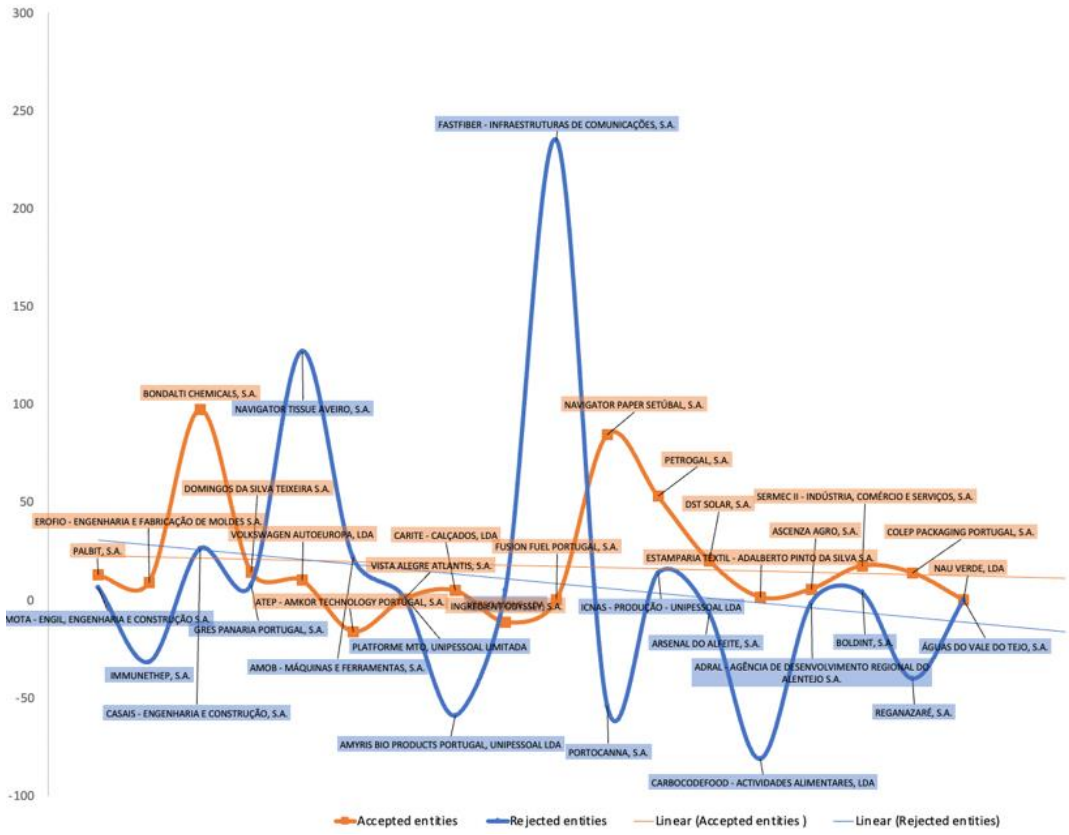


Figure 28. Profit per Employee in Euro - Industries and Production Technologies

The Profit per employee metric offers a valuable glimpse into a company's adeptness at generating profits in proportion to its workforce. On average, leaders heading the selected projects demonstrated a noteworthy profit per employee of 19,94 distinctly overshadowing the corresponding figure of 10,34 attributed to leaders overseeing non-selected projects.

This emphasizes the apparent advantage held by accepted companies in terms of their profit generation efficiency relative to their workforce.

vii. Economic and financial viability of the proponents

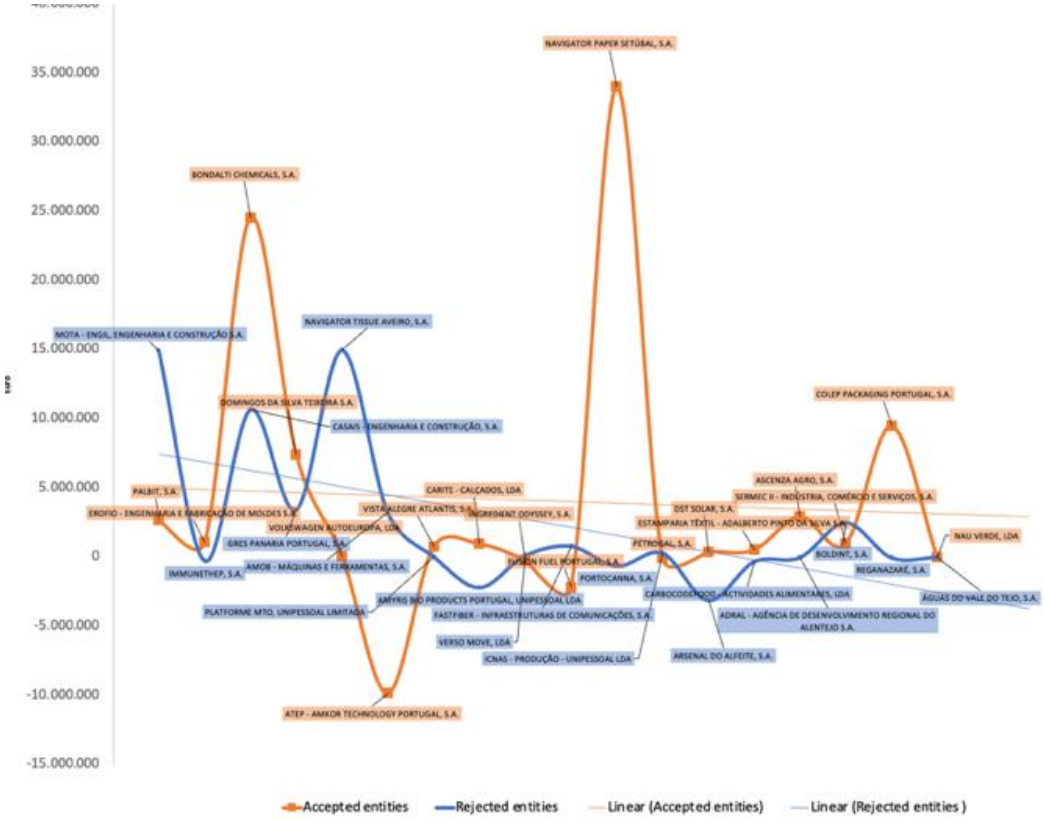


Figure 29. P/L Before Tax in Euro - Industries and Production Technologies

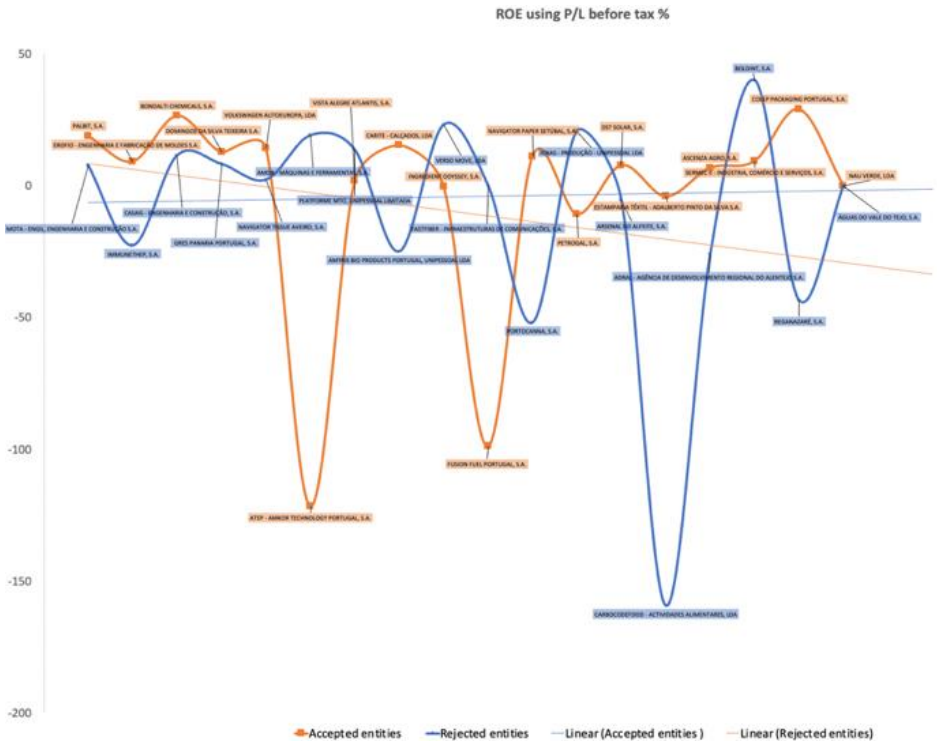


Figure 30. ROE Using P/L Before Tax in % - Industries and Production Technologies

The graph depicting P/L before tax (Figure 30) shows a distinction between the P/L before tax values of accepted and rejected proponents which indicates a potential variance in their financial performance. Notably, accepted proponents exhibit generally higher P/L values compared to their rejected counterparts.

The presence of two distinct peaks suggests the potential existence of outliers within the dataset. These peaks may correspond to exceptional cases of exceptionally high profits.

On the other hand, figure 31, portraying the ROE using P/L before tax, displays three notable peaks below zero to signify instances of negative ROE. These instances are indicative of projects that potentially failed to generate sufficient returns in proportion to the invested equity. Negative ROE often implies an inability to generate profits, leading to a reduced capacity to reinvest in the business or distribute returns to stakeholders (Furhmann, 2021)**.**

4.2.5. Acceptance into the program based on entities financial indicators

Building on the comprehensive analysis derived from the Orbit databases, the section above provided a detailed profile of the participating companies over the span of five years. This groundwork offers insights into various facets of the entities, from innovation metrics to financial robustness. Transitioning to a more focused approach with Stata analysis, the research aims to ascertain a possible correlation between an entity's financial indicators (number of employees, operating revenue, P/L before tax, Cash flow, ROE, total assets, shareholders' funds, working capital, added value, profit margin, interest coverage, solvency ratio-liability based, gearing, profit per employee, trucost score, falcon score, CRIF score) and its likelihood of acceptance, this time taking into account the year 2021 only. At the core of this analysis lies a pivotal question: Did a company's financial health influence its chances in the selection process? To delve into this question, a binary logistic regression was employed, wherein the "status" accepted companies were designated as '1' and those rejected as '0'.

$$Status = \beta_0 + \beta_1 number_{employee} + \beta_2 revenue_{2021} + \beta_3\ pl_{before_{tax}} + \beta_4\ cash_{flow} + \beta_5\ roe_{2021} + + \beta_6 total\_assets + \beta_7\ shareholders_{funds} + \beta_8\ working\_capital + \beta_9\ added_{value} + \beta_{10}\ profit_{margin} + \beta_{11}\ interest\_coverage + \beta_{12}\ solvency\_ + \beta_{13}\ gearing + \beta_{14}\ profit_{per_{employees}} + \beta_{15} trucost + \beta_{16} falcon + \beta_{17} CRIF + \in$$

A subset of 439 companies was selected for this phase of the study. This ensemble encompassed both leading companies and co-promotors, spanning those that were accepted as well as those that were rejected. Any companies that held mixed records – that is, entities that were at times accepted as co-promotors for certain projects while being rejected for others – were purposefully excluded from the dataset. This criterion was set to maintain the analytical relevance and precision, ensuring that each company's status remained unequivocal for the purpose of the binary logistic regression.

i. The Binary Logistic regression

Before running the logistic regression, recognizing the diversity of scales among variables, a standardization procedure was applied. This involved computing the standardized scores for each variable, allowing for a harmonized comparison. Considering these standardized scores, potential outliers, defined as data points that strayed three or more standard deviations from the mean, were systematically identified. To bolster the integrity of the subsequent regression outcomes, entries with outlier values were filtered out. The number of observations reduced to 150. Then, multicollinearity—a scenario where predictors highly correlate—was probed using a linear regression and assessed via the variance inflation factor (VIF). This step was crucial to ensure the predictors' independence and the regression model's validity. Two versions of the regression were undertaken, with the latter variant offering odds ratios, providing a deeper perspective on the relationships between variables (Annex IV).

ii. Model interpretation & Findings

The overall significance of the model is underscored by the LR chi2(17) value of 43.07 and its associated p-value less than 0.001, suggesting the combined predictors are influential in determining the outcome variable. The Pseudo R^2 was found to be of 0.2924, which provides evidence that approximately 29.24% of the variability in our dependent variable is attributed to our chosen predictors. In examining the coefficients:

- The number of employees, operating revenue, added value and solvency emerged as significant positive drivers for the outcome, with p-values falling under the 0.05 benchmark.
- The indicators of shareholders' funds and gearing are not statistically significant at the 5% level, but their p-values are close enough that they might be considered marginally significant.
- Contrarily, the added value metric displayed an inverse relationship with the outcome, indicating its negative influence.
- A range of factors, from PL before tax and ROE for 2021, to total assets and working capital, did not significantly impact the outcome, evidenced by their larger p-values.
- The Odds ratio offers nuanced insights. As for the number of employees, for instance: a unitary increase translates to a 1.011957-fold increase in the odds of the outcome manifesting, given all else remains constant.
- The constant term, or baseline odds, sits at a minuscule 0.0029 when every predictor is zeroed out.

While the study employed statistical methodologies to ensure the accuracy and validity of the logistic regression model, there are several limitations to consider.

First, the process of standardizing variables and filtering out outliers, although in this case needed for comparability and for eliminating extreme values, might have led to the potential loss of important real-world data points. By cutting down the observations to 150, it's plausible that certain nuances or patterns might have been overlooked. Furthermore, the Pseudo R^2 value of 0.2924 suggests that the model only explains approximately 29.24% of the variability in the outcome, leaving a substantial portion unaccounted for by the selected predictors. Hence, there might be other influential factors not considered. Finally, the significant p-values for some variables imply strong relationships, but the nature of statistical significance doesn't equate to practical significance.

Hence, the model's ability to explain only a portion of the variability underscores the complexity of the selection process for the thematic area of "Industries and production technologies", which might encompass both tangible data and intangibles such as corporate reputation, strategic alignments, and future potential. This section, while shedding light on the role of financial health, also emphasizes the multifaceted nature of project selection and the need to consider a wide array of influencing factors.

Therefore, there is still room for improvement in refining and enhancing the predictive capability of the model.

4.2.6 Conclusive Remarks

Based on the qualitative and quantitative analyses conducted, it becomes evident that the selection process for the thematic area of "Industries and production technologies" was intricate and multi-layered. Financial health of leaders and co-promotors, gauged through various metrics like operating revenue, number of employees, added value, and solvency, was

found to play a pivotal role in influencing projects' acceptance. Entities with robust financial metrics, especially those that underlie financial stability and growth potential, appeared to have an advantage in the selection process. Notably, factors such as the number of employees, operating revenue, and solvency displayed positive significance, underscoring their importance as criteria. On the other hand, while certain indicators like shareholders' funds, gearing, and added value showed marginal or inverse relationships, their presence in the model denotes their relevance.

Beyond these financial metrics, it's conceivable that intangible attributes such as corporate reputation, strategic vision, and innovative capacity also played a role in the acceptance equation.

In conclusion, it emerged that the selection criteria seamlessly blended quantitative metrics with qualitative attributes, probably ensuring that chosen project leaders and co-promoters not only exemplified financial robustness but also resonated with overarching objectives of the industry and MABI's goals for the sector .

4.3. Sector: Mobility, Space and Logistics – (by Edoardo Sacchi)

4.3.1 Overview of the thematic area

The Portuguese economy is a dynamic mix of industries that contribute to its growth and development. Portugal's economic landscape is diverse, ranging from the thriving agro-food and forestry industries to the **emerging fields of logistics, mobility and space.**

This country's strategic emphasis on sustainability, innovation, and international collaboration positions it to excel in a variety of sectors and make significant contributions to both regional and global economies.

Portugal's strategic location on the Iberian Peninsula has positioned it as a key player in the sectors of logistics, mobility, and space. These sectors collectively contribute to the nation's connectivity, economic growth, technological advancement, and global partnerships.

Distinguishing between the sectors of space's industry and the domains of logistics and mobility is of paramount significance within the contemporary economic landscape.

While **logistics and mobility** focus on efficient transportation systems and sustainable urban mobility solutions, otherwise the **space sector** focuses on technological innovation, satellite development, and international collaborations for advanced exploration.

- **Logistics and mobility**

In Portugal, the logistics and mobility sector are critical to facilitating efficient transportation of goods and people both within the country and across international borders. Portugal has made significant investments in transportation infrastructure, such as roads, railways, ports, and airports, to promote seamless movement and trade connectivity.

For much of the twentieth century, transportation and logistics were severely neglected, but beginning late in the century, there was a concerted effort to remedy the situation, backed by massive EU funding. As a result, the overall road network has grown, a four-lane highway links Lisbon to Porto, the northern capital, secondly a highway connects Lisbon to Madrid, and a four-lane highway connects Lisbon to the Algarve. The highways connect the major cities and extend to the border and ports, improving mobility's situation in the country. Road transportation infrastructure includes national roads, municipal roads and highways and accounts for 28.2 percent of total infrastructure for the sample period.

Portugal

	total	per 1 mio inhabitants	per km²
Railroads	3,622 km	348.97 km	0.04 m
Waterways	210 km	20.23 km	0.00 m
Airports	18	1.73	0.00020

Europe

total	per 1 mio inhabitants	per km²
351,447 km	21.87 km	0.02 m
380,162 km	54.16 km	0.02 m
710	0.09	0.00003

Table 5. Comparison Transport in Portugal vs Europe

In the above table there is a comparison between the situation of transport in Portugal with rest of Europe. According to the data, Europe has a much larger infrastructure network in terms of railroads and waterways than Portugal. Europe also has a higher per-square-kilometer and per-million-person density of railroads, waterways, and airports. However, when interpreting these figures, it is critical to consider the geographical and population differences between Portugal and the rest of Europe. (Transport and infrastructure in Portugal, s.d.)

The Portuguese railway system has been improved, and the enterprise Rede Ferroviária Nacional (REFER) was formed to manage it in 1997. Lisbon's metro system was expanded outside the city limits in the early twenty-first century with the addition of several new stations, and the 25th of April Bridge, once Europe's longest suspension bridge, was adapted to include a railway line. Porto has also built a light rail system, parts of which are underground.

Portugal's transportation and aviation networks are well-developed and well-connected. The primary international entry point is Lisbon's Portela Airport, which is joined by the

international airports of Faro and Porto, as well as those of Madeira and the Azores. TAP Portugal is the national airline leader, with local and international carriers providing passenger and cargo services.

Significant investments have been made in Portugal's ports to improve cargo handling capabilities and services. To meet rising demand, major ports such as Lisbon, Leixões (serving Porto), Setubal, and Sines have expanded. River transport adds versatility, with the now-navigable northern Douro accommodating both leisure cruises and commercial barges. (BRITANNIA, PORTUGAL , s.d.)

During the 1990s, investment efforts and highway extension in Portugal grew drastically, particularly in the last ten years, which saw a significant increase in roadways investment made possible by public-private partnerships. In absolute terms, this amounts to an increase from 0.75% of GDP in the 1980s to 1.56% in the last decade.

Railroads, airports, and ports are examples of other transportation infrastructures that accounted for 9.0 percent of total infrastructure investment between 1978 and 2011. These investments reached their highest levels, as a percentage of total infrastructure investment, with railroad network modernization and port expansion projects, while the last ten years have also seen significant growth in airport investment. (Pereira, Alfredo Marvão Pereira Rui Marvão, s.d.)

- **Space Industry**

The aerospace industry in Portugal exhibits a compact yet robust industrial foundation, encompassing diverse domains such as aircraft and drone manufacturing, space exploration software development, and aviation maintenance. The nation's expertise extends internationally to both civil and military aircraft. Renowned for its proficiency, Portugal excels in aircraft and drone manufacturing and space software innovation. Furthermore, companies

play a pivotal role in producing aero structures and components for renowned aircraft manufacturers including Airbus, Embraer, and Pilatus.

The Portuguese aviation experience also includes the maintenance of complex planes and the development of new businesses such as wet leasing. We build aerostructures for the innovative KC-390 and develop unmanned aircrafts for NATO, the United Nations, and the European Union's military and public safety operations (Portugues Chamber of commerce, s.d.).

The national space strategy, Portugal Space 2030, establishes new goals for the sector's development. In 2019, the government established "Portugal Space" (the Portuguese Space Agency), a private, non-profit organization dedicated to promoting and strengthening space in Portugal, as well as its ecosystem and value chain, for the benefit of society and the economy in the country and around the world. According to the Portugal Space 2030 Strategy, Portugal Space serves as a business and development unit for universities, research institutions, and businesses. Portugal passed a new military programming law in 2019, with an estimated €5.3 billion in spending through 2030.

The planned defense expenditure may contribute to improve Portugal’s NATO goal of 2% of GDP dedicated to military spending. (ITA, s.d.)

In general, Portugal's recovery and resilience plan responds to the urgent need to foster a strong recovery and prepare Portugal for the future. The plan's reforms and investments will help Portugal become more sustainable, resilient, and better prepared for the challenges and opportunities of the green and digital transitions. To that end, the plan includes 83 investments and 32 reforms.

They will be supported by €13.9 billion in grants and €2.7 billion in loans. 38% of the plan will support climate goals, while 22% will promote the digital transition. The recovery strategy emphasizes Portugal's commitment to fostering sustainable development as a cornerstone of its

economic recovery. By putting sustainability first in all sectors, the country hopes to achieve long-term growth, resilient industries, and a greener future that benefits both the economy and the environment.

Portugal's plan supports the green transition with a €300 million investment program to improve the energy efficiency of residential buildings. This investment is accompanied by additional investments in public building energy efficiency. Over €600 million in metro network extensions in Lisbon and Porto will make transportation more sustainable. Furthermore, the plan calls for the private sector to build 15,000 electric vehicle charging stations by 2025. Portugal's ambition to increase renewable hydrogen production is supported by €185 million. More than €800 million will also be allocated to greening industrial projects. (European Commission, s.d.)

4.3.2 General information on the projects

Initially, out of the total of 149 applications received for the strategy, 21 applications were directly categorized under the sector of Mobility, Logistics, and Space. This sector encompasses significant entities within the Portuguese economy, including leaders of specific sector in the country.

Furthermore, it is essential to underscore the existence of various sub-sectors relating to energy, transportation, mobility, and automotive industries.

Consequently, the tally of projects within this category amounts to 21. In accordance with the Phase I selection criteria, ten projects were assessed as highly commendable, representing 48% of the total, eight projects were deemed acceptable, accounting for 39%, and three projects were found to be ineligible, constituting 13%.

It can be deduced that merely ten companies have successfully met the requirements for advancement within the selection process.

4.3.3 Analysis of companies accepted and rejected in the selection phase

In the forthcoming assessment, it shall conduct a comprehensive analysis of companies that have recently undergone the selection phase, delving into both the accepted and rejected entities.

	Name of Company.	Sub-sector	Total Investement
Accepted	IMPRENSA NACIONAL - CASA DA MOEDA S.A.	Tecnologias Transversais e suas Aplicações	35 562 812 €
	PEUGEOT CITRÖEN AUTOMÓVEIS PORTUGAL, S.A.	Mobilidade, Espaço e Logística	145 255 349 €
	NOS COMUNICAÇÕES, S.A.	Energia	274 315 152 €
	NEURASPACE, S.A.	Automóvel, Aeronáutica e Espaço	25 998 640 €
	GEO SAT, LDA	Mobilidade, Espaço e Logística	259 032 546 €
	ALTRANPORTUGAL, S.A.	Transportes, Mobilidade e Logística	50 233 194 €
	EEA - EMPRESA DE ENGENHARIA AERONÁUTICA E		
	AUTOMÓVEL, S.A.	Mobilidade, Espaço e Logística	121 960 491 €
	CONTINENTAL ADVANCED ANTENNA, SOCIEDADE UNIPESSOAL LDA	Automóvel, Aeronáutica e Espaço	30 044 393 €
Rejected	POLISPORT PLASTICOS S.A.	Transportes, Mobilidade e Logística	258 056 568 €
	LINK CONSULTING - TECNOLOGIAS DE INFORMAÇÃO S.A.	Transportes, Mobilidade e Logística	37 769 756 €
	HORÁRIOS DO FUNCHAL - TRANSPORTES PÚBLICOS S.A.	Transportes, Mobilidade e Logística	35 364 254 €
	RANGEL DISTRIBUIÇÃO E LOGÍSTICA, S.A.	Automóvel, Aeronáutica e Espaço	27 377 041 €
	LUSOSPACE, PROJECTOS ENGENHARIA LDA	Automóvel, Aeronáutica e Espaço	77 010 403 €
	WEATHER STREAM, UNIPESSOAL LDA	Automóvel, Aeronáutica e Espaço	25 316 166 €
	RANGEL TRANSITARIOS, S.A.	Transportes, Mobilidade e Logística	25 591 191 €
	SANTOS & VALE SUL - DISTRIBUIÇÃO, LDA	Transportes, Mobilidade e Logística	45 305 489 €
	EVA - TRANSPORTES, S.A.	Transportes, Mobilidade e Logística	26 356 809 €
	PROEF, SGPS S.A.	Transportes, Mobilidade e Logística	48 240 951 €
	MITSUBISHI FUSO TRUCK EUROPE - SOCIEDADE EUROPEIA DE AUTOMÓVEIS S.A.	Transportes, Mobilidade e Logística	45 410 504 €
	SIMOLDES-PLASTICOS, S.A.	Automóvel, Aeronáutica e Espaço	26 177 081 €
	EARTH PROXIMITY LDA	Transportes, Mobilidade e Logística	58 110 984 €

Table 6. Results After the Selection Process for the 21 leaders - Mobility, Space and Logistics Sector

The evaluation of 21 company applications in the Mobility, Logistics, and Space sector resulted in an in-depth look of the selection phase outcomes. Only eight companies advanced after the second selection phase, as the above table shown.

Of the 21 submissions, the rejection of 13 companies provided valuable insights. While each company held an influential position in the industry, certain challenges emerged. Concerns focused primarily on demonstrating the feasibility of their proposals and defining long-term financial projections. These impediments prevented them from meeting the program's stringent evaluation criteria.

The program's chosen participants have been dominant entities in distinct sub-sectors of the Portuguese economy. The total investment in the sector under consideration is 7.131.847.368. The budget allocation of 6.874.422.409 was primarily directed towards the highly specialized domains of Automobile, Aeronautics, and Space, with the remainder invested in complementary sub-sectors such as Energy and Mobility.

4.3.4. Factors influencing the selection process

In the following segment of the analysis, we consider historical data spanning from 2017 to 2021, encompassing the total project leaders who were both accepted and rejected.

This inclusion of leaders, from both acceptance and rejection categories in both phases of the analysis, ensures statistical robustness and a well-balanced examination. This methodology mitigates potential biases and upholds data integrity by considering these leaders in both acceptance and rejection scenarios, thereby preventing any incomplete or skewed conclusions regarding their impact on the studied variables' outcomes.

Furthermore, this sub-section conducts an extensive descriptive analysis using a comprehensive analytical framework with multiple dimensions. It considers critical factors such as the degree of innovation, business competitiveness, productive specialization, capacity to amplify initial investments, potential economic value derived from innovative ventures, prospects for scaling, contributions to achieving carbon neutrality and improving energy resilience, quality of consortiums as measured by promoter competencies, and the economic and financial viability of the project proponents. Furthermore, it delves deeply into the anticipated impact of these initiatives on their respective regional development landscapes.

i. Degree of innovation

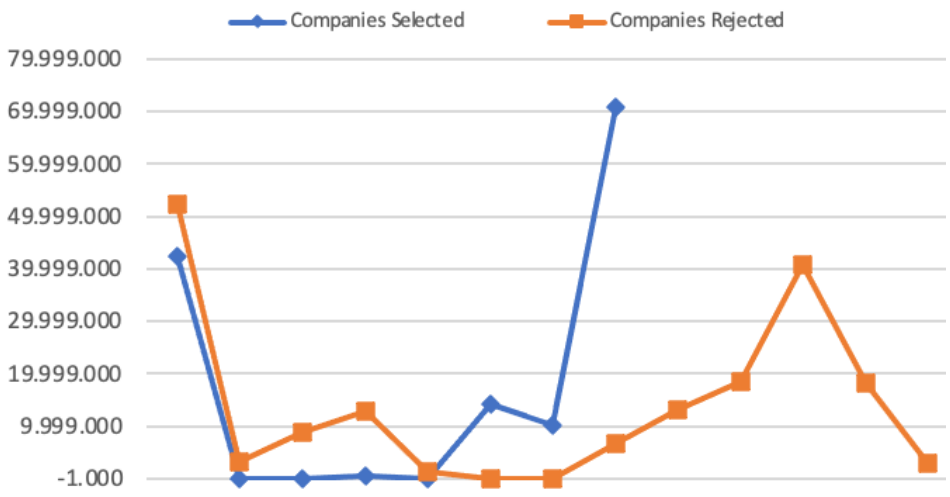


Figure 31. Added Value (€) 2017 – 2021 - Mobility, Space and Logistics Sector

The graphical representation, as illustrated in Figure 32, shows a distinct scenario wherein the trajectories of accepted and rejected companies exhibit a slight divergence in *Added Value.* The line tracking the progress of rejected companies showcases a singular peak, attributed specifically to the entity known as IMPRENSA NACIONAL - CASA DA MOEDA S.A. This particular entity demonstrates an average of €52,196,044 in added value over the temporal period from 2017 to 2022. This stands in stark contrast to the relatively consistent trend observed in the accepted companies' trajectory.

Notably, this elevated point represents a unique instance of exceptional performance among the rejected firms. However, beyond this remarkable peak, the line for rejected companies reveals a prevailing trend of generally lower values, averaging around €16,200,000. This resides below the average demonstrated by the accepted companies, which hovers at approximately €17,241,569. This intriguing contrast raises inquiries about the factors that underlie this brief yet remarkable surge in added value among rejected companies, while the persistently lower trajectory prompts consideration of the broader dynamics influencing their overall performance.

Additionally, it's worth noting that within the realm of rejected companies even if it is not clear from graph, one entity reports added values below zero, specifically EARTH PROXIMITY LDA.

ii. Business competitiveness and productive specialization

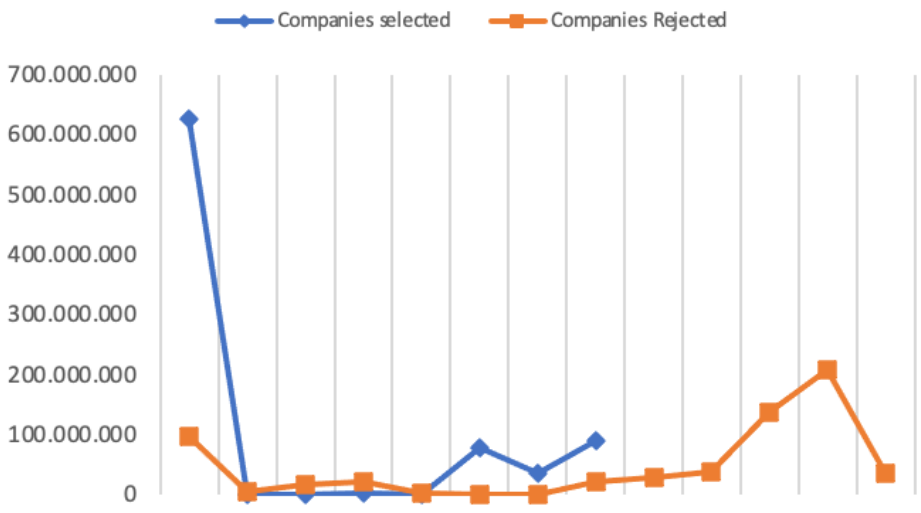


Figure 32. Operating revenue (€) 2017 – 2021 - Mobility, Space and Logistics Sector

The graphical representation depicted (Figure 33) is useful in investigating the complex dynamics surrounding the evaluation of Business Competitiveness and Productive

Specialization. The entities being considered for grant allocation have divergent trajectories, with a particular emphasis on the metric of operating revenue turnover.

The trajectory of accepted companies is notable in this analysis, with a prominent peak exemplified by the exceptional performance of PEUGEOT CITREN AUTOMOVEIS PORTUGAL, S.A., with an average operating turnover of €626,784,482 between 2017 and 2022. Following this ascendant peak is a comparable apex, this time representing a rejected entity, RANGEL DISTRIBUIO E LOGISTICA, S.A., with an average operating turnover of €208,013,635. In contrast, the overall trend among accepted companies is characterized by consistently strong operating revenue, which averages €104,052,362. Conversely, the trajectory of rejected entities reveals a descending arc, indicative of waning momentum in the realm of productive specialization. A cross-sectional observation reaffirms this disparity, with accepted entities generally commanding higher operating revenue. In summary, the graph, supported by its trend lines, unveils a complex narrative, providing insights into the intricate interplay between business competitiveness, productive specialization, and the outcomes resulting from the grant allocation process.

iii. Capacity to leverage the investment

Figure 33. Total Assets (€) 2017 – 202 - Mobility, Space and Logistics Sector

Figure 34. Shareholders´ Funds (€) 2017 – 2021 - Mobility, Space and Logistics Sector

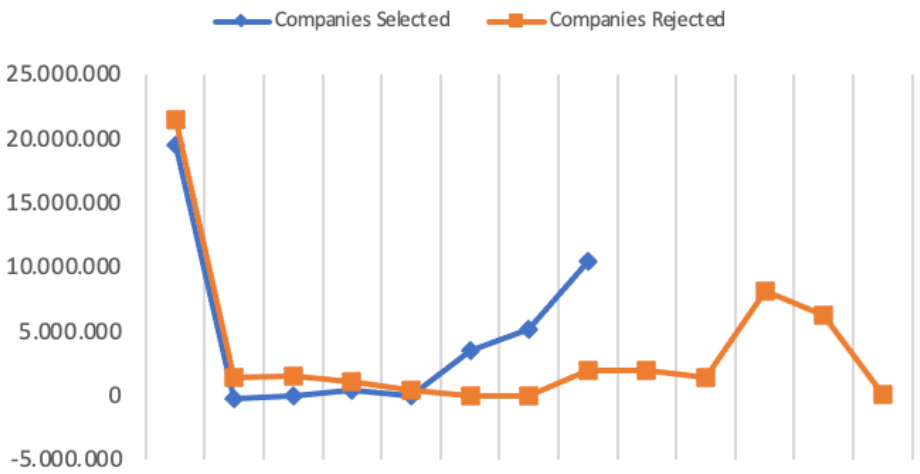


Figure 35. Cashflow (€) 2017 – 2021 - Mobility, Space and Logistics Sector

The set of graphical representations presented here serves as a platform for investigating the complex dynamics underlying companies' ability to capitalize on investment opportunities. This investigation is aided by a thorough examination of three critical financial metrics, namely total assets, shareholders' funds, and cash flow, each averaged over the period from 2017 to 2022.

The Total Assets metric represents the total value of the company's assets, and it serves as an indicator of the company's ability to use these assets for investment purposes. Surprisingly, leaders associated with rejected projects had higher total assets value on average (shown in Figure 34). The average value for rejected companies in the Total Assets variable is approximately 52,456,789, whereas accepted companies have a notably lower average value of 42,367,400.

For the accepted companies, with an average Shareholders' Funds of 33,629,395, it suggests that these companies have a stronger financial base contributed by shareholders. This can be beneficial because it shows their potential to use this wealth for a variety of purposes, including investment opportunities. The greater average Shareholders' Funds in this category may signify a larger financial buffer, thus improving their financial stability and capacity to embark on new

endeavors. The rejected firms, on the other hand, had a lower average Shareholders' Funds number of 21,116,010. This implies less capital input from stockholders. While this does not necessarily imply financial insecurity, it does suggest that these companies have a more constrained resource base to support and leverage investment prospects. To acquire a thorough knowledge of the companies' overall financial health and eligibility for investment projects, this statistic must be considered with other financial indicators and factors influencing the selection process.

Cash flow (Net Income before D&A) represents the cash generated by the company's operations and can indicate the company's ability to generate enough cash flow to support and leverage investment opportunities. Accepted project leaders had more cash flow than rejected projects on average as Figure 36 shown, but the general trend of the two groups is similar; the graph does not show an important difference.

Combining Total Assets, Shareholder Funds, and Cash Flow charts into a single visualization can be a powerful trend analysis tool. By observing how these variables interact over time, trends can be identified.

iv. The potential economic value of innovation and scalability

Figure 36 Profit Margin (%) 2017 – 2021 - Mobility, Space and Logistics Sector

This graph investigates how businesses manage their potential for innovation and growth. To accomplish this, a key financial metric known as profit margin can be used, which examines how much profit a company makes in relation to its revenue.

It's worth noting that both accepted and rejected trajectories have a lot of peaks. Notably, the average profit margin for accepted entities is 4%, while the corresponding average for rejected entities is 5%.

The profit margin metric, at its core, is a conduit for determining a company's ability to translate innovation and scalability into tangible economic outcomes. Peaks in the trajectories highlight instances where these characteristics translate into favourable financial outcomes. Profit margin variations demonstrate that both the accepted and rejected groups face challenges.

v. Contribution of the project to carbon neutrality and energy resilience

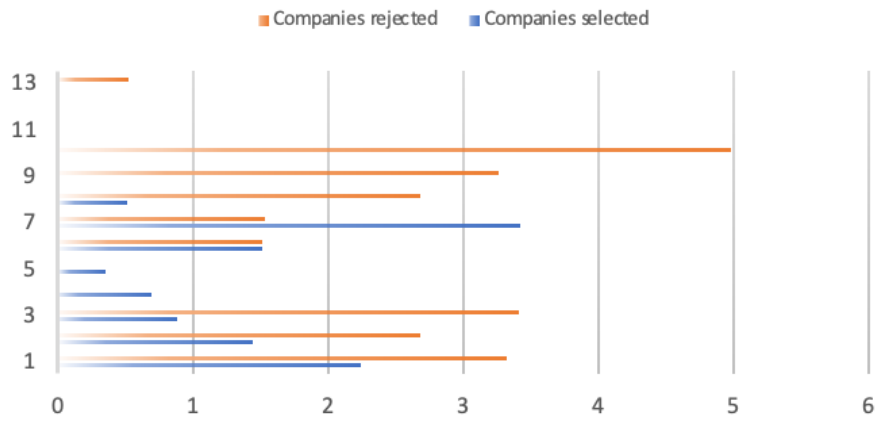


Figure 37. Environmental Score by Trucost - Mobility, Space and Logistics Sector

Regarding Trucost's Environmental Risk Score, as shown in Figure 38, the average value of the companies accepted is lower than the ones denied. For the years 2017-2021, the average Environmental Risk Score of all accepted companies was 1.38, which was lower than the value of all rejected companies of 3. This indicator demonstrates the significance of the environmental theme in the project's conclusion.

vi. Quality of the consortium in terms of the promoters´ competencies

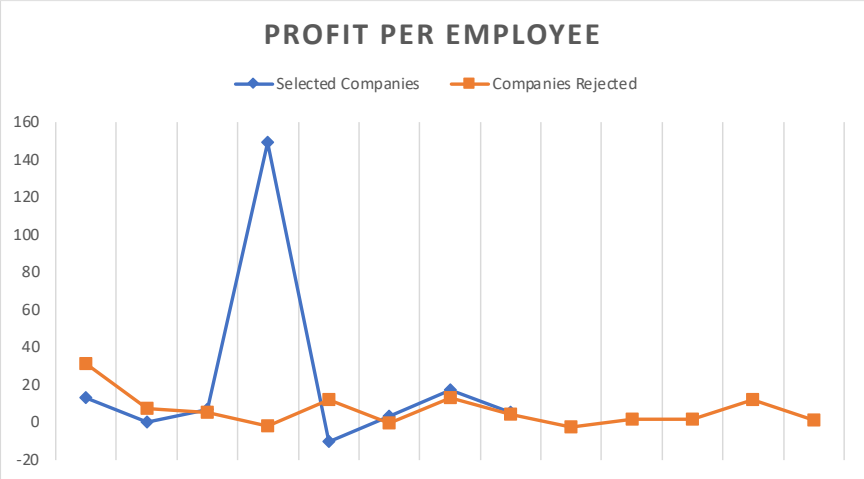


Figure 38. Profit per Employee 2017 – 2021 - Mobility, Space and Logistics Sector

On average, leaders in charge of the chosen projects displayed a significant profit per employee of 26, which markedly outperformed the figure of a minimum number associated with leaders overseeing projects that were not selected. This underscores the clear advantage held by accepted companies in terms of their efficiency in generating profits relative to their workforce.

Economic and financial viability of the proponents

Figure 39. ROE Using P/L Before Tax (%) 2017 - 2021 - Mobility, Space and Logistics Sector

Figure 40. P/L Before Tax (%) 2017 - 2021 - Mobility, Space and Logistics Sector

The graph illustrating P/L before tax values demonstrates a contrast between accepted and rejected proponents, indicating a probable variance in their financial success. Notably, accepted proponents had slightly greater P/L values than their rejected counterparts. The presence of some peaks indicates the possibility of outliers within the dataset, which may correlate to uncommon situations of extraordinarily high earnings.

The first graph, which depicts the ROE using P/L before tax, shows three distinct peaks below zero, indicating instances of negative ROE, particularly for the companies dismissed. These are examples of initiatives that may have failed to deliver sufficient returns in proportion to the invested equity.

4.3.5. Conclusion

In this section, the Stata analysis appears to produce results indicating a lack of statistical significance among variables related to mobility, transportation, and space. Despite scrutiny, it appears difficult to develop a reliable forecasting model for a company's acceptance or rejection into the program solely based on financial factors using data from the Orbis Dataset. This result could imply that the interplay of factors determining acceptance or rejection is

more complex than previously thought. Furthermore, the minor statistical significance observed for these variables highlights their limited impact in elucidating the acceptance or rejection dynamics.

This result serves as a valuable reminder of the complexities that are frequently inherent in empirical study, emphasizing the importance of considering broader contextual aspects and pursuing other lines of investigation to gain a thorough grasp of the research issue. This investigation has been limited to a group of twenty-one leaders and twenty-nine compromotores who faced acceptance or rejection at the final selection stage. While the lack of statistical significance in the mobility and transportation sector variables is perplexing, it highlights the need for a more comprehensive understanding of the intricate dynamics influencing program participation, as well as the importance of investigating additional contextual factors that may contribute to more accurate forecasting models.

The study reveals a subtle distinction between entities that are accepted and those that are rejected. Based on the characteristics under consideration, the organizations accepted into the program regularly outperformed their rejected counterparts. These executives demonstrated exceptional financial stability, profitability, and overall toughness. This distinction emphasizes the program's stringent selection requirements as well as the critical importance of strong financial management for firms aiming to pioneer breakthrough activities in this area.

Furthermore, our analysis emphasizes the importance of financial data in decision-making. It highlights how important data-driven insights are in selecting prospective candidates for government-backed investment initiatives. Our findings highlight the relevance of data-driven evaluations for making informed decisions and advancing strategic objectives in a period of rapid technology innovation and altering market dynamics within the Mobility, Space, and Transport sector.

Finally, our research highlights not only the differences between accepted and rejected enterprises in this industry, but also the critical significance of financial data in determining the landscape of innovation and growth in Portugal's Mobility, Space, and Transport domain.

4.3 Sector: Natural Resources and Environment – (by Sara Gálvez Gutiérrez)

4.3.1. Overview of the thematic area

Europe is home to a diverse range of natural resources and environments that play a significant role in its economy and environmental sustainability. Key areas of focus include agro-food production, forests, the economy of the sea, and water and environmental conservation.

Agriculture and food production´s significance is crucial due to global trends like the need for trustworthy sustenance for a growing population and increased health-consciousness, yet in Portugal, the agro-food and forestry sector has been losing weight in the national economy. This is reflected by evaluating the weight of agriculture GVA in % of GDP (which was 8.9% in 1980, 2.4% in 2000 and only 1.7% in 2021) (Grupo CaixaBank, 2023).

Unfavorable weather, increased energy and production costs linked to the Russian invasion in Ukraine have led to elevated industry producer prices for food, driving higher food index inflation (17.48%[1]) (Word Bank, 2023) than the overall inflation rate (8%) (European Commission, 2023) and several products in the sector, including meat, cereals, and fruits, exhibit external dependence due to insufficient national production for domestic consumption, reflected in degrees of self-sufficiency of 80%, 20% and 77% respectively (Instituto Nacional de Estadística, 2021). In contrast, olive oil and wine industries exhibited improved productivity and trade balance from 2020 to 2021, with wine production rising by 14.7% to 7.2 million

[1] This value of food index's inflation rate on average between January and May of 2023.

hectoliters and olive oil reaching a record 2.29 million hectoliters (Instituto Nacional de Estadística, 2021).

Ongoing supply threats brought on by the conflict in Ukraine prompted in 2022 a focus on cereals and fertilizers due to low self-sufficiency levels and reliance on conflict-involved nations (Grupo CaixaBank, 2023). In the 2020/2021 agricultural year, autumn/winter cereal production marked a 35-year low at 189.2 thousand tons, underscoring sector-wide reductions (Instituto Nacional de Estatìstica, 2021).

Secondly, Europe's **forests** are essential for biodiversity, climate regulation, and raw material provision, including exports of forest products in Portugal, accounting for around 8% of exports in 2021 while comprising less than 4% of imports (Instituto da Conservação da Natureza e das Florestas, 2022). However, the sector's vulnerability to market developments elsewhere is evident, with forest product exports declining from 11% of Portuguese international trade in 2000 to nearly 8% by 2021, mainly due to the COVID-19 pandemic crisis, which hit wood-related industries unevenly (Instituto da Conservação da Natureza e das Florestas, 2022). Besides the pandemic, the impacts of wildfires threatening raw material supply are crucial. However, Portugal's forest fires have decreased since 2017, with 2021 experiencing 15% fewer rural fires compared to 2020, reflecting a declining trend (Instituto da Conservação da Natureza e das Florestas, 2022).

Thirdly, Europe's extensive coastline and Portugal's oceanic expanse with 2,500 km of coastline and a vast exclusive economic zone (1.7 million km2)[2] highlight the significance of the **Economy of the Sea** or "Blue Economy." This sector encompasses fishing, aquaculture, maritime transport, offshore energy, and coastal tourism sustainably, as evidenced by the National Strategy for the Sea 2021–2030 (Direção-Geral de política do mar, 2023) and backed

[2] The Portuguese maritime triangle, which includes the Mainland, Madeira, and Azores, accounts for 48% of all marine waters in areas near to the European continent that are governed by two EU members (República de Portugal, 2021).

by initiatives like the European Maritime, Fisheries and Aquaculture Fund 2021-2027 (European Commission, 2023). Notably, when comparing 2018 to 2015, Portugal experienced a substantial increase in marine product exports (25%), Blue Economy businesses' GVA (30%), and Merchant Navy (94%), indicative of the sector's rapid growth and its substantial contribution to national GVA (2.3% in 2023) and employment (5%) (International Trade Administration, 2020). Portugal's pioneering projects like Winfloat85's scaling from 2 MW to 25 MW have solidified its leadership in this realm, with projects like these reflecting the nation's pivotal role in the "Blue Economy" sector (European Commission, 2023).

Finally, **Water resources and environmental conservation** are prominent EU priorities as emphasized through the EU Water Framework Directive (WFD)[3] (Europenan Parliament, 2023). While Portugal's southern regions increasingly rely on storage for water supplies, the northern regions benefit from ample natural water resources, with Spain sharing basins under the Spanish-Portuguese Albufeira Convention (United Nations, 1998) creating significant degree of external dependence. Portugal's water supply and sanitation connectivity approach the EU average, but network performance lags, impacting compliance with the Urban Wastewater Treatment Directive (OECD, 2023).

The EU's commitment to the sector is evident in the "Horizon Europe" program's establishment, with a budget of €95.5 billion addressing climate change, UN Sustainable Development Goals, and boosting competitiveness (European Commission, 2023). In addition to the different programs and strategies mentioned above, the Natural Resources and Environment sector has been prioritized in the MABI´s strategy, which is reflected in Portugal's NRRP.

[3] The WFD is a legal framework to protect and restore clean water in the EU and to ensure its long-term sustainable use (Europenan Parliament, 2023).

4.3.1. General information on the projects

Initially of the 149 project applications to the strategy 12 were directly classified in the Natural Resources and Environment sector, eventually one additional one (led by Altri Florestal S.A.) was reclassified from Industries and Production Technologies to Natural Resources and Environment due to its component supporting the forest economy. Therefore, there are 13 projects submitted in this category Table 7.

Accepted projetcs

Leader name	Thematic sub-area	Investment	Co-promoters
Altri Florestal, S.A.	Forestry and other forestry activities	€ 150,983,011.06	59
Gran Cruz Porto	Production of ordinary and liqueur wines	€ 91,624,402.50	52
Inovamar, LDA	Research and development in biotechnology	€ 168,375,955.71	89
Mc Shared Services, S.A.	Manufacture of soft drinks and other non-alcoholic beverages, n.e.c.	€ 142,391,205.20	54
Totals		€ 553,374,574.47	254

* Investment distributed among three major subsectors: forestry (27%), agro-food (42%) and Economy of the Sea (30%).
*Allocation of funds: productive investment (49%) and research and technological development (45%), dissemination and promotion (3%), qualification and internalization (2%) and human resources (1%).

Rejected projecs

Leader name	Thematic sub-area	Investment	Co-promoters	Results of selection
Be Water, S.A.	Water and Environment	€ 58,939,841.00	26	Eligible Not Selected
Ovolider - Ovos Do Centro LDA	Water and Environment	€ 43,639,415.00	21	Eligible Not Selected
C. M. E. - Construção e Manutenção Electromecânica S.A.	Agri-food	€ 95,613,969.00	89	Not Eligible
A4F, Alga Fuel, S.A.	Water and Environment	€ 88,826,730.00	21	Eligible Not Selected
Agromontesinho - Casa Agricola de Vinhais, LDA	Water and Environment	€ 36,664,236.00	20	Eligible Not selected
Xsealence - Sea Technologies S.A.	Sea Economy	€ 20,354,262.00	14	Eligible Not Selected
SGS Portugal - Sociedade Geral de Superintendência S.A.	Forestry	€ 66,110,151.00	43	Not Eligible
Edia - Empresa de Desenvolvimento e Infra-Estruturas do Alqueva S.A.	Water and Environment	€ 99,356,545.00	50	Not Eligible
Ba Glass Portugal, S,A.	Water and Environment	€ 24,653,967.00	9	Not Eligible
Totals		€ 534,159,116.00	293	

* Investment distributed among four major subsectors: Forestry (12%), agro-food (18%) and Economy of the Sea (3%) and water and environment (67%).

Table 7. Accepted and rejected projects - Natural Resources and Environment Sector

4.3.2. Analysis of companies accepted and rejected in the selection phase.

For the "Natural Resources and Environment" sector, a total of 429 entities applied. Taking into account that the ultimate objective of the strategy is improving the competitiveness and economic development of productive companies in Portugal, 87 entities classified as "Public Administration, Education, Health Social Services", 26 classified as associations of producers

/ cooperatives and 21 Academic Institutions were eliminated. Therefore, the universe was reduced to 298 entities. There was also no information available for 36 of them and 8 were not found in the very comprehensive data base of Orbis, so they were also excluded leaving a sample of 254 companies.

According to the rules of the NRRP Strategy, it was possible for an entity to participate in more than one project. As a result, within the group of 254 entities, 17 (6.7%) of them are repeated in both selected and rejected projects. In this part of the analysis, historical information from 2017 to 2021 from both selected and rejected project leaders (13 leaders) as well as information from the rest of co-promoters and leaders for the year 2021 (254 - included the ones both rejected and accepted) is considered.

Including leaders belonging to both categories (selected and rejected) in this part of the analysis avoids possible biases and maintains the integrity of the data by taking these companies into account in the selection and rejection scenarios, avoiding incomplete or biased conclusions about their influence on the results of the variables studied.

Degree of innovation and differentiation

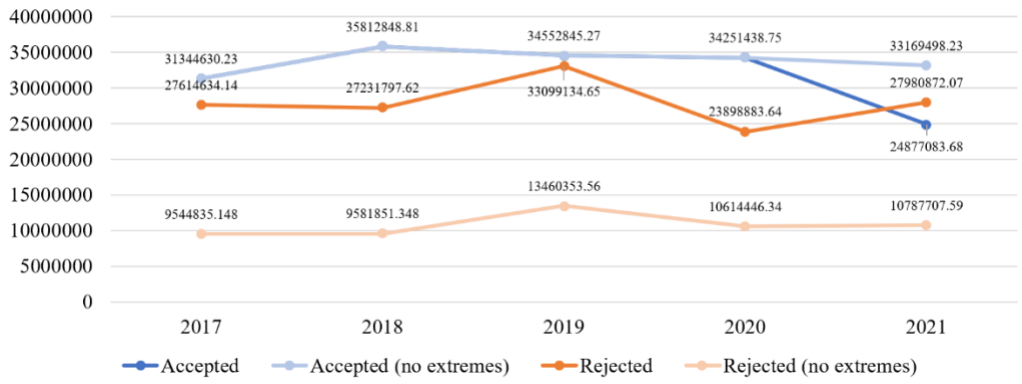


Figure 41. Added Value of Leaders 2017 - 2021 - Natural Resources and Environment Sector

Regarding the **added value**, although the trends among several of the leaders are similar and overall higher than leaders with rejected projects, in 2021 the trend seems to change, being outperformed for the first time by the group of rejected projects as seen in figure 43.

It is important to notice that Inovamar, L.D.A, a leader of a selected project, is the only one in its group with a negative value added (€ -160). However, this company was created in 2021 as a Business Services institution and it is part of the Sociedade Francisco Manuel Dos Santos, Sgps S.E., an entity with presence in 6 countries and an important financial muscle. In fact, for 2022 its added value increases to €5927,86. Excluding this leader for its characteristics, as can be seen in Figure 43, in 2021 the companies with selected projects remain above the other group which can indicate their ability to differentiate its products or services.

BA GLASS PORTUGAL S.A. is the leader with the highest aggregate value (€165,526,187.9) and is among the leaders with rejected projects. This is followed by significantly less amount by MC Shared Services S.A (€68,062,028.45). The remaining leaders have values ranging from €333,124 to €33,789,510.

The aggregate Added Value of all of the accepted companies for 2021 was €16,693,149.21, significantly higher than the value of all of the rejected companies of €12,332,766.14. This trend does not change even excluding outlier performance (Added value of accepted leaders of €11,910,834.9 compared to €11,297,675.4 of the rejected ones).

Business competitiveness and productive specialization

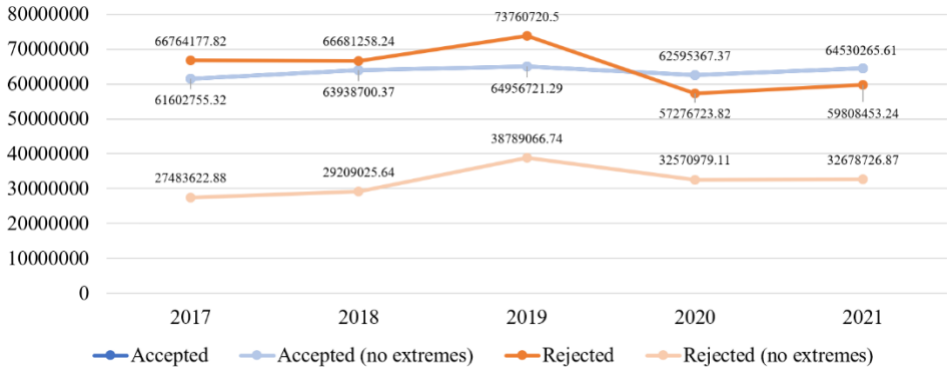


Figure 42. Operating Revenue of Leaders (Turnover) 2017 – 2021 - Natural Resources and Environment Sector

Regarding the Operating Revenue, and including all leaders, in figure 44 it is possible to see a trend where those selected remain below those rejected from 2017 through 2019 with a drop in 2020 that left them below those selected through 2021. However, from a closer look, this position is leveraged by only one of the rejected leaders: BA Glass Portugal, S.A.

BA Glass Portugal, S.A. is by far the leader with the highest amount of operating revenue (€276,846,264) only followed by C. M. E. - Construção E Manutenção Electromecânica S.A. (€123,726,149). However, if BA Glass Portugal, S.A. is excluded, leaders with selected projects have on average a higher operating revenue (€63,524,762) than those with rejected projects (€32,146,284.2) which can indirectly indicate their impact on business competitiveness.

For 2021, the Operating Revenue of all of the selected companies was €58,575,574, higher than the value of all of the rejected companies of €43,514,524.05. This trend does not change even excluding outlier performance (Operating Revenue of accepted leaders of €47,992,360 compared to €34,142,689.4 of the rejected ones).

Capacity to leverage the investment.

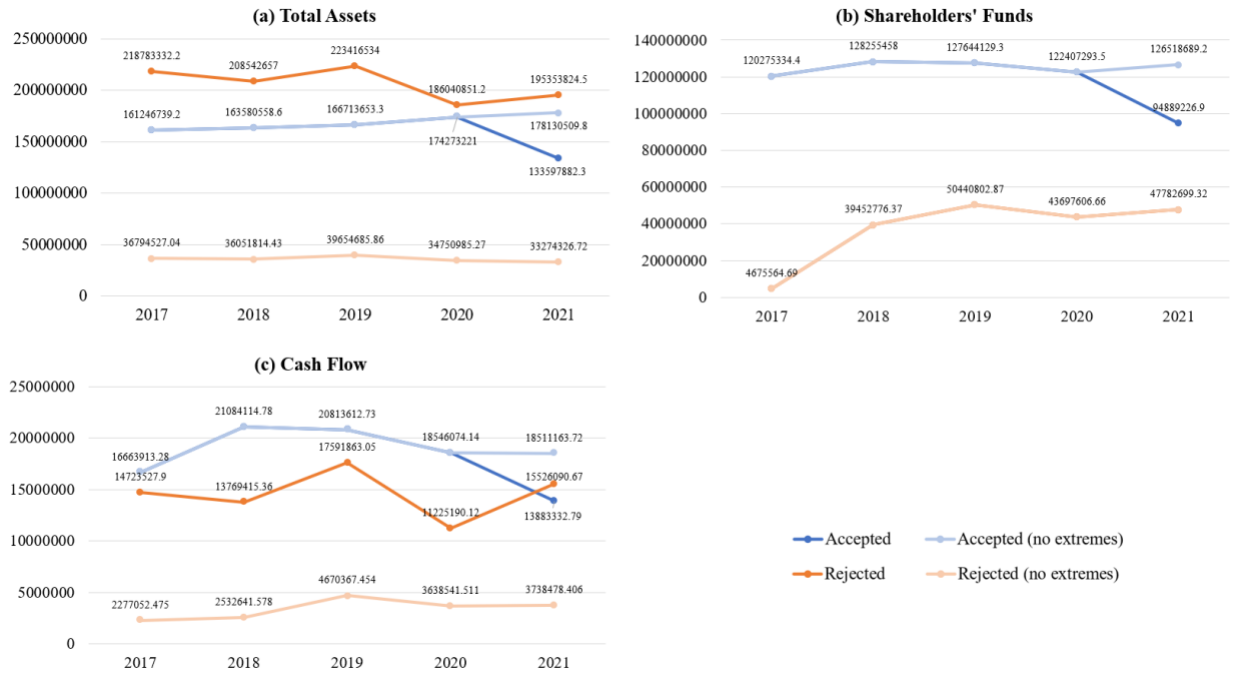


Figure 43. Total assets, Shareholders´ Funds and Cash flow of Leaders 2017 – 2021 - Natural Resources and Environment Sector

Regarding **Total Assets**, on average leaders with rejected projects had higher values as seen in figure 45 (a). This result is leveraged by two of their leaders EDIA - Empresa de Desenvolvimento e Infra-Estruturas do Alqueva S.A. (€790,455,964) and BA Glass Portugal, S,A. (€777,901,750), since without these two, the rest of the leaders of rejected projects would have total assets in average of €36,000,873.2, significantly lower than the accepted project leaders, even including Inovamar, L.D.A., which, as previously explained, due to its characteristics, affects the average of the group of accepted projects downwards.

For 2021, the Total Assets of all the selected companies was €88,082,009, higher than the value of all of the rejected companies of €66,715,157. This trend does not change even excluding outlier performance (Total Assets of selected companies of €62,373,005 compared to €47,311,149 of the rejected ones). This result can indicate the capacity of accepted companies to leverage those assets for investment purposes.

Regarding **Shareholders Funds,** on average, and even including Inovamar, L.D.A, the leaders of selected projects have higher shareholder's Funds (€118,694,288.4) than leaders of rejected projects (€37,209,889.9) as seen in figure 45 (b). For 2021, the Shareholders Funds of all the selected companies were €35,353,501.83, higher than the value of all of the rejected companies of €24,967,902.08. This trend does not change even excluding outlier performance (Shareholders Funds of selected companies of €31,684,777.7 compared to €20,269,752.7 of the rejected ones). This can be an important factor in determining the company's ability to leverage additional investment.

Regarding **Cash flow (Net Income before D&A)**, on average, selected project leaders have had more cash flow (€18,198,209.54) than rejected projects (€14,567,217.42) as seen in figure 45 (c). During most of the time analyzed, the results of the rejected project leaders are lower than those of the accepted ones with the exception of 2021 where they outperformed selected projects by 1,642,757.885. However, if BA Glass Portugal, S.A. is not taken into account as it is considered an extreme case, the difference would increase significantly (on average the rejected ones would have €8,400,612.302 of cash flow) as shown in the figure 45.

For 2021, the Cash flow of all the selected companies was €9,021,225, higher than the value of all the rejected companies of €6,055,809. This trend does not change even excluding outlier performance (Cash flow of accepted companies of €6,015,740 compared to €5,354,652 of the rejected ones). This can show the ability to generate sufficient cash flow to support and leverage investment opportunities of the accepted companies.

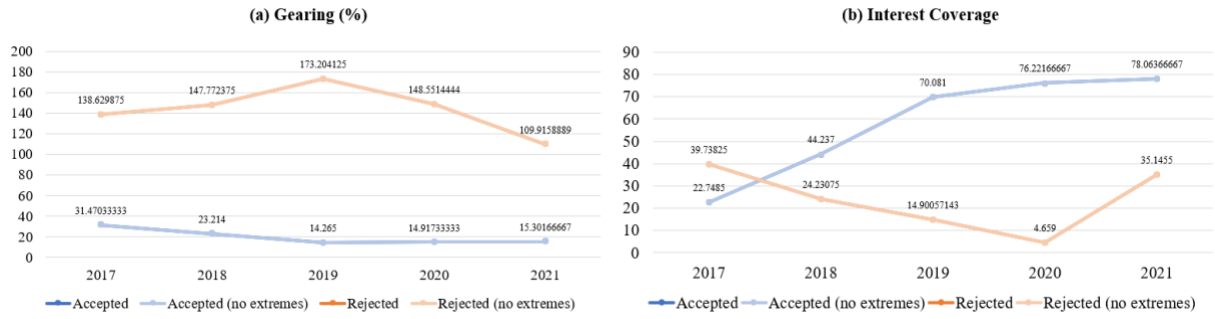


Figure 44. Gearing, Solvency Ratio and Interest Coverage of Leaders 2017 – 2021 - Natural Resources and Environment Sector

Regarding the variable **Gearing**, on average, selected project leaders had a gearing of 19.83 while unselected leaders of 143.61, showing that rejected leaders have a higher risk of financial failure. For 2021, Gearing of all of the accepted companies was 88.35, lower than the value of all of the rejected companies of 110,12. This trend does not change even excluding outlier performance (accepted companies of 85,15 compared to 92,64 of the rejected ones) as seen in figure 46 (a).

Regarding the **Interest coverage**, on average, the selected project leaders had a value of 58.27. This result was leveraged by Altri Florestal, S.A. (128,23). Without this leader the value would have been 33,83. It is important to note that there is no information available for Inovamar LDA. The leaders of non-selected projects had an interest coverage of 23.73. It is important to point out that there is no information available for SGS Portugal – Sociedade Geral de Superintendência S.A. As can be seen in figure 46 (b), the interest coverage of the selected project leaders in 2021 is significantly higher than that of those not selected.

For 2021, interest coverage of all the selected companies was 61.49, higher than the value of all of the rejected companies of 32.43. This trend does not change even excluding outlier performance (Gearing of selected companies of 42.80 compared to 28.06 of the rejected ones) which can show the higher ability of selected companies to pay interest on its outstanding debt.

Potential economic value of innovation and scalability

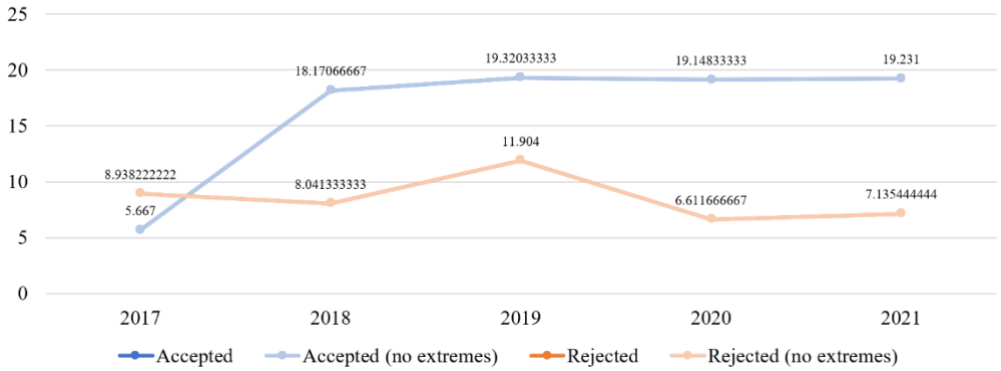


Figure 45. Profit Margin of Leaders 2017 – 2021 - Natural Resources and Environment Sector

Regarding the **Profit Margin**, on average, the leaders with selected projects had a value of 16.30, while those with rejected projects had a profit margin of 8.53 as seen in figure 47. It is important to highlight that within the group of rejected projects EDIA - Empresa De Desenvolvimento e Infra-Estruturas Do Alqueva S.A. has a negative value of -10.94. Without this leader, the average value would be 10.93, which is still significantly lower than the selected group. This trend is reversed when all the companies are included, since by 2021, the Profit Margin of all the selected companies was 3.2, lower than the value of all of the rejected companies of 4.18. This trend does not change even excluding outlier performance (Profit Margin of selected companies of 5.1 compared to 5.8 of the rejected ones). This result could indicate greater capacity to generate returns and leverage investment by rejected companies.

Contribution of the project to carbon neutrality and energy resilience

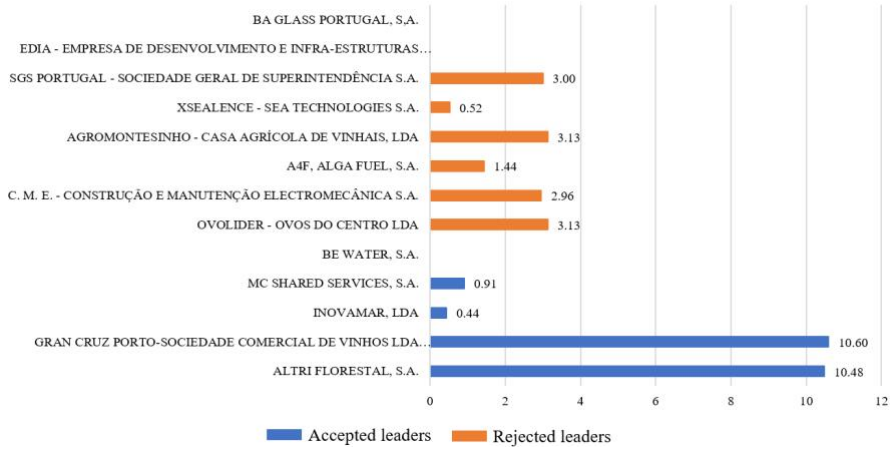


Figure 46. Environmental Score by Trucost 2020 - Natural Resources and Environment Sector

Regarding the Environmental Risk Score made by Trucost, and as shown in Figure 48, two of the four accepted leaders have a higher risk in environmental terms: Altri Florestal, S.A. and Gran Cruz Porto-Sociedade Comercial de Vinhos LDA (Granvinhos, LDA). For 2021, the Environmental Risk Score of all the selected companies was on average 12.98, lower than the value of all of the rejected companies of 35.38. This trend is reversed when excluding outlier performance (score of selected companies of 12.98 compared to 7.9 of the rejected ones).

Quality of the consortium in terms of the promoters´ competences

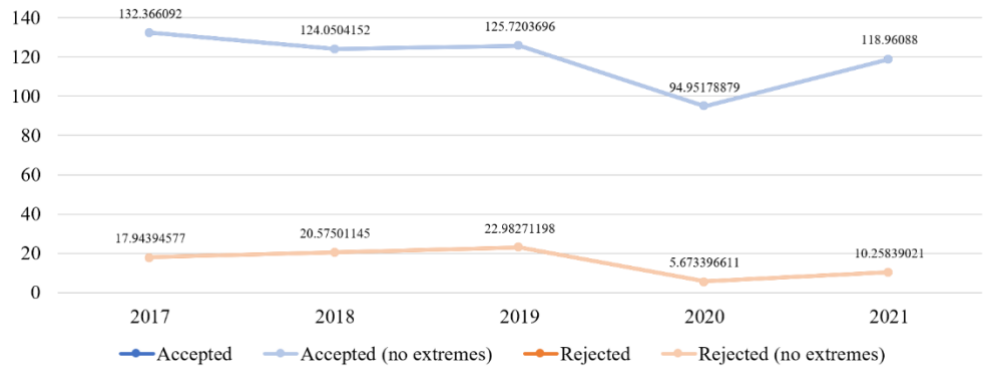


Figure 47. Profit per Employee of Leaders 2017 - 2021 - Natural Resources and Environment Sector

Regarding profit per employee, on average, leaders of selected projects had a value of 119.21 versus 15.49 for leaders with non-selected projects as seen in figure 49. For 2021, the profit per employee of all the selected companies was on average 25.59, higher than the value of all

the rejected companies of 16.35. This trend does not change when excluding outlier performance (value of selected companies of 15.55 compared to 9.96 of the rejected ones).

Economic and financial viability of the proponents

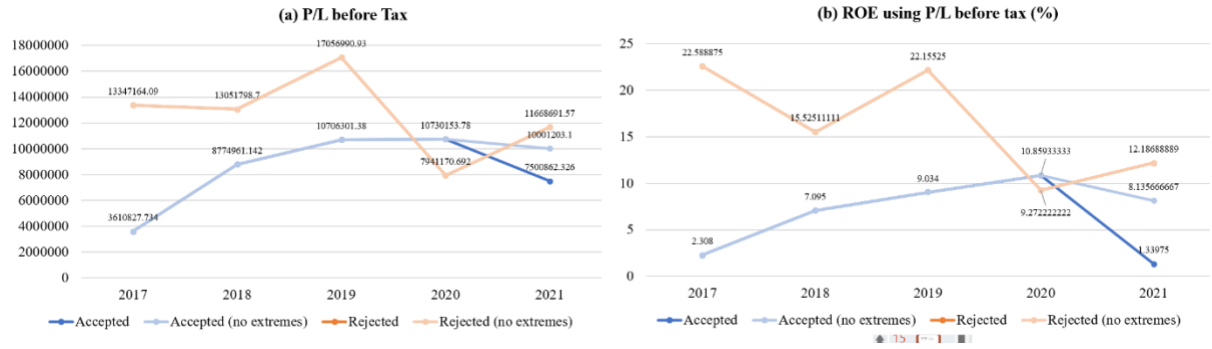


Figure 48. P/L Before Tax and ROE Using P/L Before Tax of leaders 2017 - 2021 - Natural Resources and Environment Sector

Regarding the **P/L Before Tax** (Pre-tax profit/loss) variable as seen in figure 50 (a), on average, rejected project leaders do not have a value higher than the selected ones until 2020 when this trend reversed showing that the rejected companies may have been more likely to be affected by the crisis resulting from the COVID-19 pandemic than the selected project companies. However, by 2021 the trend is again, with the rejected leaders (€11,668,691.57) positioning above the selected ones (€7,500,862.32). For 2021, the P/L Before Tax of all the selected companies was on average €4,875,836, higher than the value of all of the rejected companies of €2,956,157. This trend does not change when excluding outlier performance (P/L Before Tax of selected companies of €3,539,431 compared to €2,296,094 of the rejected ones).

The **ROE using P/L before tax** has a behavior similar to P/L Before Tax when talking about the leaders of projects both selected and rejected as seen in figure 50 (b). However, when talking about all companies, for 2021, the value of all the selected companies was on average 6.37, lower than the value of all of the rejected companies of 63401.26. This trend does not change when excluding outlier performance (value of selected companies of 5.15 compared to

10.74 of the rejected ones). In summary, on average, companies with selected projects have higher profits (before taxes) than companies with rejected projects. However, this trend is reversed for profits in relation to the equity invested.

4.3.3. Acceptance into the program based on entities´ financial indicators.

While selection or rejection depended mainly on the project that each consortium submitted, this section will explore if it can be predicted whether a business will be accepted or rejected into the program based on its financial and environmental indicators. With this goal, it is used a binary logistic regression. In this case, the independent variables are some features related to the companies (see Figure 5), and the dependent variable would be whether the company is part of a selected (1) or rejected (0) project.

Data Preparation and Cleaning.

Within the group of 254 entities, 17 (6,7%) of them are repeated in both selected and rejected projects. To ensure that the features used in the model are relevant and informative for both accepted and rejected groups this analysis exclude the companies simultaneously selected and rejected on different projects.

In this analysis, missing data is retained due to data heterogeneity, arising from diverse companies leading to variable data availability differences. This mirrors real-world variations in data collection and highlights authentic disparities between companies. Additionally, retaining missing values sustains dataset representativeness, ensuring findings accurately encompass the studied population. Removing cases with missing values risks introducing bias and compromising the broader applicability of results across a diverse spectrum of companies.

On the other hand, outliers can exert undue influence and lead to biased coefficient estimates. For this reason, Z-Scores were calculated for each variable and values outside of three standard

deviations from the mean were treated as outliers. A total of 37 outliers were removed leaving a sample of 199 companies.

The Binary Logistic Regression Model

A first model was run including almost all the variables included in the analysis of the previous section. Upon thorough examination, it was decided to eliminate Interest Coverage and Solvency Ratio from the model since the lack of information for several companies affects the number of observations, as well as the presence of another debt-related ratio variable such as gearing can cover this issue within the model.

A collinearity diagnostic was also run to identify if independent variables in the binary regression model including all the variables shown Figure 5 were highly correlated, or not, with each other. The VIF (Variance Inflation Factor) was used and variables with values greater than 10 were studied. As a result, added value, Profit per Employee, PL Before Tax, Cash flow, Total assets and Shareholders´ Funds got values greater than 10. The variables could be interconnected due to underlying economic relationships.

Total Assets and Shareholders' Funds are often closely related, as the latter is a component of the former, so the latter was eliminated. It is also possible that larger Total Assets might lead to higher Cash Flow, so this variable was also eliminated. With these adjustments, all the variables within the model shown below comply with the required VIF to be considered.

$$\begin{aligned} Acceptance = {} & \beta_0 + \beta_1\, Number\ of employees + \beta_2\, Added\ value + \beta_3\, Operating\ revenue + \beta_4\, PL\ before\ tax \\ & + \beta_5\, ROE\ using\ PL\ before\ tax + \beta_6\, Profit\ margin + \beta_7\, Working\ capital + \beta_8\, IProfit\ per\ Employee \\ & + \beta_9\, Trucost\ 2020 + \beta_{10}\, CRIF + \beta_{10}\, Total\ Assets + \beta_{11} Gearing + \in \end{aligned}$$

Model Interpretation

The operational liquidity (Working Capital) and the Environmental Risk Score calculated by Trucost are statistically significant (P-values lower than 0.05) and all the coefficients are positive which indicates a positive relationship between the predictor variables and the likelihood of being selected occurring.

- The Working Capital coefficient of 1.49 suggests that for a one-unit increase in the variable, the log-odds of being selected increases by 1.49 units.
- The Environmental Risk Score coefficient of 0.06 suggests that for a one-unit increase in the variable, the log-odds of being selected increases by 0.06 units.

As seen in the Annex 7, an LR chi2(11) (Likelihood Ratio chi-squared) value of 44.47 indicates that the model with the predictor variables provides a significantly better fit to the data compared to a model with no predictors. The Prob > chi2 value of 0.0000 associated to the previous result suggests that the chi-squared statistic is extremely unlikely to have occurred by random chance alone. In other words, the p-value is effectively zero. This indicates strong evidence against the null hypothesis, supporting the conclusion that the predictor variables collectively have a highly significant effect on the outcome variable.

The Pseudo R2 of 0.2002 suggest that the predictors in the model collectively contribute a moderate amount of explanatory power. This value indicate that the model is explaining a substantial portion of the variation, but there might still be room for improvement.

Model Assessment

In order to assess model fit, the Hosmer-Lemeshow test was used (See Annex 8). With 162 observations, the results show a Prob > chi2 of 0.3805, which indicates that there is not strong evidence to reject the null hypothesis (the model's predicted probabilities align well with the observed outcomes, indicating good model fit and calibration). This suggests that the model's

predicted probabilities are reasonably well-calibrated to the observed outcomes. A Hosmer–Lemeshow chi2(8) equal to 8.46 indicates that a chi-square statistic as extreme as 8.46 can be expected to occur about 38.95% of the time due to random chance.

Model limitations and future research

The current model, while providing valuable insights, is subject to certain limitations and considerations. Missing values could affect the overall accuracy and generalizability of the results. Although proxy variables are employed, it is important to assess their appropriateness and explore further options to fully capture the underlying relationships. The relationship between environmental risk score and outcome presents complexities that require further investigation, including potential omitted variables and interaction effects.

Future lines of research encompass addressing missing data issues, refining proxy variables, and delving into the impact of omitted variables. Exploration of advanced modeling techniques can shed light on complex dynamics and improve the predictive capability of the model for more informed decision making.

4.3.4. Conclusions

On average, the performance of companies with approved projects in 2021 in terms of Company Size and Resources (Number of Employees, Total Assets and Shareholders' Funds), Liquidity and Risk (Working Capital, Interest Coverage, Solvency Ratio, Gearing, CRIF), Environmental and Social Factors (Trucost_2020) and Financial Performance and Efficiency (Operating Income, Profit per Employee, PL before Taxes, Cash Flow, ROE using PL before Taxes) was better than that of companies with rejected projects. The only exceptions were Profit Margin and ROE using pre-tax P/L (belonging to Financial Performance and Efficiency).

In trying to find out if it is possible to predict whether a company will be accepted or rejected in the program based on its financial and environmental indicators, it was found that both Working Capital and Environmental Risk Score are statistically significant. For working capital, the results suggest that that for a one unit increase in the variable, the log-odds of being selected increase by 1.49. This means that the liquidity of the companies and their ability to cover short-term obligations played a relevant aspect in belonging to selected projects or not.

For the Environmental Risk Score the results suggest that for a one-unit increase, the log-odds of being selected increase by 0.06. This is counter-intuitive, since higher values of the score indicate higher levels of risk should a company have to pay for its environmental damage, so a positive coefficient implies that the higher the risk of damage, the higher the probabilities of being selected. Some explanations may be related to aggregating various environmental factors into a single risk score as this could be masking individual factors' relationships with selection or also companies with higher risk scores might have better reporting practices or be more transparent about their environmental impact.

4.5 Health, Well-Being, and Territory - (by Vittoria Barbagallo)

To investigate, along with the previous case studies, the Mobilizing Agendas for Business Innovation strategy's acceptance dynamics on the Health, Wellbeing and Territory sector in the Portuguese economy, an overview of the thematic area will be presented.

4.5.1. Overview of the thematic area

Within this thematic area, many companies contributing to the Portuguese economy are included. Among them, companies in the health and tourism sectors, cultural and creative industries, those related to the audio-visual (i.e., television and multimedia production) and

finally the territory sector, encompassing construction, architecture, urban planning, real estate, and related industries.

First, the **health** sector in Portugal embraces various sub-sectors, including healthcare services, pharmaceuticals, medical devices, and biotechnology. Portugal's National Health Service (NHS) is a universal tax-financed health system, covering all residents. The NHS coexists with two other systems: the health subsystems, special health insurance schemes that provide coverage for specific professions or economic sectors, and the private voluntary health insurance (VHI) schemes. The VHI has a supplementary role facilitating access to private hospital treatment and consultations. In 2017 approximately 25% of the population was covered by a health subsystem or VHI schemes (de Almeida Simoes, Augusto, Fronteira, & Hernandez-Quevedo, 2017).

The country has been focusing on promoting medical research, innovation, and technological advancements in the healthcare sector. For many years before the COVID outbreak, Portugal has been spending less on health per capita and as a percentage of its total economy compared to the average in the European Union. In 2019, Portugal spent €2314 per capita on healthcare, which is 1/3 less than the EU average of €3521 per capita. Additionally, health spending in Portugal accounted for 9.5% of its GDP, which was lower than the EU average of 9.9%.

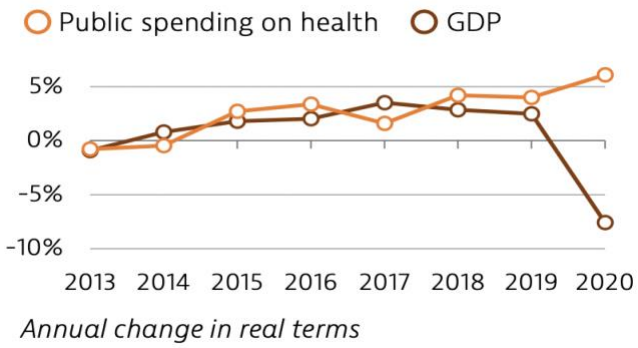


Figure 51 Public Spending on Health vs GDP (2013-2020)

However, due to the COVID-19 pandemic in 2020, there was an increase in public spending on healthcare, but at the same time, the country's GDP experienced a significant decline as

shown in the graph below (OECD/European Observatory on Health Systems and Policies, 2021).

Second, tourism plays a vital role for the Portuguese economy, contributing significantly to the country's GDP, job creation, and regional development. Before Covid-19, this sector in Portugal has shown significant growth, contributing 8.0% of the Gross Value Added (GVA) in 2018 and growing twice as fast as the overall economy. In the same year, it employed 9.0% of the working population, employing 413,000 people, and its growth rate was higher than that of the broader economy (OECD, 2020). As for tourism revenues after the Covid-19 crisis, and according to data from the Bank of Portugal, the accumulated 12 months of 2022 reached 21.1 billion euros, an amount 109.7% higher than in 2021 and 15.4% higher than in 2019 (Turismo de Portugal I.P. (TdP), 2017).

The sector is overseen by Turismo de Portugal, a public institution responsible for tourism development, regulation, and promotion. The government plays a role promoting policies and initiative to boost this promising economic sector. For example, the Tourism Strategy 2027 aims to drive economic, social, and environmental development in the country and position Portugal as a competitive and sustainable tourism destination (Turismo de Portugal I.P. (TdP), 2017). The strategy focuses on five pillars, including valuing historical and cultural heritage, boosting the economy through competitiveness and innovation, promoting knowledge and skills, generating connectivity, and enhancing Portugal's positioning as an attractive destination.

Several programs, such as Valorizar, Tourism 4.0, and the Revive program, focus on investment, innovation, sustainable tourism, and education and training. Turismo de Portugal also invests in data sources and monitoring frameworks to address knowledge challenges, especially related to sustainable tourism implementation. Finally, the Portuguese tourism sector

also emphasizes vocational and academic training, with a network of 12 hotel and tourism schools supporting over 8,000 students in developing entrepreneurial and innovative skills to contribute to the industry's advancement.

To continue, the **cultural and creative industries'** sectors, along with the audio-visual one, have suffered far worse than the national economy when facing the pandemic crisis, as measured by national GDP. Specifically, Portugal's 2020 losses ranged between approximately 30% and 35% (UNESCO, 2021). Yet, Portugal has a vibrant creative scene, with festivals, museums, galleries, and design events that showcase the country's cultural richness. The government supports the development of creative industries through funding, training, and initiatives that encourage innovation and entrepreneurship. Also, the government has implemented policies to enhance the internationalization of Portuguese cultural products and to support the participation of artists and creative professionals in international events and film festivals (ACE, 2020).

Finally, when referring to **territory**, the sector encompasses construction, architecture, urban planning, real estate, and related industries. The real estate sector is of the utmost importance to the Portuguese economy. Real estate and construction activities account for 7.3% of total employment and the construction sector was responsible for 8.1% of Portugal's GDP in 2018 (Belo & Gil Pinheiro, 2019). In their annual report, PwC presents how cities in Europe are capable to attract investments and capital.

Indeed, while the post-Covid period seen a unified recovery across Europe, this year's survey and interviews reveal a more fragmented response to the difficult market conditions, with varying levels of resilience among cities (PwC, 2023). Various factors are affecting how well cities are performing economically and how real estate investments are expected to yield returns. One crucial factor is the varying outlook for inflation among different countries, which

is influenced by their reliance on fossil fuels for energy. Additionally, differences in interest rates and the proximity to the war in Ukraine also impact the economic prospects of cities.

These variations in economic performance and real estate potential are essential considerations for investors and developers when deciding where to put their money. Despite this fragmented economic context, Lisbon stands out as an exception. It has risen from the 16th to the 11th position in the survey, indicating that it is performing better compared to other markets. Lisbon is experiencing strong demand from international investors, even if local investments may not be as prominent (PwC, 2023).

Demand in Portugal continues to grow. During the first three quarters of 2022, the total number of housing transactions in Portugal rose by 8% while transaction value increased 22.9% according to the Instituto Nacional de Estatística (PwC, 2023). All Portuguese regions saw strong to moderate increases in housing transactions over the same period. Also, the residential construction sector remains strong: in the first three quarters of 2022, licenses for new construction increased 3.1% as compared to the same period the previous year (PwC, 2023). In 2022, the Portuguese economy experienced significant growth, estimated at 6.7% compared to the previous year. This growth was robust, following a 5.5% expansion in 2021 and a sharp 8.4% contraction in 2020 due to the impact of the COVID-19 pandemic (PwC, 2023).

The strong economic recovery was mainly driven by a resurgence in tourism and increased private consumption. However, the pace of growth is expected to slow down significantly this year, with both the European Commission and the International Monetary Fund projecting a real GDP growth rate of only 0.7% (European Commission, 2023) (IMF, 2023). The Banco de Portugal has slightly more optimistic forecasts, expecting a growth of 1.5% in 2023 and 2% in 2024 (Banco de Portugal, 2023).

4.5.2. Information on the projects

As it was already mentioned, the selection process within the MABI was divided in different phases. Among the initial number of 143 consortia which submitted their applications, 18 were categorized as part of the thematic area of Health, Wellbeing and Territory. During the conclusive selection round, the number of qualified consortia was further narrowed down to 53, and among these, only 10 belonged to the Health, Wellbeing and Territory thematic area.

4.5.3 Analysis of companies accepted in the selection phase

The final stage of the selection process has unveiled the cohort of 10 consortia who are at the forefront of driving transformative change through the NRP's European funds for the Health, Wellbeing and Territory sector. These companies, accompanied by their co-promoters, are driving a constellation of innovative projects that have the promise to reshape industries and catalyze Portuguese progress. We now delve into the consortia and initiatives selected.

First, the area with most selected project was the health one, with a total of six consortia. Bluepharma - Indústria Farmacêutica S.A., with 6 co-promoters, got access to €79millions invested on the project “CiNTech” a technological pole of innovation and industrialization dedicated to complex injectable medicines that will be a center of unique competence in Portugal. The leader Als Life Sciences Portugal, S.A. with 11 co-promoters, received €25millions invested in “SMARTGNOSTIC”, a project that aims to develop technology to bring to the global market solutions capable of detecting and monitoring the existence and resistance of the specific microbiota.

Furthermore, the leader Mediceus Dados De Saúde, S.A. with 16 co-promoters, obtained a €24millions investment on the project Data 4 Life, that includes a complete system demonstrated to connect large-scale health data storage and processing units that will allow the development of dozens of projects that are still at the concept and idea stage in scientific and

academic research and in health care. Decsis II Ibéria, Lda with 13 co-promoters obtained an investment of €23millions bringing forward the project “D2 – Diabete Digital”, developed as an answer to the urgent problem of the type 2 diabetes that represent an important cost to the health sector in Portugal. Also, the leader Prológica - Sistemas Informáticos S.A. with 95 co-promoters had an investment of €136millions in the project “Pacto de Inovacao HfPT”, composed by 4 vertical macro projects that, in general terms, aim at implementing the Portuguese innovation and integration in the health sector. Finally, the leader Technophage, Investigação E Desenvolvimento Em Biotecnologia S.A. with only 3 co-promoters and an investment of €40millions aims at broader the horizon of the Portuguese medical and biological innovators development.

To continue, from the thematic area of cultural and creative industries (“Well-Being”), only one consortium was selected to receive the funding. Specifically, S.P. Televisão, S.A. with its 26 co-promoters and the Project “Agenda ICCAV_PT” received €67milions. The main objectives of the ICCAV_PT Agenda are to accelerate economic development, increase the country's cultural wealth and enable the country to produce and distribute its own content.

In the area of territory, three consortia were selected. The leader Bosch Termotecnologia S.A. with its 34 co-promoters received €143millions invested in the project “Agenda ILLIANCE”, for the Portuguese energy transition. Tmad - Soluções Em Madeira E Derivados, Lda with 40 co-promoters and an investment of €52millions, aims at developing the project “inovHabitat” a holist approach that has the goal of integrate value chains in different sector to boost the innovation of Portuguese companies. Finally, specifically for the tourism sector, Palminvest S.A. and its 34 co-promoters received a funding of €145millions to make the fundamental economic sector of tourism more modern and in line with other European countries.

4.5.4 Factors influencing the selection process

The following analysis is based on data retrieved from the already mentioned ORBIS database. Namely, specific variables were selected and analyzed to assess different criteria of the companies under investigation.

Degree of innovation

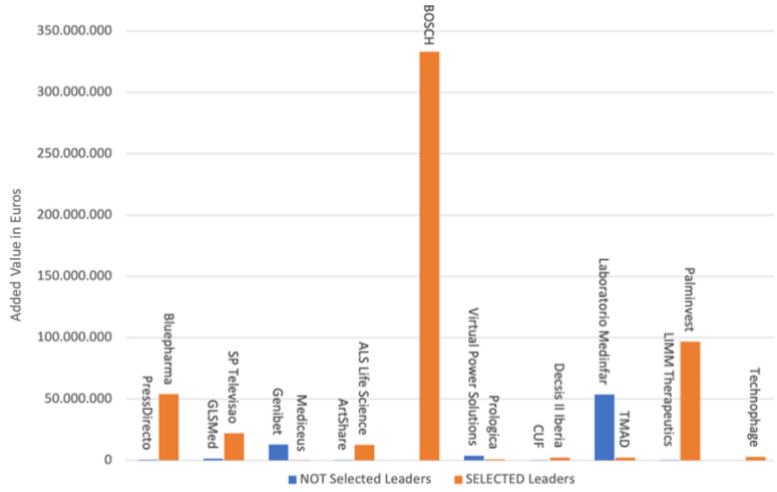


Figure 49. Added Value for the year 2021 - Health, Well-Being, and Territory

The variable "Added Value" indicates a company's ability to create value through its production process, and it is a crucial indicator of competitiveness and differentiation. As shown in the graph below, among the selected leaders, Bosch Termotecnologia S.A. stands out with the highest added value of 53,370,979. This points their significant contribution to the value chain and suggests a strong competitive edge in their sector. On the other hand, among the not selected companies, Laboratorio Medinfar shows the highest added value of 16,270,713, signifying its robust economic performance despite not being selected for NRP funds.

The data indicates that the selected leaders tend to exhibit higher added values compared to the not selected ones. This could imply that the selection process prioritizes companies with a

proven ability to create substantial value, possibly reflecting the program's intention to support and enhance the competitiveness of businesses that already demonstrate economic strength. However, it's essential to recognize that added value is just one aspect of a company's overall performance, and other factors may also play a role in the selection process.

Business competitiveness and productive specialization

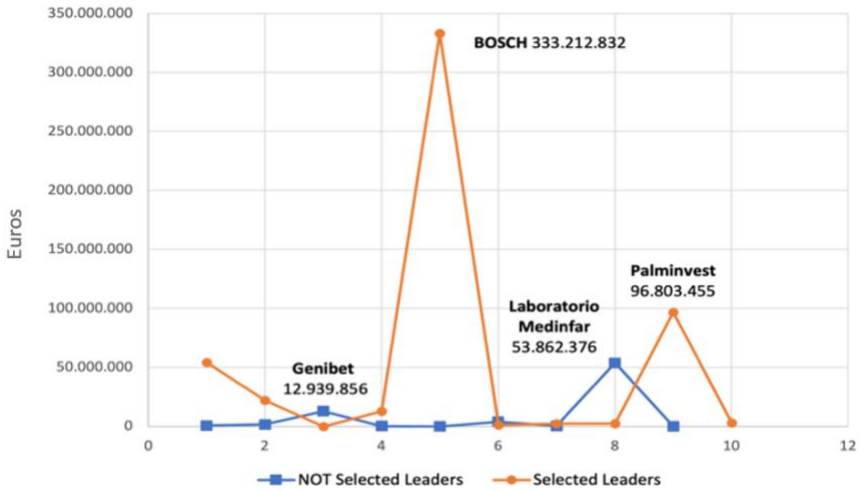


Figure 53. Operating revenue (Turnover) of Leaders 2021 - Health, Well-Being, and Territory

Examining key variables such as Operating Revenue (Turnover), Added Value, and, where available, R&D Expenses, offers a comprehensive view of how these companies contribute to both their competitiveness and the country's productive specialization.

Among the selected leaders, Bosch Termotecnologia S.A. emerges as a significant player with the highest Operating Revenue (Turnover) of 333,212,832 in 2021 as well as the company Palminvest, with the second-highest turnover of 96,803,455 in the same year. On the other hand, examining not selected leaders like Laboratorio Medinfar (with an Operating Revenue (Turnover) of 53,862,376 in 2020) and Genibet Biopharmaceuticals S.A. (with an Operating Revenue (Turnover) of 12,939,856 in 2020) offers a contrasting perspective. While not selected, these companies still contribute significantly to revenue generation, signifying their

relevance to the Portuguese business landscape. However, to comprehensively evaluate the impact on business competitiveness, it would be ideal to have R&D Expenses as a percentage of Operating Revenue data. This would reveal how much these companies invest in research and innovation, which is a crucial factor in maintaining competitiveness in modern markets.

Capacity to leverage the investment.

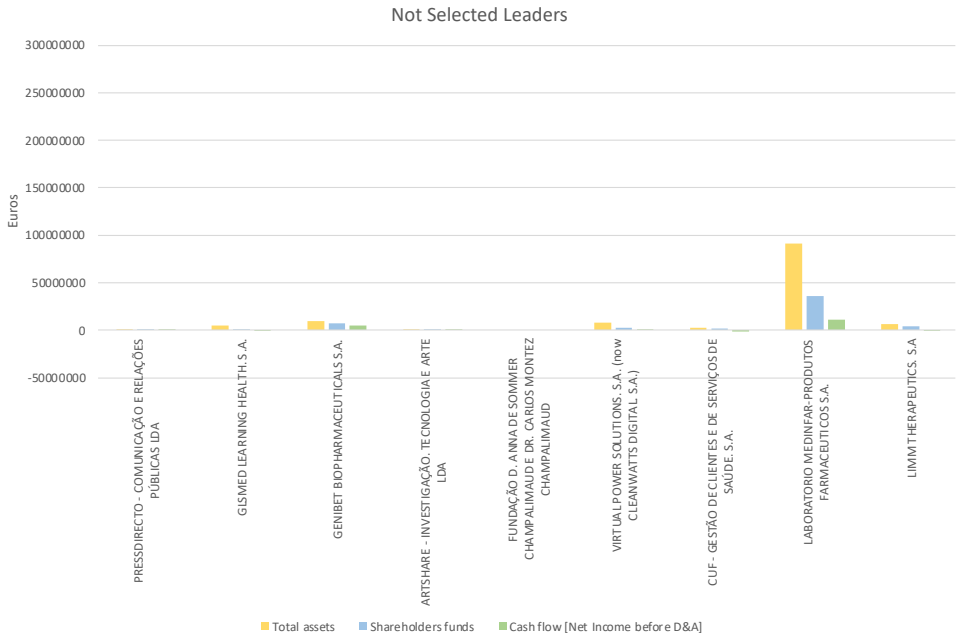


Figure 54. Total Assets, Shareholders´ Funds and Cash Flow of Not Selected Leaders - Health, Well-Being, and Territory

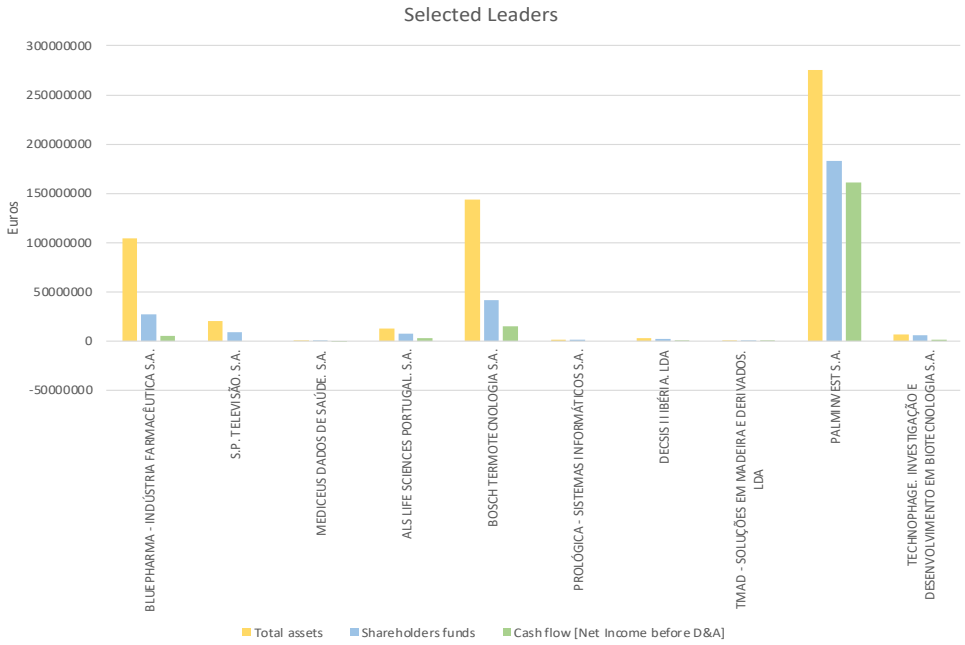


Figure 55. Total Assets, Shareholders´ Funds and Cash Flow of Selected Leaders - Health, Well-Being, and Territory

In assessing companies' capacity to leverage investment, with a focus on the leaders, three key financial variables - Total Assets, Shareholders' Funds, and Cash Flow [Net Income before D&A] - are instrumental in gauging their readiness for investment opportunities. The two figures above (Figure 54 and 55) already visibly show a difference in selected and not selected leaders' numbers.

Among the selected leaders, Palminvest stands out prominently in all the key financial variables for the year 2021. The company boasts an impressive Total Asset value of €275,643,725, signifying a robust foundation of assets that can be potentially leveraged for further strategic investments. Furthermore, its Shareholders' Funds, totaling €182,773,224, highlight the substantial capital contributed by shareholders, strengthening the company's financial stability. Lastly, the substantial Cash Flow of €160,918,408 underscores Palminvest's exceptional ability to generate significant cash from its operational activities. This formidable financial position positions Palminvest advantageously within its sector, providing the company with ample resources to undertake strategic investments that can fuel expansion and foster growth.

On the contrary, among the not selected leaders, Laboratorio Medinfar reported a Total Assets value of €91,517,958 in 2021, indicating a substantial asset base that can be leveraged for potential investments. The company's Shareholders' Funds, amounting to €36,141,872, reflect a healthy level of capital infusion from shareholders, bolstering its financial standing. While the Cash Flow of €10,910,196 is notably lower compared to Palminvest, it still signifies Laboratorio Medinfar's capacity to generate cash from its operational activities. Though not as financially robust as Palminvest, these figures depict a favorable financial position for Laboratorio Medinfar, allowing for prudent consideration of strategic investment opportunities within its sector.

Potential economic value of innovation and scalability

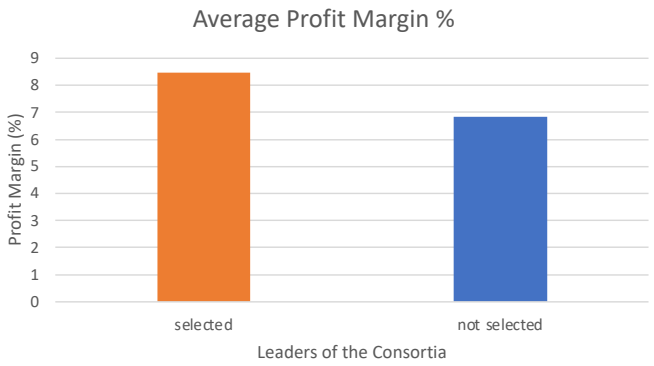


Figure 56. Leaders´ Average Profit Margin % - Health, Well-Being, and Territory

Profit margin (%), serves as a key indicator of a company's profitability. Notably, the results reveal a contrast between the selected leaders and the not selected ones, with the former displaying a higher average profit margin of 8,45% compared to the latter's 6,823%. This difference implies that the selected consortia are generally more profitable. Higher profit margins suggest that these companies may have innovative strategies, better cost management, or more competitive offerings. It also indicates potential for scalability and growth.

Carbon Neutrality and Energy resilience

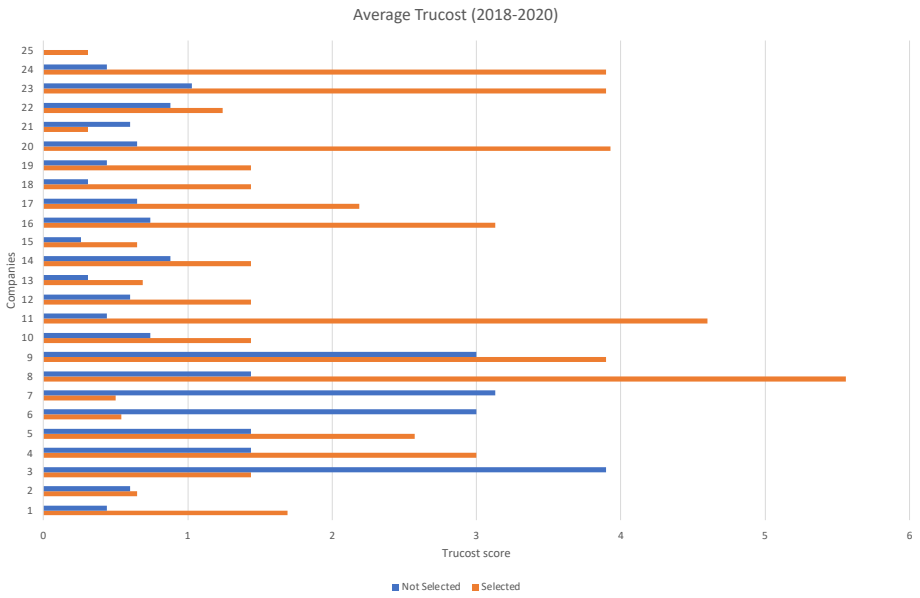


Figure 57. Environmental Score by Trucost - Health, Well-Being, and Territory

To assess companies' contribution to carbon neutrality and energy resilience, two key variables were considered: RepRisk and Trucost. RepRisk data, unfortunately, were largely absent in the Orbis database, limiting the availability of information for this analysis. To compensate for this, the average Trucost scores for the years 2020, 2019, and 2018 were utilized to provide a more comprehensive dataset.

Trucost scores are metrics used to evaluate a company's environmental performance and sustainability (S&P Trucost Limited, 2019). These scores assess factors such as greenhouse gas emissions, resource use, water and waste management, and overall environmental impact. They help investors, organizations, and analysts gauge a company's commitment to environmental responsibility and sustainability practices. Higher Trucost scores indicate better environmental performance, making them valuable for making informed investment and supply chain decisions, promoting eco-friendly practices, and identifying companies that prioritize environmental responsibility (S&P Trucost Limited, 2019).

By looking at the graph it becomes evident that, on average, the selected companies outperformed the not selected ones in terms of their commitment to carbon neutrality and energy resilience. This is particularly notable given that, as the graph shows, seven of the selected companies achieved scores higher than 3, with two even surpassing 4. Specifically, Tmad - Soluções Em Madeira E Derivados. Lda stands out with an impressive average score of 5.51, indicating a strong commitment to environmental sustainability. In contrast, the highest score among the not selected companies was attained by Genibet Biopharmaceuticals S.A. with an average of 3.35.

These findings suggest that, on average, the selected companies are more actively engaged in environmental sustainability efforts. This is a significant indicator of their commitment to addressing climate change, aligning with global sustainability goals, and potentially reaping

long-term benefits, including cost savings, improved brand image, and resilience in the face of environmental challenges. However, it's crucial to remember that these are averages, and specific companies may have unique circumstances that influenced their scores. Nonetheless, the overall trend suggests that the selected companies are more inclined towards environmentally responsible practices.

Quality of the consortium in terms of the promoters' competences

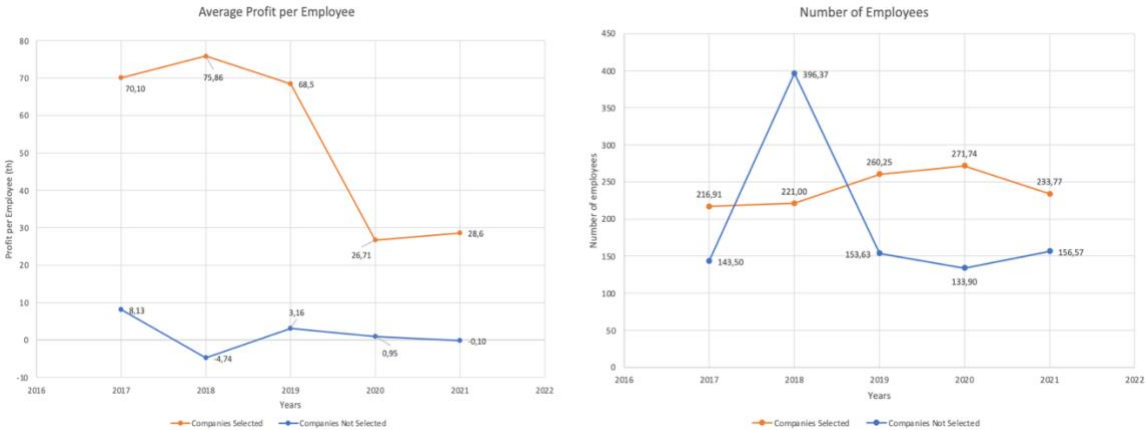


Figure 58. Companies' Average Profit per Employee and Number of Employees - Health, Well-Being, and Territory

The analysis suggests that the selected consortia consistently outperformed the not selected consortia in terms of profit per employee (th) across the years, indicating a higher level of competencies and efficiency within the selected group. The year 2019 saw a decline in profit per employee (th) for both selected and not selected consortia, with a steeper decline for selected companies, as the graph on the left above shows. This could be related to changes in the number of employees as shown in the graph on the right. In 2018, the not selected companies had a significant increase in their average number of employees, which might have affected their productivity and profitability. On the other hand, selected companies experienced a more moderate increase in their average number of employees during the same period, and throughout the years.

In 2021, there is another variation in the average number of employees, with selected companies having a higher average compared to not selected companies. This shift in employment numbers could be one of the factors contributing to the observed differences in profit per employee. Looking at the average profit per employee, the impact of COVID-19 becomes apparent in 2020 and 2021 for the not selected consortia, that moved from 0.95 to -0.10. Also, the selected consortia increased from 26.71 in 2020 to 28.6 in 2021, yet these numbers do not seem encouraging when compared to 2019's average profit per employee of 68,5. The pandemic's adverse conditions likely contributed to the decline in profit per employee for both groups, yet the selected consortia displayed greater resilience.

Economic and financial viability of the projects and of the proponents

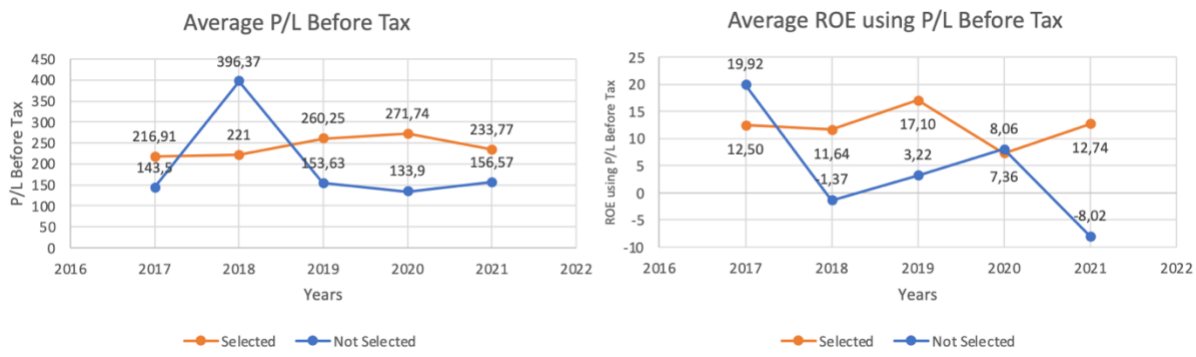


Figure 59. Companies' P/L Before Tax and Companies' ROE Using P/L Before Tax - Health, Well-Being, and Territory

The analysis of the P/L before tax and Return on Equity (ROE) using P/L before tax (%) for the selected and not selected companies provides valuable insights into the economic and financial viability of the projects and their proponents, with a focus on the patterns throughout the years. In 2017, the selected companies demonstrated an average P/L before tax of 216.91, while the not selected companies had an average of 143.5. Moving to 2018, both groups saw an increase in P/L before tax, with the selected companies averaging 221 and the not selected companies surging to 396.37. This significant jump in P/L before tax for the not selected companies might be attributed to specific factors within their operations.

Transitioning to 2019, the selected companies maintained a lead with an average P/L before tax of 260.25, while the not selected companies averaged 153.63. In 2020, both groups displayed resilience amid the challenges brought by the COVID-19 pandemic. The selected companies maintained an average P/L before tax of 271.74, while the not selected companies averaged 133.9. Finally, in 2021, the selected companies, with an average P/L before tax of 233.77, outperformed the not selected companies, which had an average of 156.57.

When considering ROE using P/L before tax, in 2017, the selected companies had an average ROE using P/L before tax of 12.50, while the not selected companies reported a higher average of 19.92. This suggests that the not selected companies might have been more efficient in generating returns for shareholders based on their profit before tax. In 2018, both groups saw their ROE using P/L before tax decline, while 2019 witnessed an increase in ROE for both groups, with the selected companies at 17.10 and the not selected companies at 3.22. In 2021, the selected companies maintained a higher average ROE of 12.74, while the not selected companies reported a negative average ROE of -8.02.

4.5.5 Determining factors for program acceptance: a predictive analysis

This section investigates whether a business's acceptance or rejection into the program can be predicted based on its financial and environmental indicators. A binary logistic regression is employed, with the dependent variable indicating whether the company is part of a selected (1) or rejected (0) consortia. Missing data are retained due to the heterogeneity of the data, reflecting variations in the real world, as the removal of missing values could introduce biases and compromise the representativeness of the dataset. Before running the logistic regression with the STATA software, the dataset was cleaned from the outliers, as those can bias coefficient estimates. Thus, Z-Scores were used to identify and remove 15 outliers: this resulted in a sample of only 35 companies.

The Binary Logistic Regression Model

First, a model including all the variables included in the analysis of the previous section was used. Then, after a collinearity diagnostic, it was decided to exclude specific variables such as Operating Revenue (Turnover), Shareholders Funds and Cashflow. This exclusion procedure was carried out by looking at the VIF (Variance Inflation Factor) and, when the variables had values greater than 10, showing high correlation, they were automatically excluded to avoid multicollinearity and achieve a better interpretability of the model.

Thus, the following model was constructed with specific independent variables.

$$\begin{aligned} Acceptance = {} & \beta_0 + \beta_1\, PL\ before\ tax + \beta_2\, ROE\ using\ PL\ before\ tax + \beta_3\, Total\ Assets + \beta_4\, Working\ Capital \\ & + \beta_5\, Added\ value + \beta_6\, Profit\ margin + \beta_7\, Interest\ Coverage + \beta_8\, Solvency\ Ratio \\ & + \beta_9\, Gearing + \beta_{10}\, Profit\ per\ Employee + \beta_{10} Falcon\ 2021 + \beta_{11} CRIF\ 2021 + \beta_{12} Trucost \in \end{aligned}$$

When running the logistic regression, the output is not promising (see Annex 9). With a log-likehood of -18.128501 the model does not fit well the observed data. This is further proved by the all P-values bigger than 0.005, thus not statistically significant. Indeed, the only P value worth mentioning as marginally significant is the one of Falcon 2021, with P=0.056.

SciKitLearn Logistic Regression Analysis

In addition to the analysis on STATA, a parallel one was carried out by training a machine learning model implemented in Python and using a combination of the libraries Pandas and SciKitLearn. Specifically, Pandas was used in the dataset cleaning and preparation, and the generated data-frame was used to train a regression model using the LogisticRegression class of SciKitLearn. It is important to underline that the missing values are set to zero, to make the dataset compliant with the model. The model is trained and used to predict whether a company is accepted or not depending on its economic and environmental performance based on the data available from the Orbis database.

This model extracts the coefficients of the logistic regression for each variable, including Operating Revenue (Turnover), Shareholders Funds and Cashflow that were previously excluded after the collinearity diagnostic in STATA. In Figure 69 (Annex 10), the values of the coefficients are shown in descending order. The first coefficient, being the largest, has the greatest impact on the prediction of a company's acceptance. Thus, according to this interpretation, the variable that most affects the probability of being accepted is Working Capital and the one with least impact are Trucost and RepRisk, possibly due to the high number missing data.

Of course, the limitations of these analysis carried out in STATA and Python are many, especially due to the number of observations within the datasets. Undoubtedly, more in-depth research with larger amounts of data can help shed light on why some consortia were selected and others were not.

4.5.6 Conclusive remarks

In summary, this comprehensive exploration of the Health, Wellbeing, and Territory thematic area within the context of the MABI strategy offers profound insights into the multifaceted sectors contributing significantly to Portugal's economic landscape. The 10 consortia selected represent a diverse array of projects, ranging from groundbreaking advancements in pharmaceuticals and cultural enrichment to the seamless integration of healthcare data and sustainable energy solutions. These strategic investments hold the potential to serve as catalysts for progress and innovation across their respective sub-sectors.

The pronounced emphasis on the health sector within this thematic area can be attributed to several compelling factors. Firstly, the health sector's profound economic and societal

importance cannot be overstated. It not only constitutes a substantial portion of Portugal's GDP but it also plays a pivotal role in delivering vital services and fostering job opportunities. The backdrop of the COVID-19 pandemic has underscored the critical need for a resilient healthcare system, prompting governments to prioritize investments in healthcare infrastructure, research, innovation, and emergency preparedness.

Also, the health sector presents abundant opportunities for innovation and technological breakthroughs, spanning from cutting-edge medical treatments to transformative healthcare technologies and pharmaceutical advancements. Ultimately, the concentrated emphasis on the health sector mirrors Portugal's profound recognition of its indispensable role in driving economic growth, fostering societal welfare, and nurturing the seeds of future innovation.

Overall, the analysis reveals that the companies within the selected consortia consistently displayed stronger financial and environmental performances across the years, indicating better economic and financial viability. This pattern is visible not only in this last section exploring Health, Well-Being and Territory, but in each of the individual case studies on the different economic sectors and areas of MABI.

4.5.7 Limitations and Recommendations

Recognizing the study's limitations is essential to guide future research endeavors. While the analysis offered a comprehensive exploration of the selected consortia, the absence of detailed data on rejected firms and projects restricts a holistic understanding of the selection process. To address this gap, future research should prioritize an in-depth examination of these excluded entities and their advanced projects, unraveling critical insights for refining the selection criteria. Also, it is crucial to consider two factors that may have had an impact on the analysis. First, the possibility of outliers that, in both selected and rejected consortia, might have influenced the analysis of the data. Second, the impact of external factors, such as the COVID-

19 pandemic on these figures, and the need to conduct a more in-depth assessment of the financial health and strategies of individual companies.

Considering these findings, recommendations for policy makers come into focus. Supporting a strong commitment to health research and innovation is crucial but, nurturing the growth of sustainable tourism and promoting cultural and creative industries should remain focal points too. Furthermore, prioritizing efforts to strengthen the construction and housing sectors can foster Portugal's economic vitality. To improve decision-making, policymakers should invest in strengthening data sources and monitoring frameworks, particularly for tourism and creative industries, which, according to this study, seem to be undervalued.

5. Survey and administrative data (Group Part)

5.1. Survey

The use of surveys to assess the Portuguese NRP is certainly a valuable tool for gathering information and feedback. The advantages of surveys generally lie in their ability to effectively collect data from a wide range of participants and, considering the number of companies within the 143 consortia, this specific case fits the purpose.

However, the shortcomings of the survey conducted in this study, with only 40 companies responding, compromise its external validity and limit its generalizability. Also, as the projects presented by the selected consortia are still in the development phase, it is impossible to assess the investments' impact. For this reason, the survey employed focuses only on the evaluation of the application process, further limiting the depth of understanding of the broader impact of NRP funding. Therefore, the inclusion of more comprehensive evaluation measures in future evaluations is necessary.

The survey, consisting of 24 qualitative questions, analyses the effectiveness and inclusiveness of communication within the entities and assesses how the application process facilitates the implementation of the initiative. Respondents are also asked to identify the most relevant aspects of the application process and to identify any challenges encountered during its implementation. In addition, the survey measures the level of support and guidance provided by the public bodies responsible for the programme, as well as the companies' perceived benefits of working with universities. Finally, respondents are given the opportunity to express their interest in non-financial incentives and their expectations of the long-term impact of the programme, and then conclude with suggestions to make the application process more feasible and easier for the applicants. This comprehensive approach, despite the shortcomings mentioned above, allows for a holistic assessment of the effectiveness of the programme application process and its influence on various dimensions of the operations and development of participating entities. Ethical considerations in conducting such a survey are included ensuring the privacy of participants, by obtaining informed consent and safeguarding the confidentiality of data, all of which are fundamental to maintaining the trust and integrity of the research process.

5.1.1 Data Collection

The survey was distributed to participating companies with the valuable assistance of IAPMEI, the Portuguese Agency for Competitiveness and Innovation, which operates within the Portuguese Ministry of Economy. The participants' responses were collected through the KoboToolbox platform.

The distribution of the survey began on 14 July 2023, with a deadline for responses set for 21 July 2023. A total of 44 responses were received. Of these, three were left blank and one was a company that had already completed the survey. Specifically, The Cricket Farming Co, Lda,

a company involved in two consortia (number 59 and 20), provided two responses, while the other companies involved in multiple consortia provided only one response each. This dataset was meticulously prepared and organised using Microsoft Excel, incorporating rigorous data cleaning procedures to ensure accuracy and consistency. Through analysis, it is intended to extract insights from the data collected on the programme, mainly shedding light on the challenges and effectiveness of its various components. These results, though few in number, are a valuable resource for understanding the programme's strengths and areas for improvement, to inform future initiatives and policy adjustments.

5.1.2 Analysis of the responses

Among the companies that answered to the survey, 23 (42%) were involved in consortia and projects in the thematic area of Industries and Production Technology, 13 (24%) in Cross-Cutting Technologies and Their Applications, 4 (7%) in Health, Well-being and Territory, 13 (24%) Natural Resources and Environment, and only 2 (3%) in the thematic area of Mobility, Space and Logistics. As briefly mentioned above, different companies were part of more than one consortium, thus differing also in thematic area, and hence resulting in a total of 55 different responses for the thematic area.

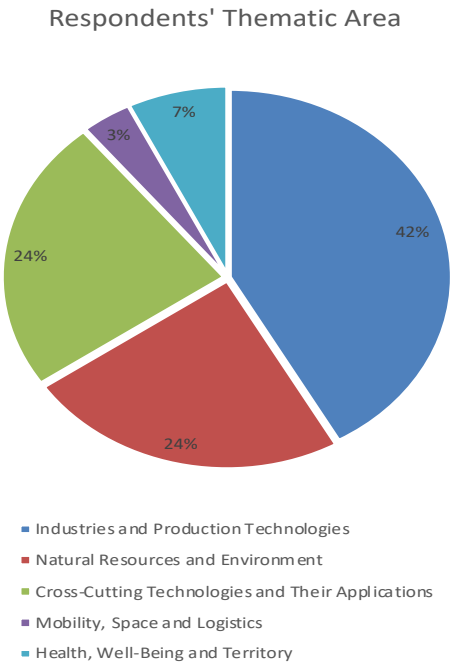


Figure 60. Respondents´ Thematic Area

By looking at the data, one can see that 77,5% of the respondents already received the funds, and 97,5% already started the project implementation. On the same line, only 25% of the entities believe that the program is not respecting the established agenda and timetable. The different type of investments received are divided, within the survey, in four categories: “Fixed investments”, “Intangible investments”, “Training” and “Other”. The “Training” investments were the ones less allocated among the companies that answered the survey (only 3%).

To continue, 21 of the 40 companies agree that the initiative was communicated effectively and inclusively, covering various levels of the organisation, and no company answered, "Strongly disagree". Also, 20 companies agree that the application process facilitated the implementation of this initiative in their organisation. In the application process, the aspects considered most relevant to facilitating implementation were the identification and scheduling of implementation stages and phases (57,5%) and the identification of co-promoters (27,5%).

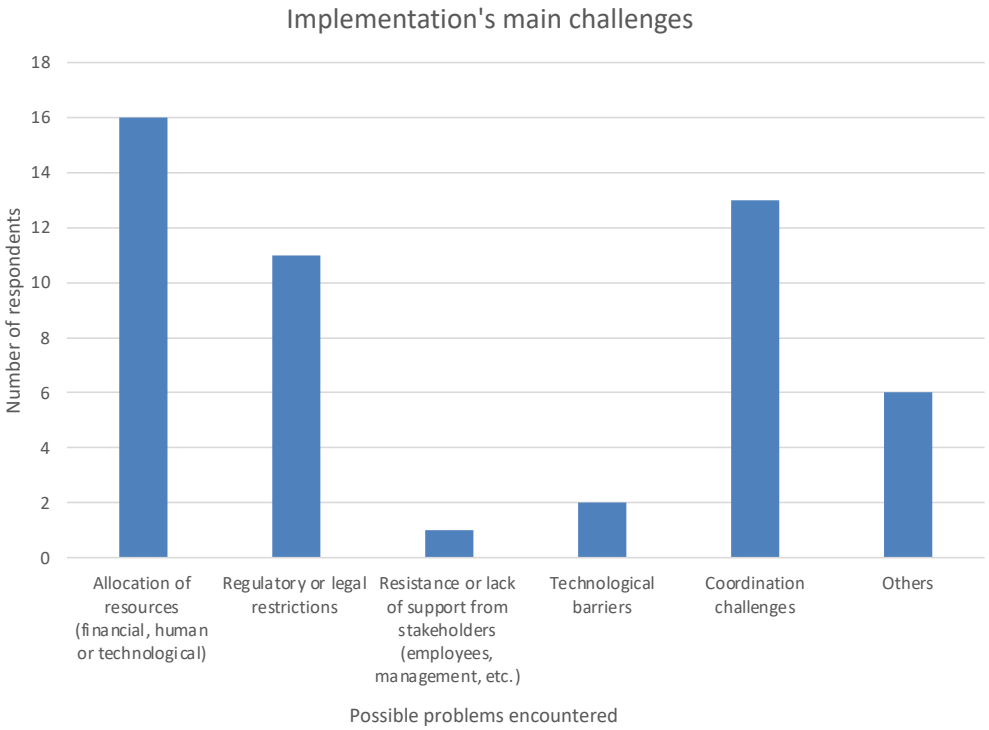


Figure 61. Program implementation´s Main Challenges

Analyzing the responses, the surveyed application process appears to be flawed. In fact, 75% of the companies declared they experienced difficulties during the process. Specifically, 16 companies had problems with resource allocation (financial, human, or technological), 13 had difficulties with coordination, and 11 had problems with regulatory or legal restrictions. Despite the difficulties encountered, the answers to the subsequent questions in the survey give the program a positive note. Specifically, 85% of respondents agree or strongly agree with the statement that guidance and monitoring allow the companies to identify any obstacles or challenges during project implementation. However, when asked “How do you rate the general help and guidance provided by the public entities responsible for the program in relation to the specific objectives outlined in the project?” only two companies responded "Excellent", 11 "Good", 16 "Neutral", and 11 "Insufficient", pointing to a need to increase support to companies during the project implementation process.

Moving on, the survey denotes a positive attitude on the collaboration of companies with public entities, especially Portuguese universities. However, this contrasts with the administrative data collected on the Orbis platform in which universities and many public entities do not present any data, creating imbalances if one wants to analyze the future impact of the NRP on public entities that are part of the consortia.

In the final questions of the survey, respondents are asked to answer to enquiries related to the project's future impact and areas of development within the companies, as well as expectation on the company's performance because of the implemented program.

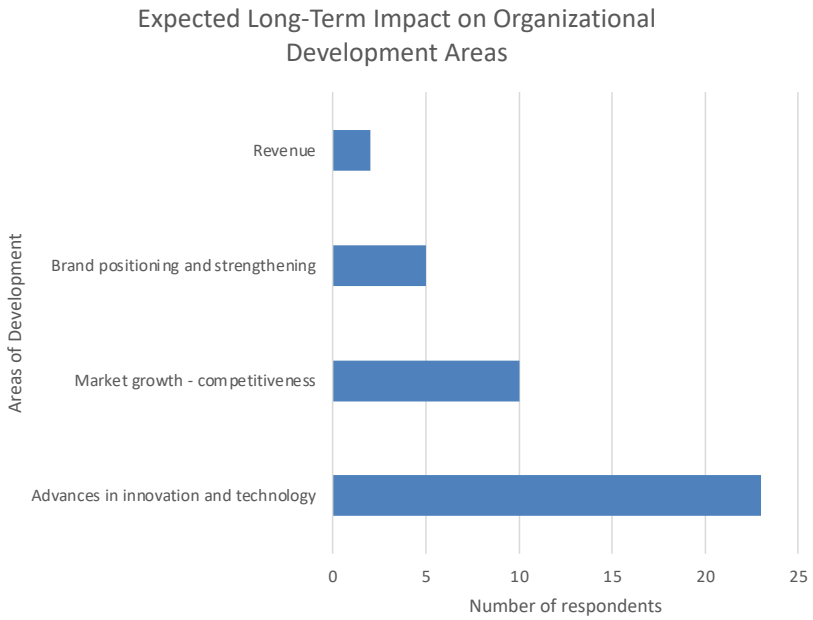


Figure 62. Project's long-term impact on companies' areas of development

Firstly, regarding the desire for additional non-financial incentives, a considerable number of companies expressed agreement with the idea: 6 companies strongly agreed, 16 agreed, and 15 were neutral. This suggests that companies are open to receiving non-financial support. Secondly, when asked about the areas where they believe the project will have the most significant long-term impact, most respondents (23 out of 40) indicated "Advances in

innovation and technology". This points to a strong emphasis on innovation as a key expected outcome of the program.

To continue, in assessing whether the program helped the selected participants identify and adopt innovative practices or technologies, it's notable that a significant number (25 companies) agreed, while 8 companies strongly agreed. However, 5 companies were neutral. This suggests that the program has indeed been effective in promoting innovative practices among a substantial portion of the participants. Lastly, the expectations of companies regarding improvements in various areas resulting from their participation in the program indicate a positive outlook. Many respondents expected improvements in areas such as innovation and technology advancement, market growth, revenue generation, brand positioning, and efficiency. This suggests that the program is perceived as a catalyst for positive changes in these crucial aspects of business operations.

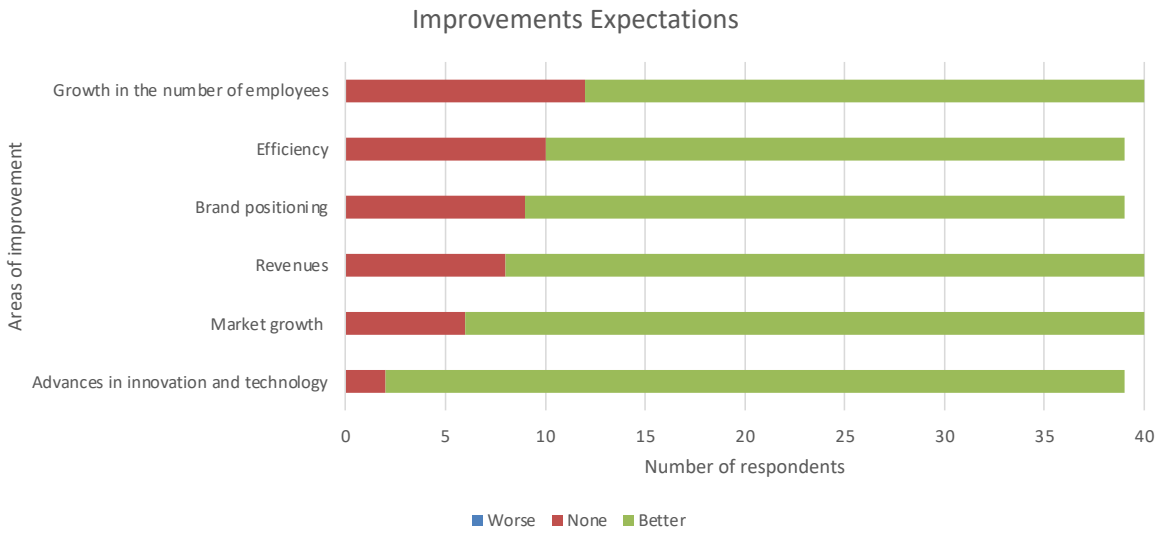


Figure 63. Companies' Expectations for Improvements

In summary, while the survey indicated a generally positive sentiment among respondents, emphasizing innovation as a pivotal goal and recognizing the program's effectiveness in promoting innovative practices, there were notable concerns. Respondents voiced apprehensions regarding bureaucratic processes, the need for better communication and

support from program administrators, and a desire for non-financial incentives such as mentorship and training. These concerns, although raised by a limited number of respondents, are significant as they highlight areas for potential program improvement. As the "Agendas para a Inovação Empresarial" initiative progresses, addressing these concerns and building upon the positive sentiment expressed in the survey can lead to more effective support for companies' growth and innovation endeavours in Portugal.

5.1.3 Recommendations

Looking forward, to assess the impact of NRP funding once projects have been implemented, it is essential to include questions that capture both qualitative and quantitative aspects. These questions should assess not only the financial results, but also the broader social and environmental impacts, in line with the multiple objectives of the programme.

Unlike the questions presented in the above-mentioned survey, in assessing the impact of NRP funding after its implementation, it will be essential to consider a comprehensive set of criteria and variables encompassing various aspects of the funded initiatives. These criteria include corporate financial performance indicators such as revenue growth, profit margins, changes in operating costs and return on investment (ROI). In addition, the impact on employment and labour must be assessed, including the creation of new jobs, wages, and skills development within the company. The adoption of innovation and technology, by looking at the number of patents or innovations developed in the company, can translate into business productivity and efficiency. Once projects are implemented, environmental sustainability efforts, such as the reduction of carbon emissions and social and community impact, will be key considerations. Finally, risk management, cost-benefit analysis, collaboration, inclusiveness, and diversity must be evaluated to provide a holistic understanding of the impact of the NRP programme.

6. Recommendations for Program Improvement (Group Part)

6.1 Importance of Data

The analysis conducted was based on numerous companies, no less than fifty companies in each sector, which includes both industry leaders and co-promoters, between accepted and rejected participants, evaluating each company under different perspectives.

This extensive research allowed an in-depth investigation of the possible strengths and weaknesses inherent in each field and included some possible recommendations for future analysis.

To undertake a full data analysis of the companies, it was necessary to delve into the financial profiles of firms from all sectors of the Portuguese economy. The building of a dataset with a variety of factors was required to support this undertaking. These characteristics efficiently separate and differentiate the firms under consideration, such as the number of employees, date of incorporation, or size, allowing for a thorough evaluation.

The thorough validation of data completeness is a crucial endeavour in economic analysis. It necessitates meticulous scrutiny of financial data for all selected companies to identify and rectify gaps or missing information. Failing to do so can undermine the precision and reliability of the analytical process.

It is necessary to emphasize the underlying role of data in economic analysis. Data, particularly financial data obtained from sources such as Orbis, serves as the foundation for comprehensive and analytical studies. This data's quality, consistency, and comprehensiveness are not only needed but also required for effective decision-making and accurate assessments of a company's financial health and performance.

These difficulties must be handled methodically to guarantee that the data on which key choices are made is both robust and dependable. Furthermore, the importance of data goes beyond the quantitative sphere. It is also critical to integrate qualitative data, such as contextual knowledge about market circumstances, competitive dynamics, and regulatory environments. This qualitative layer supplements the quantitative data, offering a comprehensive picture of the economic environment in which businesses function. (Why is data validation important in research? s.d.)

Data is especially important in programs like the 'Agenda Mobilizadoras,' where firm selection is a critical stage. Financial stability, innovation potential, environmental obligations, and project alignment are all dependent on data-driven insights. The availability of extensive and reliable data serves as the foundation for firms' eligibility to engage in transformative projects.

6.1.1 Statistically significance

In data analysis, the significance of variables having a statistically significant p-value must be emphasized. The p-value in statistical analysis shows the probability that the observed results, or even more extreme outcomes, occurred just by chance. When a variable produces a low p-value, often less than a present significance level (commonly 0.05 or 0.01), it indicates that there is strong statistical evidence to reject the null hypothesis and accept that the variable has a substantial influence on the result under consideration.

The foundation of reliable and believable analysis is statistically significant variables. They provide a firm foundation for reaching meaningful findings and making sound judgments based on factual facts. These are the variables that researchers and analysts may safely attribute as having a true impact on the phenomena under study. Variables with high p-values, on the other

hand, are often regarded as non-significant and may not give accurate insights into the connections under investigation. (Stats Value, s.d.)

Identifying variables with statistical significance is important not only for hypothesis testing but also in several fields, where the accuracy of predictions, policy recommendations, and treatment decisions is dependent on the strength of evidence provided by these variables. In essence, the important drivers are statistically significant factors. Identifying variables with statistical significance is important not only for hypothesis testing but also in fields like medical research, economics, and social sciences, where the accuracy of predictions, policy recommendations, and treatment decisions is dependent on the strength of evidence provided by these variables. In the analysis conducted in different sectors.

6.2 Limitations

Several significant constraints arose during the analysis. A noteworthy concern was the dataset's missing values and omitted variables, which limited the study and impacted the completeness and correctness of our analysis. Also, the dataset has a limited number of variables with statistically significant p-values. This issue was especially important since it impacted the robustness of our statistical inferences.

An important issue was discovered in the entity dataset: certain firms were present in both accepted and rejected projects. This was a problem since we needed to guarantee that the attributes included in the analysis were still relevant and useful for both approved and rejected groups. Furthermore, because our analysis was undertaken so close to the start of the project, the availability of previous data for a fuller review was limited.

Each of these constraints necessitated careful study and mitigation to assure the trustworthiness and usefulness of our findings in the project context. While these issues increased the research's

complexity, they also underlined the importance of rigorous procedures and data management practices in similar future attempts.

6.3 Variables

Rigorous data analysis seemingly forms the backbone of these explorations. The process involved the construction of comprehensive datasets through detailed consideration of fundamental factors, such as the number of employees, date of incorporation, size, among others. Such factors distinguish the companies under scrutiny and lay a foundation for a thorough evaluation. The completeness of the data diligently ensures the integrity and reliability of this evaluation. Scrutiny doesn't halt at the dataset's foundation; it continues into detecting and rectifying potential missing information or gaps.

Although indispensable, it came to light that the dataset housed a limited number of variables with statistically significant p values. The lack of significant p values can subsequently obscure our statistical inferences, questioning the robustness of the outcomes. A significant complication arose when there was an overlap of firms participating in both the accepted and rejected project brackets, challenging the relevancy and usefulness of certain attributes in the analysis.

The constraints laid out by the project’s initiation time compounded these complications, limiting the data available for more comprehensive scrutiny. Yet, these limitations also underscored the importance of rigorous data processes and management practices to ensure the robustness of the project's analytic outcomes.

Combined, these elements contribute to a focused, critical analysis of integral variables determining the final decision. These variables' identification follows a logical progression rooted in methodological rigor, aiding in future decision-making processes. This continuous,

critical exploration enhances further research, with each constraint acting as a catalyst, directing towards improved methodologies and more comprehensive datasets for future analyses.

While specific limitations, all echoing the need for extensive, well-rounded datasets and meticulous management practices were uncovered, the in-depth exploration provided fertile ground for both immediate and future analyses. Ensuring data integrity and focusing on the significance of variables, both statistically and methodologically would substantially enhance future research undertakings within these sectors, and indeed, investigations of a similar kind.

6.4 Recommendations

Our research has unveiled several knowledge gaps within the methodology and research taken into practice. These gaps, stemming from our findings, beckon for comprehensive investigation, with the potential to enrich and expand the theory we have meticulously crafted through realist evaluation. We propose the following avenues for future research:

Enhanced Model Fit and Significance: Given the non-significant p-value associated with the LR chi-square value, it is imperative for future research to delve into potential confounding variables or unanticipated influences that might be contributing to this outcome. Conduct a comprehensive review of the model's underlying assumptions and the dataset to identify any factors that could be obscuring the significance of the predictors.

Exploring Additional Predictors: To address the relatively modest explained variability indicated by the Pseudo R-squared value, consider broadening the scope of predictors used in the model. Explore the inclusion of additional relevant predictors that could capture nuances within the economic landscape. Collaborate with subject-matter experts to identify potential

variables that could enhance the model's predictive power and better capture the complexities of the outcome variable.

Advanced Modelling Techniques: Given the non-significant individual coefficients, it might be advantageous to experiment with advanced modelling techniques that can handle non-linear relationships and interactions more effectively. Techniques like polynomial regression, interaction terms, or machine learning algorithms could help capture intricate interactions among predictors that might be influencing the outcome variable.

Diverse and Enriched Dataset: Expand the dataset's breadth by incorporating a wider range of industries, economic contexts, and operational scenarios. This approach can offer a more holistic understanding of the model's applicability across diverse contexts. Additionally, consider including industry-specific indicators, market trend data, and external factors such as geopolitical events, which could contribute to a more nuanced and comprehensive analysis.

Validation and Sensitivity Analysis: Perform thorough validation exercises to ensure the model's robustness across different datasets and scenarios. Employ sensitivity analyses to gauge the model's stability in the presence of varying assumptions or changes in predictor values. This step can enhance the reliability and generalizability of the model's findings.

Collaboration with Domain Experts: Engage in collaborative efforts with domain experts who possess intricate knowledge of the economic sectors under study. Their insights can guide the selection of relevant predictors and the interpretation of results, contributing to a more accurate and contextually informed analysis.

7. Evaluation of Program Expected Effectiveness (Group Part)

7.1 Program Objectives definition

This section is devoted to present a framework tailored for the evaluation of program effectiveness seeking to provide a systematic approach to measure the impact of the intervention. At its baseline lies the “Theory of Change”, a structured methodology that illustrates the intervention's strategy to achieve desired outcomes by tackling existing challenges. By considering the broader context, including changes in policies and socio-economic factors, the Theory of Change provides a holistic viewpoint. This methodology empowers intervention designers and implementers to thoroughly evaluate and enhance the intervention's structure, guaranteeing consistency regarding its envisioned mechanisms and results (UK Government , 2020).

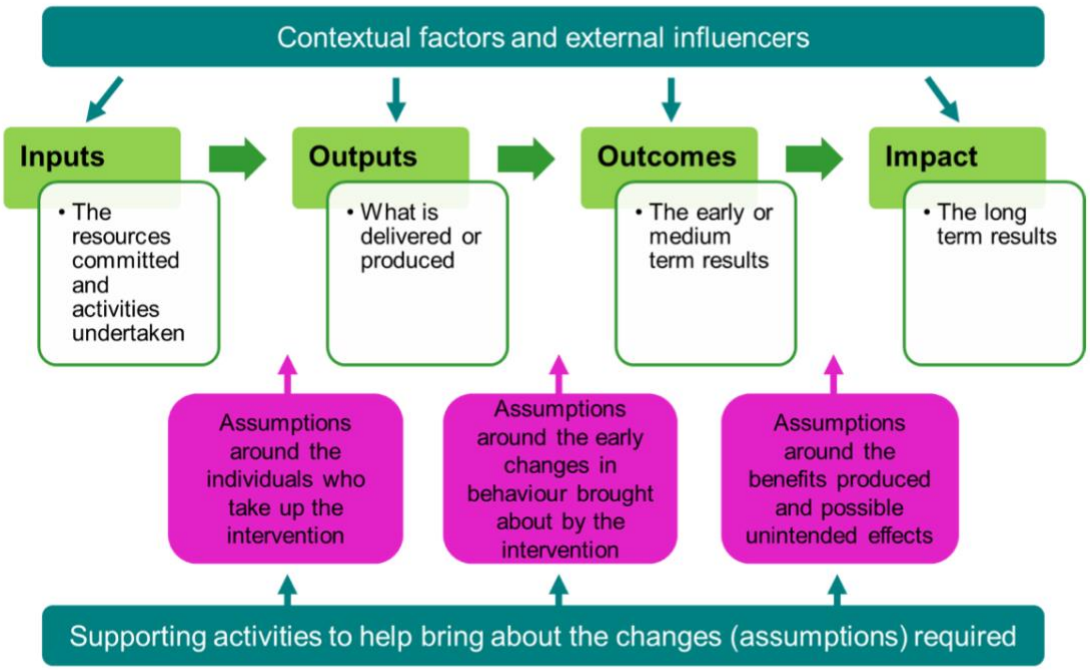


Figure 64: Example of a linear Theory of Change (Mayne, 2017)

As mentioned above, the European Union introduced the Next Generation EU as a temporary recovery tool, which included the implementation of National Recovery and Resilience Plans. The Portuguese PRR incorporates Component 5 - Capitalization and Business Innovation within its Resilience Dimension.

Within this context, the Theory of Change should break down the end goal into smaller, achievable steps that can be easily measured and tracked. By doing so, it should become clear which strategies are working and which ones need to be adjusted (EvalCommunity, 2023).

Firstly, identifying the obstacles to implement the Component 5 plan is essential, and there are numerous such barriers. Regulatory and bureaucratic hurdles, as well as political challenges, pose substantial obstacles. Excessive red tape, lengthy approval procedures, and demanding compliance requirements may impede progress. Furthermore, political factors, such as changes in government or political instability, have the potential to disrupt the implementation of long-term plans and initiatives. Shifts in priorities or policy directions can impact the continuity and advancement of the mobilizing agendas. Technological challenges and skills gaps require investment and collaboration. Financial constraints can hinder progress, and regional disparities need to be addressed for equal participation.

Secondly, the intervention should be clearly outlined. In this case, the intervention in response to these challenges involves the disbursement of funds amounting to €558 million, supporting initiatives that align with the strategic priorities defined in the National Strategy for Research and Innovation for Smart Specialization (Estratégia Nacional de Investigação e Inovação para uma Especialização Inteligente).

The intervention follows a structured process consisting of three phases: first, entities and companies submit project proposals; second, a jury evaluates and assesses the proposals; finally, the selected projects enter the contracting phase for implementation.

After the successful completion of Phase I, an extensive assessment of the proposed ideas took place, resulting in the advancement of 70 Agendas to Phase II out of 143 total proposals. During this phase, a total of 64 final funding applications were submitted. Subsequently, all final proposals underwent a thorough analysis, leading to the pre-selection of 53 Agendas for the negotiation phase (IAPMEI, 2023).

The third step in building a Theory of Change involves the identification of expected outcomes which, in this case, are numerous and significant. They include enhanced productivity and competitiveness of the Portuguese economy, increased exports of high-value goods and services, accelerated progress in research and development activities, generation of qualified and highly skilled employment opportunities, expansion of technological capabilities and knowledge transfer, promotion of circular economy principles and sustainable practices, and a transition towards energy efficiency and carbon neutrality.

Lastly, the Theory of Change should outline how the actions implemented by the initiatives lead to a series of outcomes culminating in the desired or observed impacts (BetterEvaluation, s.d.). The impact of the Recovery and Resilience Plan and its associated initiatives are aimed to facilitate a strong and sustainable recovery from the economic crisis caused by the pandemic, leading to a structural transformation of the Portuguese economy towards a more specialized and innovative profile. This transformation will result in boosted economic growth, increased resilience, and improved international competitiveness. Additionally, the initiatives will promote sustainable resource management, reduce environmental impact, and drive long-term societal and economic benefits. They will enhance the quality of life and well-being of citizens while strengthening Portugal's international positioning. Furthermore, the interventions will contribute to economic, social, and territorial cohesion within the European Union and mitigate the social and economic impacts of the crisis, thereby aligning with the general objectives of the European Union (Annex II).

7.2.Key Indicators, baseline data and monitoring

7.2.1 Quantitative indicators

The quantifiable indicators that would measure progress towards the 7 objectives established by the strategy and summarized in its Theory of Change (see Annex 1). These indicators may be more or less sensitive to changes caused by the strategy depending on the type of project being implemented. Since until 2023 most projects are in the contracting stage or have just completed it (Jornal de Negocios, 2023), and in terms of investment, projects will be completed mostly by the end of the programming term, between 2025 and 2026 (Corti, Nuñez, Ruiz, & Regazzoni, 2021), it is essential to start with the pre-pandemic data collection approximately three to four years before the pandemic since provides a substantial amount of data points and a robust sample size and allows for more reliable trend identification and forecasting. Also, by 2017, economic and market conditions had largely recovered from the global financial crisis of 2008, offering a relatively stable environment to begin data collection. The data collection must go until now (2023) and continue until the end of the implementation of the projects in 2026 and at least 3 or four years for a post-implementation evaluation.

Enhanced Productivity and Competitiveness of the Portuguese Economy

Assessing productivity and competitiveness helps to measure the efficiency of companies and the economy in general, which is vital for economic growth and long-term stability.

Indicator	Description	Source
Operating Revenue (Turnover) per Employee (th)	This indicator shows how much revenue each employee generates. Higher revenue per employee suggests higher productivity and effectiveness in utilizing human resources.	Orbis Data Base (by Bureau van Dijk)
Profit Margin (%)	Profit margin indicates how efficiently a company converts revenue into profit. A higher profit margin reflects better operational efficiency and competitiveness.	Orbis Data Base (by Bureau van Dijk)
ROE using Profit (Loss) before Tax (%)	Return on Equity (ROE) measures how effectively shareholders' equity is being utilized to generate profit. A higher ROE signifies better use of investor capital.	Orbis Data Base (by Bureau van Dijk)
ROCE using Profit (Loss) before Tax (%)	Return on Capital Employed (ROCE) assesses how efficiently a company uses its capital to generate profit. A higher ROCE indicates effective capital management.	Orbis Data Base (by Bureau van Dijk)
ROA using Profit (Loss) before Tax (%)	Return on Assets (ROA) gauges how efficiently assets generate profit. A higher ROA reflects better utilization of assets.	Orbis Data Base (by Bureau van Dijk)
Average Cost of Employee (th) **	This metric provides insight into the cost of human resources. A lower average cost per employee may suggest streamlined processes and cost efficiency.	Orbis Data Base (by Bureau van Dijk)
Working Capital per Employee (th)	Higher working capital per employee indicates greater liquidity and financial stability, which can contribute to competitiveness.	Orbis Data Base (by Bureau van Dijk)

* Although the indicators are included in the Orbis database, no information was found for the Portuguese companies analyzed, so it is necessary to gather information from direct sources
** These indicators are not included in the ORBIS database; therefore, it is necessary to gather information from direct sources

Increased Exports of High-Value Goods and Services

Export growth can stimulate economic expansion, reduce trade deficits, and show the country's competitiveness on the world stage.

Indicator	Description	Source
Export Revenue* / Operating Revenue (%)	This ratio indicates the proportion of total revenue that comes from exports. A higher percentage suggests a greater focus on exporting and potentially high-value products or services.	Orbis Data Base (by Bureau van Dijk)
Export Revenue*	The actual revenue generated from exports, showing the success of efforts to increase high-value exports.	Orbis Data Base (by Bureau van Dijk)
Export Revenue* Growth Rate	This rate quantifies the increase in export revenue over a specific period, indicating the success of strategies aimed at expanding valuable exports.	Orbis Data Base (by Bureau van Dijk), own calculations

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Accelerated Progress in Research and Development Activities

Monitoring R&D progress fosters innovation, which is fundamental for economic development and staying competitive in the global market.

Indicator	Description	Source
Research & Development Expenses* / Operating Revenue (%)	This ratio shows the portion of revenue allocated to research and development. A higher percentage indicates a stronger commitment to innovation and progress.	Orbis Data Base (by Bureau van Dijk) Own data collection
Number of Employees in Research & Development	This count reflects the scale of R&D activities and signifies the company's investment in innovation.	Own data collection
R&D Expenses* Growth Rate	Measures the rate of increase in R&D spending over time, indicating the pace of R&D acceleration.	Orbis Data Base (by Bureau van Dijk), Own calculations

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** These indicators are not included in the ORBIS database; therefore, it is necessary to gather information from direct sources

Expansion of Technological Capabilities and Knowledge Transfer

Technological advancement and knowledge transfer improve industries' capabilities, attracting investment, and driving economic growth.

Indicator	Description	Source
Technological Investment** / Total Assets	This ratio measures the extent to which the company invests in technology relative to its asset base. A higher ratio indicates greater technological investment and potential expansion.	Orbis Data Base (by Bureau van Dijk) ** Own data collection
Number of Technology Partnerships	The count of partnerships suggests the company's engagement in collaborations for technology sharing and knowledge transfer.	Own data collection
Knowledge Transfer Ratio	Measures the effectiveness of transferring R&D knowledge to practical applications in the industry.	Own data collection

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** These indicators are not included in the ORBIS database; therefore, it is necessary to gather information from direct sources

Promotion of Circular Economy Principles and Sustainable Practices

Adopting sustainable practices contributes to environmental protection, resource efficiency, and long-term economic viability.

Indicator	Description	Source
Trucost (Environmental Cost) / Added Value	This ratio reveals the environmental cost in relation to value generated, indicating efforts to promote sustainable practices.	Orbis Data Base (by Bureau van Dijk)
Percentage of Recycled Materials Used in Production **	Higher use of recycled materials reflects commitment to circular economy principles.	Own data collection
Sustainable Product Development Investment **	Investment in sustainable product development indicates efforts to align with circular economy and sustainability goals.	Own data collection

* Although the indicators are included in the Orbis database, no information was found for the Portuguese companies analyzed, so it is necessary to gather information from direct sources
** These indicators are not included in the ORBIS database; therefore, it is necessary to gather information from direct sources

Generation of Qualified and Highly Skilled Employment Opportunities

Creating high-quality jobs increases the standard of living, reduces unemployment, and enhances workforce skills, essential for overall prosperity.

Indicator	Description	Source
Trucost (Environmental Cost) / Added Value	This ratio reveals the environmental cost in relation to value generated, indicating efforts to promote sustainable practices.	Orbis Data Base (by Bureau van Dijk)
Percentage of Recycled Materials Used in Production **	Higher use of recycled materials reflects commitment to circular economy principles.	Own data collection
Sustainable Product Development Investment **	Investment in sustainable product development indicates efforts to align with circular economy and sustainability goals.	Own data collection

* Although the indicators are included in the Orbis database, no information was found for the Portuguese companies analyzed, so it is necessary to gather information from direct sources
** These indicators are not included in the ORBIS database; therefore, it is necessary to gather information from direct sources

Transition Towards Energy Efficiency and Carbon Neutrality

Moving toward energy efficiency and carbon neutrality is critical for environmental sustainability, meeting international commitments, and mitigating climate change's adverse effects.

Indicator	Description	Source
Energy Consumption Reduction Rate	This rate shows the reduction in energy consumption over time, reflecting efforts toward energy efficiency and carbon neutrality.	Own data collection
Carbon Emissions per Unit of Production	Measures carbon intensity, indicating progress toward carbon neutrality goals.	Own data collection
Investment in Renewable Energy Sources	Higher investment suggests commitment to transition to cleaner energy sources.	Own data collection

* Although the indicators are included in the Orbis database, no information was found for the Portuguese companies analyzed, so it is necessary to gather information from direct sources
** These indicators are not included in the ORBIS database; therefore, it is necessary to gather information from direct sources

7.2.2. Qualitative indicators - Perception (surveys)

The survey was designed to identify and assess, from the perspective of the participating companies, the processes, and results within the strategy. Additionally, a section was added to collect data that is not possible to find in databases such as Orbis. Therefore, it contains nine sections:

- **Identification & others**: includes different identifiers and number of employees.
- **State of the initiative**: inquire about whether the company has already received funds and whether it is already implementing the project.
- **Processes – Elaboration**: inquire about the development of the proposal in terms of inclusiveness and effectiveness / efficiency in implementation.
- **Processes - Application and selection**: inquire about the allocation of funds in terms of fairness and funding for performance-enhancing measures.
- **Processes – implementation**: inquire about challenges or barriers in the implementation process as well as possible solutions.
- **Processes – Monitoring**: inquire about the overall support and guidance provided by the program as well as the monitoring processes and its ability to identify any bottlenecks or challenges during the initiative's implementation.
- **Collaboration/partnerships**: inquire about the dynamics of collaboration between participating companies.

- **Expected benefits**: inquire about the perception of obtaining benefits as a result of the program in terms of efficiency, growth, innovation, among others.
- **Additional data:** Include the collection of data related to Export and Revenue Enhancement, Research and Development (R&D) and Innovation, Circular Economy and Sustainability, Workforce Development as well as Energy Efficiency and Carbon Neutrality.

The survey must ensure clear instructions and confidentiality.

7.2.3. Qualitative indicators - stakeholders interview

Once quantitative administrative and perception information has been collected, as mentioned above, semi-structured interviews should be conducted with stakeholders from the different groups analyzed in order to complete the "narrative" and information that was not possible to collect with the previous instruments.

7.3. Treatment and control groups

Control groups and treatment groups are essential components of the strategy evaluation. They allow to assess the impact of the intervention by comparing the outcomes of those who receive the intervention (treatment group) with those who do not (control group). This comparison helps to determine whether any observed changes can be attributed to the program itself rather than other external factors, so it can be possible to establish causality, rule out other factors that might influence outcomes and enhances the internal validity of the study. For the evaluation of the Mobilizing Agendas for Business Innovation, the following groups should be identified and created:

- **Treatment group (Receives the Program Intervention):** This group receives the intervention since their projects were selected. If the total number of co-promoters who applied to the program and were selected is not taken, a significant sample of them should be taken at random (with a confidence level of 95% and a margin of error of 5%). It is important to ensure that the treatment group receives the full intervention as planned.
- **Control Group That Doesn't Receive the Program Intervention**: co-promoters that receives no intervention but is otherwise similar to the treatment group. Randomly assign eligible participants to the treatment and control groups. If the total number of co-promoters who applied to the program is not taken, a significant sample of them should be taken at random (with a confidence level of at least 95% and a margin of error of at least 5%). It is important to ensure that the control group experiences the same conditions as the treatment group, except for the intervention itself (through techniques such as random assignment, Matching and control external factors)
- **Control Group That Did Not Apply to the Program**: businesses that did not apply for the program. They can be randomly selected from the same Orbis Data Base considering relevant characteristics to the treatment group to minimize bias. It is important to ensure they were not exposed to the possibility of receiving the intervention. Ideally, control candidates should be identified in advance, before the program is widely known or promoted. However, this is not a possibility, so the best option is to randomly select participants for this control group from the eligible population that did not apply to participate in the program and ensure that the random selection process is truly random and avoids any deliberate or unintentional bias.

7.3 Implementation monitoring

The objectives of monitoring are to ensure that the intervention is working as planned, to identify possible bottlenecks to act on them, and ultimately to make it possible to identify the impact of the strategy on the different strategic objectives established and mentioned above. For this reason, a set of quantitative and qualitative indicators were identified in this document to be monitored, as they allow to account for both the processes and the results of this strategy.

It is important to specify the timeline and personnel responsible for data collection to ensure the adequacy and flow of data. continuously collecting data on the indicators as the program progresses helps to identify early trends and provides insight into any required adjustments.

once the quantitative data is analyzed to calculate relevant metrics and trends, the survey responses to understand perceptions and the stakeholder interviews to extract valuable qualitative insights, cross-source validation should proceed in which findings are compared across the different sources of information to identify areas of convergence and divergence validating quantitative trends with qualitative insights from surveys and interviews.

Finally, results from all sources should be synthesized to form a comprehensive understanding of the progress and challenges of implementation with both descriptive statistics and inferential tools. Based on the integrated results, actionable insights could be identified that can guide decision making and program adjustments.

7.4 Data preparation

At the heart of any meaningful analysis is the foundational task of data preparation. Raw data, by its very nature, often contains inconsistencies—missing elements, inaccuracies, and discrepancies. By enhancing raw organizational data—such as by amalgamating internal and external data sources or harmonizing datasets—the information becomes not only more

coherent but also richer in context (TIBCO , 2023). As a tool in this endeavor, the Orbis Database offers an expansive repository of data that can be utilized to enrich and fine-tune the primary datasets, fortifying the analysis and providing a broader perspective for the program evaluation. Once determined key indicators, outlined in the Figure 5, it is possible to leverage the Orbis Database to source pertinent data. This step can facilitate a more in-depth quantitative assessment, ensuring that our evaluation is both comprehensive and robust.

7.4. Data analysis and impact on indicators

A core component of the evaluation is data analysis, that is using the appropriate statistical techniques for a comprehensive examination of the collected information. A key aspect of this analysis involves comparing the outcomes on indicators of the treatment group (companies which received the program intervention) with a control group (companies that didn't receive the program intervention or did not apply to the program). This helps delineate the program's genuine impact (Samad, 2010).

One of the intricate challenges of impact evaluations is crafting a robust counterfactual. This is visualizing the trajectory participants might have taken in the program's absence addressing potential biases that might tint the understanding of the program's genuine impacts. This can be done through various methodologies such as randomized controlled trials (RCTs), regression discontinuity (RDD), difference-in-differences (DiD) or propensity score matching (PSM). Each of these methodologies has its own strengths, limitations, and assumptions. The best method to use often depends on the nature of the data or the design of the program (Samad, 2010). In this case, considering that data on financial indicators can be used as part of the evaluation, using RCTs, though rigorous, might not always align with the practical dimensions of certain business contexts. Regression Discontinuity is contingent upon a clear threshold, which is absent in this scenario. On the other hand, DiD could be a viable choice if companies

would follow the same trends; however, the unpredictable and dynamic nature of the broader economic environment, can make this assumption questionable.

Conversely, PSM emerges as the most suitable approach for understanding the impact of receiving funds. Operationalizing PSM begins by identifying financial indicators influencing a company's likelihood to receive funds. A statistical model, often logistic regression, is then employed to estimate propensity scores, which are then used to match companies that received funds with those that didn't, based on their predicted propensity. This matching process aims to construct a comparison group that is as similar as possible to the treated group based on observed characteristics. By comparing outcomes between these matched groups, the effect of receiving funds can be inferred.

Advantages of PSM include its ability to significantly reduce selection bias, its flexibility with observational data, and its intuitive matching concept which simplifies explanation to a varied audience. However, it comes with disadvantages: the inability to account for unobserved confounders, potential challenges in finding a perfect match for every treated unit, assumptions of common support, reliance on the quality of the model generating propensity scores, and possible loss of data when not all treated subjects are matched.

Tracking shifts in matched companies over specific durations can also provide deeper insights into the prolonged impact of the funds, allowing for a more dynamic understanding of their effect (Samad, 2010).

7.5 External factors

When evaluating the impact of the program, it is essential to consider external factors that might have played a role in influencing the observed outcomes. These externalities can either augment or diminish the perceived effectiveness of an intervention.

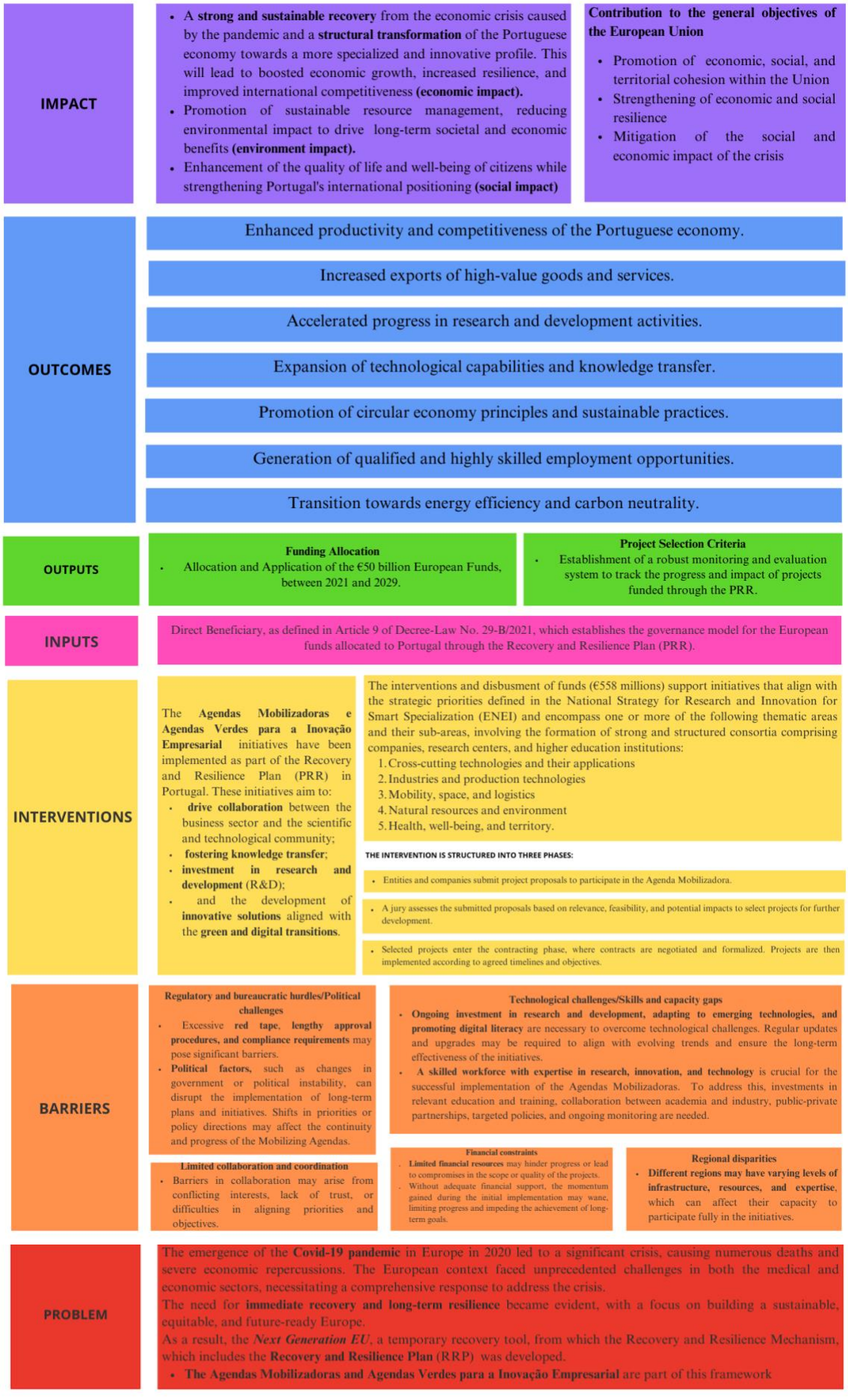
Economic conditions, for instance, can exert a substantial influence; a sudden economic downturn or upswing can affect a company's performance irrespective of the funds received. Similarly, policy changes at EU level, in this case, might either complement the benefits of the program or negate them. For instance, an EU-wide economic stimulus or a trade agreement can impact the business environment in which companies operate, irrespective of the funds they received from the program. Additionally, unforeseen events, such as natural disasters, pandemics, or significant market disruptions, can significantly sway results.

By understanding and accounting for these external factors, the evaluation process becomes more nuanced, attributing the outcomes more accurately to the intervention itself rather than extraneous influences.

7.6 Cost-effectiveness evaluation

It is equally crucial to juxtapose these outcomes against the resources expended to achieve them. Cost-effectiveness evaluation delves into understanding the economic efficiency of the program, determining whether the benefits derived are justifiable given the expenses incurred. By comparing the costs associated with the program (both direct and indirect) against the positive outcomes achieved (be they monetary or non-monetary), one can ascertain the value the program brings. If the benefits substantially outweigh the costs, the program can be deemed cost-effective. Conversely, if the expenses run high with minimal observable advantages, it may prompt a reconsideration of the program's design or implementation.

Annex 2. Theory of Change Scheme



Annex 3. Industries and Production Technologies accepted leaders

Leader	Investment	Agenda verde	Copromotores	Summary of the project
PALBIT, S.A.	49.694.142,56	No	24	**Hi-rEV – Recuperação do Setor de Componentes Automóveis** The project addresses the automotive industry's evolving landscape, responding to challenges including pandemic recovery, energy transition, digitalization, and manufacturing restructuring. The objective is to establish local automotive entities as models of sustainable growth, innovation, and advanced technology supply. Through strategic collaborations and industrial partnerships, the initiative aims to reshape the national manufacturing landscape, fostering progress and specialization in accordance with industry needs.
EROFIO - ENGENHARIA E FABRICAÇÃO DE MOLDES S.A.	97.278.006,08	No	81	**INOV.AM – Inovação em Fabricação Aditiva** The initiative centers on Additive Manufacturing's distinctive attributes, with applications spanning sectors for tailored, high-value, and sustainable products. Collaboration between cross-industry corporations and national scientific bodies defines the program, focusing on novel materials, advanced manufacturing methods, automation, and more. A core objective is to train personnel comprehensively in additive manufacturing, accompanied by an encompassing advanced training and certification strategy.
BONDALTI CHEMICALS, S.A.	147.814.482,01	Yes	5	**H2Enable - The Hydrogen Way for Our Chemical Future** The H2Enable Agenda aims to accelerate and reshape the green hydrogen value chain in Portugal, commencing from the Estarreja Chemical Complex—home to major industry players Bondalti and Air Liquide. These corporate promoters, supported by two Research and Innovation entities—the Faculty of Engineering at the University of Porto and the Collaborative Laboratory HyLab—alongside APQuímica, the chemical and petrochemical cluster management entity, will drive Research & Development, Productive Investment, and Promotion efforts. The core objective is the establishment of a pivotal large-scale green hydrogen plant and associated infrastructure, allowing broad distribution across numerous economic sectors.
DOMINGOS DA SILVA TEIXEIRA S.A.	215.080.294,42	No	53	**R2UTechnologies - modular systems** This Innovation Pact is born from the integration of the initiatives "R2U Technologies" and "Glass Net," aiming for a profound transformation in the modular construction sector. It seeks to shift from labor-intensive production to knowledge-intensive paradigms. This pact aims to empower businesses, academia, and human resources to create a global modular construction cluster.
VOLKSWAGEN AUTOEUROPA, LDA	167.272.966,83	No	46	**Transição para a fábrica do futuro** The "Drivolution Agenda" aims to establish a Future Factory model addressing energy transition and digital transformation challenges in the automotive sector, fostering intelligent, sustainable, inclusive, and resilient growth. Designed around 5 key actions—Digitalization, Industry 5.0, Safety & Ergonomics, Materials, and Specialized Digital Training—this initiative comprises 20 sub-projects, driving innovation in each area. With the participation of 40 entities, including 20 companies and 20 scientific and technological institutions, this Agenda targets impactful process and product innovation, contributing significantly to the national economy.
ATEP - AMKOR TECHNOLOGY PORTUGAL, S.A.	76.652.612,28	No	17	**Agenda Microeletrónica** The "Microelectronics Agenda" aligns with European initiatives like IPCEI on Microelectronics and the EU Chips Act, aiming to enhance Europe's autonomy in this pivotal sector. Designed as a proactive response to address systemic shortcomings, this Agenda prioritizes investments in production capacity, innovation, skill development, and information generation within the national semiconductor industry. It represents a crucial initial step towards bolstering Europe's position and societal value amidst Asian market dominance and digital transition imperatives.
VISTA ALEGRE ATLANTIS, S.A.	118.153.431,55	Yes	35	**Ecocerâmica e Cristalaria de Portugal** The ECP Pact presents an inclusive, cross-cutting proposition for the Ceramic and Glass sectors, targeting competitiveness drivers to enhance international positioning. Focusing on 4 core themes—energy sustainability, circular economy and industrial symbiosis, digital transition, and capacity-building—it fosters high-value product, process, and service development through novel trans-sectoral industrial models. This initiative advances the value chain globally by prioritizing higher-value activities and encouraging collaboration, innovation, and investment across segments. Anchored in a vital national sector, the ECP Pact aims to heighten competitiveness through innovation, differentiation, robust collaboration, and asset qualification improvements
CARITE - CALÇADOS, LDA	59.363.113,15	No	47	**FAIST - Fábrica Ágil Inteligente Sustentável e Tecnológica** The FAIST Agenda—Agile, Intelligent, Sustainable, and Technological Factory—unites 45 entities to enhance the footwear and leather goods sector's agility and competitiveness. By leveraging innovative technologies, sustainable materials, and reinforced digitization, it aims to foster industry growth. Advancements will hinge on automation, robotics, ICT, artificial intelligence, and ecodesign.

INGREDIENT ODYSSEY, S.A.	60.132.740,58	No	45	**InsectERA** InsectERA Agenda propels circular economy and high-value-added innovation for sustainable environmental transition. It fosters new products, processes, and services anchored in research and technology, encompassing the innovation cycle. With a focus on technologically advanced production, it comprises four main work packages: InFood—utilizing insects for sustainable nutrition; InFeed—using insects in animal feed for sustainability; InIndustry—creating insect-derived materials for cosmetics, bioplastics, and more; InBiorremediation—using insects for bioremediation, such as waste elimination.
FUSION FUEL PORTUGAL, S.A.	161.997.896,25	Yes	4	**Sines Green Hydrogen Valley (SinesH2GValley)** Sines H2 Green Valley Agenda unites diverse partners and initiatives to establish a comprehensive green hydrogen value chain, catalyzing innovation in Sines as a technological hub. Aligned with the National Hydrogen Strategy, it fosters inventive services linking producers and consumers directly. This initiative focuses on introducing two Public-Private Partnerships (PPS): green hydrogen production and distribution, alongside HEVO-SOLAR Generation 2 electrolyzers developed within the Agenda. With external partners in Sines embracing future green hydrogen consumption, this initiative echoes national hydrogen goals while creating innovative regional services.
NAVIGATOR PAPER SETÚBAL, S.A.	118.590.327,71	Yes	31	**From Fossil to Forest** This "Innovation Pact" targets cellulose-based packaging and products to replace fossil plastics. It encompasses six work packages: (1) high-yield pulps and brown papers, (2) mechanically enhanced papers, (3) barrier-enhanced papers, (4) biocomposites, (5) smart packaging paper sensors, and (6) molded cellulose for rigid packaging.
PETROGAL, S.A.	578.610.439,6	No	20	**Moving2Neutrality** The Agenda addresses the energy transition challenge in transportation by producing sustainable fuels for carbon neutrality. Led by Petrogal, the consortium unites visionary partners sharing the ambition and expertise to decarbonize and reduce energy dependency. Centered at the Green Energy Park in Sines, this hub capitalizes on unique regional resources to become a green energy production nucleus.
DST SOLAR, S.A.	239.227.191,89	No	57	**NGS - New Generation Storage** The New Generation Storage (NGS) Innovation Pact aligns with the EU's energy transition strategy by 2040 and complete electrification of mobility by 2035. Organized into 8 Work Packages covering the entire value chain—components, packs, and battery recycling—this initiative adds value at every step, culminating in a shared objective: creating a new battery technology ecosystem to elevate national industry on the global stage.
COLEP PACKAGING PORTUGAL, S.A.	203.600.655,93	No	126	**PRODUTECH R3** The PRODUTECH R3 project aims to empower the Production Technologies sector (FTP) to leverage the substantial investments anticipated during the green and digital transition. It aims to reduce external technological dependence, enhance domestic value addition, and shift Portugal's economic specialization.
NAU VERDE, LDA	119.697.962,77	No	21	**Projeto Lusitano** The Lusitano Project aims to revitalize the national Textile and Clothing Industry (ITV) by reindustrializing and restoring a crucial segment of the value chain within Europe. Through R&D, Productive Innovation, Training, and Internationalization, it aims to develop the capability to manufacture recycled and natural fiber threads, leading to high-value textile and clothing innovations. Additionally, it seeks to enhance sector competitiveness by integrating intelligent systems aligned with Industry 4.0 and the Internet of Things, while implementing wastewater treatment and reuse solutions to minimize water resource consumption. By sharing results, the project intends to inspire and spread its impact across other entities.
ESTAMPARIA TÊXTIL - ADALBERTO PINTO DA SILVA S.A.	22.624.131,59	No	30	**GIATEX - Gestão Inteligente da Água na ITV** The GIATEX project addresses water-intensive challenges faced by textile finishing companies. Its objective is to develop tools enabling these companies to reduce water consumption through less intensive finishing technologies and adoption of water treatment methods for reuse. Simultaneously, it supports informed decision-making for water utilization through integrated monitoring and process control systems. The strategy involves (i) studying and characterizing wet processes, (ii) R&D in intelligent process monitoring systems, low-water-consumption finishing technologies, and wastewater treatment methods, (iii) implementing developed technologies in pilot units, and (iv) creating a decision-support software for water management. This initiative aligns with sustainability objectives, fostering water-efficient practices within the textile industry.
ASCENZA AGRO, S.A.	57.105.150,59	No	18	**TEC4GREEN** The Agenda TEC4GREEN aims to prepare the agro-industrial sector (food and forestry) for future technological and environmental challenges, while minimizing environmental impacts on soil, water, and the atmosphere, thereby promoting sectoral sustainability. Guided by circular principles, the agenda focuses on protection (of crops), nutrition (of crops), production (agricultural), and valorization (of waste) in the agro-industrial value chain.

SERMEC II - INDÚSTRIA, COMÉRCIO E SERVIÇOS, S.A.	68.558.152	No	14	**PRODUZIR MATERIAL CIRCULANTE FERROVIÁRIO EM PORTUGAL** This Innovation Pact aims to diversify and enhance Portugal's economic structure and specialization. By horizontally integrating specialized companies within a broad national consortium, it endeavors to construct three types of carriages to develop an innovative and much-needed "Portuguese train." Through research promotion, business innovation, and cooperation, the project aims to bolster the national industry's capability in meeting the growing demand for railway rolling stock. This demand stems from trains being the most energy- and environmentally-efficient mode of transportation, aligning with EU mobility policies and global shifts in transportation strategies.

Annex 4. Model estimations for Industries and production technologies

Logistic regression — Number of obs = 150; LR chi2(17) = 43.07; Prob > chi2 = 0.0005; Log likelihood = -52.115694; Pseudo R2 = 0.2924

Status	Odds ratio	Std. err.	z	P>|z|	[95% conf.	interval]
number_employees	1.011957	.0049721	2.42	0.016	1.002258	1.021749
revenue_2021	1.000098	.0000423	2.33	0.020	1.000016	1.000181
pl_before_tax	1.000226	.0004479	0.50	0.614	.9993483	1.001104
cash_flow	1.000415	.0004375	0.95	0.343	.999558	1.001273
roe_2021	1.00336	.0169538	0.20	0.843	.9706759	1.037146
total_assets	1.000009	.000045	0.19	0.848	.9999205	1.000097
shareholders_funds	.9998233	.0001054	-1.68	0.094	.9996167	1.00003
working_capital	.99997	.0000823	-0.36	0.716	.9998086	1.000131
added_value	.9994285	.0002712	-2.11	0.035	.998897	.9999603
profit_margin	.9309685	.0779609	-0.85	0.393	.7900488	1.097024
interest_coverage	1.002006	.0068707	0.29	0.770	.9886294	1.015563
solvency_	1.074223	.0266849	2.88	0.004	1.023175	1.127819
gearing_	1.008719	.005254	1.67	0.096	.998474	1.01907
profit_per_employees	.9896748	.0385724	-0.27	0.790	.9168896	1.068238
trucost_	1.130538	.1158348	1.20	0.231	.9248493	1.381972
falcon_	.9757506	.2942926	-0.08	0.935	.5402702	1.762246
CRIF_	1.004361	.0042187	1.04	0.300	.9961261	1.012663
_cons	.0029729	.0079816	-2.17	0.030	.0000154	.5733746

Annex 5. Model estimations for The Cross-Cutting Technologies and Their Applications

Logistic regression — Number of obs = 50; LR chi2(11) = 10.95; Prob > chi2 = 0.4476; Log likelihood = -22.932666; Pseudo R2 = 0.1927

Outcome	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
OperatingrevenueTurnover202	2.09e-08	3.15e-08	0.66	0.508	-4.09e-08	8.27e-08
ROEusingPLbeforetax	-.0076174	.0148672	-0.51	0.608	-.0367566	.0215217
PLbeforetax	2.87e-07	4.33e-07	0.66	0.507	-5.61e-07	1.14e-06
CashflowNetIncomebeforeDA	-6.25e-07	5.68e-07	-1.10	0.271	-1.74e-06	4.89e-07
Totalassets	-4.74e-09	4.26e-08	-0.11	0.911	-8.83e-08	7.88e-08
Shareholdersfunds	-9.06e-08	1.13e-07	-0.80	0.422	-3.11e-07	1.30e-07
added_value	2.79e-07	1.68e-07	1.66	0.098	-5.13e-08	6.09e-07
Profitmargin	-.010557	.0261008	-0.40	0.686	-.0617136	.0405996
Gearing	-.002379	.0033834	-0.70	0.482	-.0090105	.0042524
Profitperemployeeth	.0175398	.0139094	1.26	0.207	-.0097223	.0448018
numberofemployers	-.0001282	.0004831	-0.27	0.791	-.0010751	.0008187
_cons	.0248971	.6439274	0.04	0.969	-1.237177	1.286972

Annex 6. Goodness-of-fit test for The Cross-Cutting Technologies and Their Applications

Goodness-of-fit test after logistic model
Variable: **Outcome**

Number of observations = **50**
Number of groups = **10**
Hosmer-Lemeshow chi2(**8**) = **9.86**
Prob > chi2 = **0.2747**

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Annex 7. Model estimations for The Natural Resources and Environment

Logistic regression — Number of obs = 162; LR chi2(12) = 44.47; Prob > chi2 = 0.0000; Log likelihood = -88.817635; Pseudo R2 = 0.2002

Decision	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
Number_of_employees	.0036017	.0021257	1.69	0.090	-.0005645	.007768
Added_value	-5.97e-08	6.16e-08	-0.97	0.332	-1.80e-07	6.10e-08
Operating_revenue	-7.10e-09	1.53e-08	-0.46	0.643	-3.71e-08	2.29e-08
Profit_per_employee	.0095106	.0102158	0.93	0.352	-.0105121	.0295332
PL_before_tax	9.32e-08	1.22e-07	0.76	0.445	-1.46e-07	3.33e-07
ROE_using_PL_before_tax	.0025506	.0141495	0.18	0.857	-.0251819	.0302831
Total_assets	-3.44e-09	5.99e-09	-0.58	0.565	-1.52e-08	8.29e-09
Profit_margin	-.0106368	.0309969	-0.34	0.731	-.0713896	.050116
Working_capital	1.49e-07	5.63e-08	2.65	0.008	3.90e-08	2.60e-07
Trucost_2020	.0639497	.0198968	3.21	0.001	.0249527	.1029468
CRIF	-.0039797	.0023743	-1.68	0.094	-.0086332	.0006739
Gearing	-.002659	.001945	-1.37	0.172	-.0064712	.0011531
_cons	1.864756	1.430701	1.30	0.192	-.9393677	4.668879

Figure 50. Model Estimation without companies with both accepted/rejected status

Annex 8. Goodness-of-fit test for The Natural Resources and Environment

Goodness-of-fit test after logistic model
Variable: Decision

Number of observations = 162
Number of groups = 10
Hosmer–Lemeshow chi2(8) = 7.31
Prob > chi2 = 0.5037

Figure 51. Goodness-of-fit test

Annex 9. Model estimations for The Health, Well-Being and Territory sector

Logistic regression

Number of obs = 35
LR chi2(13) = 12.23
Prob > chi2 = 0.5085
Log likelihood = -18.128501 Pseudo R2 = 0.2523

Status	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
PL_before_tax	-2.12e-08	5.28e-07	-0.04	0.968	-1.06e-06	1.01e-06
ROE_using_PL_before_tax	.0085969	.0120138	0.72	0.474	-.0149496	.0321434
Total_assets	-1.05e-08	8.59e-09	-1.22	0.221	-2.73e-08	6.33e-09
Working_capital	2.10e-07	2.59e-07	0.81	0.418	-2.98e-07	7.18e-07
Added_value	-2.88e-08	5.23e-08	-0.55	0.582	-1.31e-07	7.37e-08
Profit_margin	-.0330793	.04023	-0.82	0.411	-.1119287	.04577
Interest_coverage	-.0049676	.0319239	-0.16	0.876	-.0675372	.057602
Solvency_ratio	-.0164796	.0178595	-0.92	0.356	-.0514835	.0185243
Gearing	.0010026	.005912	0.17	0.865	-.0105847	.01259
Profit_per_employee	.0198362	.025828	0.77	0.442	-.0307858	.0704582
Falcon_2021	.8533751	.446757	1.91	0.056	-.0222525	1.729003
CRIF_2021	-.00614	.0066597	-0.92	0.357	-.0191928	.0069128
Trucost	.4057508	4.142929	0.10	0.922	-7.714241	8.525742
_cons	.8653447	3.754896	0.23	0.818	-6.494116	8.224806

Figure 68. Logistic Regression -Health, Well-Being and Territory

Annex 10. Python's coefficient in descending order for The Health, Well-Being and Territory sector

```
Working capital                          2.214543e-07
Cash flow [Net Income before D&A]        1.652906e-07
P/L before tax                           8.956090e-08
Added value                              8.167310e-08
Operating revenue (Turnover)             1.761061e-08
Shareholders funds                       6.494208e-09
Total assets                             1.324601e-09
Gearing (%)                              1.027099e-10
CRIF 2021                                6.386961e-11
Profit per employee (th)                 4.096110e-11
ROE using P/L before tax (%)             3.088692e-11
Profit margin (%)                        2.977754e-11
Solvency ratio (Liability based) (%)     1.045202e-11
Interest coverage (x)                    4.359976e-12
Falcon 2021                              3.500392e-12
Trucost                                  9.600104e-14
RepRisk                                  0.000000e+00
dtype: float64
```

Figure 69. Python Coefficients -Health, Well-Being and Territory

Annex 11.

Section	Number	Variable	Description	Dependency	Data type	values/ domains	Description of Values
Identification & others	1	Privacy consent	Privacy consent	No	Boolean	1. Yes 2. No	1. Yes 2. No
Identification & others	2	Company	Name of the company	No	Alphabetic		
Identification & others	3	N_Employees	Number of employees	No	Numeric - discrete		
Identification & others	4	Tematic_Area	Thematic area	No	Alphabetic		
Identification & others	5	Initiatives	what specific initiatives or activities did you engage in?	No	Alphabetic		
State of the initiative	6	Received_Funds	Did your company received funds already?	No	Boolean	1. Yes 2. No	1. Yes 2. No
State of the initiative	7	Started_Implementations	Did you company start the implementation of the initiative already	6	Boolean	1. Yes 2. No	1. Yes 2. No
Processes - Elaboration	8	Inclusiveness_Elaboration	How much would you agree with the following statement: The initiative was effectively communicated and inclusive, reaching all levels of the company, not just limited to the CEO?	No	Numeric - discrete	1 2 3 4 5	1 Strongly disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly agree
Processes - Elaboration	9	Efficient/effective_Elaboration	In your opinion, how much would you agree with the following statement "the process of elaborating the candidature contribute to a more efficient and effective implementation of the initiative"	No	Numeric - discrete	1 2 3 4 5	1 Strongly disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly agree
Processes - Application and selection	10	Allocation_Funds	Do you feel that the allocation of funds among consortia was fair and equitable?	No	Numeric - discrete	1. Yes 2. No	1. Yes 2. No
Processes - Application and selection	11	Access_funding	Did the program provide your company with access to funding or financial incentives to invest in overall performance-enhancing measures?	6	Numeric - discrete	1. Yes 2. No	1. Yes 2. No
Processes - implementation	12	Challenges_Boolean	Has your company faced any challenges or barriers in implementing the "Agendas para a Inovação Empresarial" in Portugal?	No	Boolean	1. Yes 2. No	1. Yes 2. No

Processes - implementation	13	Challenges	What were the main obstacles or difficulties encountered during the implementation of the program?	7	Numeric - discrete	1 2 3 4 5 6	1. Resource allocation (financial, human, or technological) 2. Regulatory or Legal Constraints 3. resistance or lack of buy-in from stakeholders (employees, management, etc.) 4. Technological Barriers 5. Coordination Challenges 6. Other, what?
Processes - implementation	14	Possible_Solutions	What are the possible solutions to these problems you envision	13	Alphabetic		
Processes - Monitoring	15	Overall_Support	How would you rate the overall support and guidance provided by the program to help your company improve overall performance?	No	Numeric - discrete	1 2 3 4 5	1. Not supportive 2. partially supportive 3. Neutral 4. Supportive 5. Very supportive
Processes - Monitoring	16	Monitoring_Incidence	In your opinion, how much would you agree with the following statement "the monitoring processes enable your company to identify any bottlenecks or challenges during the initiative's implementation"	No	Numeric - discrete	1 2 3 4 5	1 Strongly disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly agree
Collaboration/partnerships	17	knowledge-sharing	Did "Agendas para a Inovação Empresarial" encourage collaboration and knowledge-sharing among companies in Portugal?	No	Numeric - discrete	1 2 3 4 5	1 Strongly disagree 2 Disagree 3 Neutral 4 Agree 5 Strongly agree
Collaboration/partnerships	18	Collab-Uni	Did your company collaborate with research institutions or universities through the initiative?	No	Boolean	1. Yes 2. No	1. Yes 2. No
Collaboration/partnerships	19	Collab-Uni-helpful	To what extent do you think such a collaboration would be / was helpful?	18	Numeric - discrete	1 2 3 4 5	1 Very helpful 2 Helpful 3 Neutral 4 Not so helpful 5 Not helpful
Expected benefits	20	Effectiveness_Program	How would you rate the effectiveness of the program in enhancing your company's …...?	7	Numeric - discrete	1 2 3 4 5	1. Revenue (1 to 5) 2. Efficiency (1 to 5) 3. Growth in terms of market - competitiveness (e.g., expansion to new markets / bigger market share / expansion to other geographical areas / expansion of partnerships) (1 to 5)

							4. Growth in terms of number of employees (1 to 5) 5. Positioning and strengthening as a brand (1 to 5) 6. innovation and technology advancement (1 to 5)
Expected benefits	21	Non-Financial_Resources_Program	Would you have preferred for the provision of any additional non-financial support, such as mentoring or training?	7	Boolean	1. Yes 2. No	1. Yes 2. No
Expected benefits	22	Overall_Growth	Do you believe the funding from the initiative will contribute to the overall growth of your company in the long term?	7	Boolean	1. Yes 2. No	1. Yes 2. No
Expected benefits	23	Overall_Growth_specific	What do you think the initiative will contribute to the overall growth of your company in the long term in?	7	Numeric - discrete	1 2 3 4 5 6 7	1. Revenue 2. Efficiency 3. Growth in terms of market (e.g., expansion to new markets / bigger market share / expansion to other geographical areas / expansion of partnerships) 4. Growth in terms of number of employees 5. Positioning and strengtening as a brand 6. innovation and technology advancement 7. Other, what?
Expected benefits	24	Measurable_improvement	Have you observed any measurable improvements in your company's innovation capabilities or technology adoption as a result of participating in the program?	7	Boolean	1. Yes 2. No	1. Yes 2. No
Expected benefits	25	Innovation	Did the program help your company identify and adopt innovative practices or technologies to improve performance?	7	Boolean	1. Yes 2. No	1. Yes 2. No

Expected benefits	26	Comparison	How would you compare your company's ..... before and after engaging with "Agendas para a Inovação Empresarial"?	7	Numeric - discrete	1. (1,2,3) 2. (1,2,3) 3. (1,2,3) 4. (1,2,3) 5. (1,2,3) 6. (1,2,3) 7. (1,2,3)	1. Revenue (1. Worst 2. No change 3. Better) 2. Efficiency (1. Worst 2. No change 3. Better) 3. Growth in terms of market (e.g., expansion to new markets / bigger market share / expansion to other geographical areas / expansion of partnerships) (1. Worst 2. No change 3. Better) 4. Growth in terms of number of employees (1. Worst 2. No change 3. Better) 5. Positioning and strengthening as a brand (1. Worst 2. No change 3. Better) 6. innovation and technology advancement (1. Worst 2. No change 3. Better)
Expected benefits	27	Portuguese_Challenges	In your opinion, did the program successfully address the challenges and needs of Portuguese businesses regarding …...?	No	Numeric - discrete	1. (1,2,3,4,5) 2. (1,2,3,4,5) 3. (1,2,3,4,5) 4. (1,2,3,4,5) 5. (1,2,3,4,5) 6. (1,2,3,4,5) 7. (1,2,3,4,5)	1. Revenue (1. Strongly disagree 2. disagree 3. neutral 4. disagree 5. Strongly disagree) 2. Efficiency (1. Strongly disagree 2. disagree 3. neutral 4. disagree 5. Strongly disagree) 3. Growth in terms of market (e.g., expansion to new markets / bigger market share / expansion to other geographical areas / expansion of partnerships) (1. Strongly disagree 2. disagree 3. neutral 4. disagree 5. Strongly disagree) 4. Growth in terms of number of employees (1. Strongly disagree 2. disagree 3. neutral 4. disagree 5. Strongly disagree) 5. Positioning and strengthening as a brand (1. Strongly disagree 2. disagree 3. neutral 4. disagree 5. Strongly disagree) 6. innovation and technology advancement (1. Strongly disagree

							2. disagree 3. neutral 4. disagree 5. Strongly disagree)
Expected benefits	28	Recommend_Program	Would you recommend the initiative to other companies seeking funding and support for innovation activities?	No	Boolean	1. Yes 2. No	1. Yes 2. No
Extra data collection	29	R&D_expenses	How much is invested in research and development purposes?	No	Numeric - continuous		
Extra data collection	30	Technology_investment	How much is invested in technology?	No	Numeric - continuous		
Extra data collection	31	Sustainable_product_development_investment	How much is invested in sustainable product development?	No	Numeric - continuous		
Extra data collection	32	Investment_renewable_energy_sources	How much is invested in renewable energy sources?	No	Numeric - continuous		
Extra data collection	34	Number_Employees_R&D	How many employees work in R&D related activities?	No	Numeric - discrete		
Extra data collection	35	Highly_skilled_employees	Of your workforce, how many of them are considered Highly Skilled Employees?	No	Numeric - discrete		
Extra data collection	36	Technology_partnerships	How many Technology Partnerships do you have, which ones?	No	Numeric - discrete		
Extra data collection	36	Recycled_materials_production	What is the percentage of recycled materials used in production?	No	Numeric - continuous		
Extra data collection	36	Energy_consumption	what are your energy consumption levels?	No	Numeric - continuous		
Extra data collection	37	Carbon_emissions	What are the carbon emissions per unit of production in your company?	No	Numeric - continuous		

Carbon Emissions per Unit of Production	Measures carbon intensity, indicating progress toward carbon neutrality goals.	Own data collection

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