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The Impact of European Funds on the Performance of Cork Sector Companies

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Resumo

Os fundos europeus têm sido um instrumento decisivo para o investimento empresarial em Portugal, com particular importância em indústrias estratégicas como a da cortiça. Apesar da importância global do setor e do seu forte contributo para as exportações nacionais, não existia até agora uma avaliação causal sistemática destes fundos. Este trabalho procura tratar dessa lacuna, ao analisar o impacto do programa Portugal 2020 no desempenho das empresas do setor da cortiça entre 2013 e 2023.

Recorrendo a uma amostra que combina dados oficiais das operações aprovadas do Portugal 2020 com informação contabilística extraída do SABI, foi construído um painel emparelhado recorrendo ao *Propensity Score Matching*. Os efeitos causais do apoio foram depois estimados com recurso a um modelo de Diferenças-em-Diferenças em escalonamento temporal. O desempenho empresarial foi avaliado em três dimensões fundamentais: valor acrescentado bruto (VAB), produtividade e volume de negócios.

Os resultados indicam que o apoio do Portugal 2020 teve um impacto positivo e estatisticamente significativo no VAB, sobretudo nas empresas que receberam financiamento mais cedo, com efeitos que se materializam sobretudo a médio prazo. Contudo, não foram encontradas evidências consistentes de melhorias na produtividade ou nas vendas. Estes resultados reforçam a ideia de que os efeitos dos fundos europeus não são automáticos nem homogéneos, dependendo tanto do momento de entrada no programa como do tempo necessário para que os investimentos apoiados se traduzam em resultados mensuráveis.

Palavras-chave: Fundos Europeus, Portugal 2020, Setor da Cortiça, Desempenho Empresarial, Diferenças-em-Diferenças.

Abstract

The European funds have been a decisive instrument for business investment in Portugal, with particular importance in strategic industries such as cork. Despite the sector's global relevance and strong contribution to national exports, no systematic causal evaluation of these funds existed until now. This research seeks to fill that gap by analyzing the impact of the Portugal 2020 programme on the performance of cork sector firms between 2013 and 2023.

Using a sample that combines official data on approved Portugal 2020 operations with accounting information from SABI, a matched panel was constructed through *Propensity Score Matching*. The causal effects of support were then estimated through a staggered Difference-in-Differences model. Firm performance was assessed across three key dimensions: gross value added (GVA), productivity and sales.

The results indicate that Portugal 2020 support had a positive and statistically significant impact on GVA, particularly among firms that received funding earlier, with effects materializing mainly in the medium term. However, no consistent evidence was found regarding improvements in productivity or sales. These findings reinforce the idea that the effects of European funds are neither automatic nor homogeneous, depending both on the timing of entry into the programme and on the period needed for supported investments to generate measurable outcomes.

Keywords: European Funds, Portugal 2020, Cork Sector, Firm Performance, Difference-in-Differences.

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1. Introduction

European funds have played a decisive role in Portugal's economic development, becoming one of the main sources of public financing for business investment over the last decades. Since the country's accession to the European Union, these instruments have represented on average around 3% of national Gross Domestic Product (GDP), contributing to competitiveness, productive modernization and territorial cohesion (Cabral & Campos, 2023). From 2014 to 2020, the Portugal 2020 programme mobilized approximately 25 billion euros, directed mainly towards innovation, internationalization and business capacity building.

The importance of these funds is particularly evident in the cork industry. Portugal is the world's leading producer, responsible for around 50% of global output, and sector exports exceed 2 billion euros annually, representing about 2% of the national total (APCOR, 2023). The industry is highly internationalized, with more than 70% of production destined for foreign markets, holding a strategic role in shaping the country's external specialization.

Although recent studies have advanced in measuring the impacts of European funds on firm performance across several countries (Benkovskis, Tkačevs & Yashiro, 2018; Muraközy & Telegdy, 2023) and national evaluations for Portugal have also found positive effects across dimensions such as turnover, exports and employment (Cabral & Campos, 2023; AD&C, 2018; EY-Parthenon, 2023), the evidence remains largely aggregated and cross-sectoral. For the cork sector in particular, no systematic causal evaluation exists to date for Portugal. It is within this context that the present dissertation is positioned, aiming to address the following research question: what is the impact of Portugal 2020 European funds on the performance of firms in the Portuguese cork sector?

To evaluate the firm performance, the analysis considers three core dimensions: gross value added (GVA), productivity and sales. Based on these dimensions, the following research hypotheses were defined:

H1. Portugal 2020 had a positive effect on the GVA of supported companies.

H2. Portugal 2020 had a positive effect on the productivity of supported companies.

H3. Portugal 2020 had a positive effect on the sales of supported companies.

The empirical strategy relies on firm-level panel. The sample combines information from the Portugal 2020 operations database with accounting data from SABI. To improve comparability between treated and control firms, propensity score matching was applied to improve the balance between the two groups when constructing the sample. Causal impacts were then estimated using a staggered difference-in-differences approach (Callaway & Sant'Anna, 2021), implemented in *Stata* through the *csdid* command, which is particularly suitable for staggered adoption settings.

The results indicate that Portugal 2020 support is associated with gains in GVA, especially among firms that entered the programme earlier, with effects becoming visible in the medium term. By contrast, no consistent evidence of improvements in productivity is found, and in the case of sales, the estimated effects are weak and imprecise. Therefore, the evidence supports the first hypothesis (**H1**), whereas the others (**H2** and **H3**) are not corroborated.

From an academic perspective, this dissertation provides the first causal evaluation of Portugal 2020 specifically within the cork sector, contributing sector-specific evidence to a literature that has so far been predominantly aggregated. From a policy perspective, the findings suggest that the effects of European funds are neither homogeneous nor immediate, highlighting the importance of sectoral focus and the timing of firms' entry into support schemes.

The dissertation is structured as follows. The chapter 2 presents the context of European funds, with particular emphasis on Portugal 2020, and characterizes the cork sector, including a descriptive overview of its participation in the programme. Then, the chapter 3 reviews the relevant literature and outlines the research hypotheses. Subsequently, the chapter 4 describes the data sources, sample construction and econometric approach. Next, the chapter 5 presents and discusses the empirical results, including robustness checks. Finally, chapter 6 summarizes the main conclusions, identifies limitations and outlines directions for future research.

2. The Context: European Funds and the Cork Sector in Portugal

This chapter provides the contextual background for the empirical analysis. It begins with an overview of the European Structural and Investment Funds (ESIF)[1] and their role in Portugal, followed by a discussion of the Portugal 2020 programme. It then characterizes the cork sector, outlining its economic relevance, international positioning and main challenges. Finally, the chapter includes a descriptive analysis of the cork sector's participation in Portugal 2020, providing the empirical foundation for the subsequent econometric evaluation.

2.1. European Structural and Investment Funds

The Structural and Investment Funds of the European Union (EU) are key financial instruments designed to promote economic, social and territorial cohesion by reducing disparities between regions (Mateus, 2013). Rooted in the Treaty of Rome in 1957, the principle of cohesion gained prominence with the Single European Act in 1986, which formally introduced economic and social cohesion as a core objective for EU (Mateus, 2013).

Portugal's accession to the European Communities in 1986 enabled access to these instruments at a time when the country faced significant infrastructure deficits, low productivity and weak institutional capacity (Pires, 2017). From that moment, the Structural Funds played a central role in financing modernization and convergence policies (Pires, 2017).

In the initial decades, three funds acted as the backbone of the EU's cohesion policy:

- **European Social Fund** (ESF)[2]: Established in 1957, the ESF is the oldest of the instruments and focuses on improving employment opportunities, promoting social inclusion and enhancing workforce skills. In Portugal, it has supported vocational training centers, employment programs and the integration of disadvantaged groups (Mateus, 2013).

[1] Fundos Estruturais e de Investimento Europeus (FEEI).
[2] Fundo Social Europeu (FSE).

- **European Agricultural Guidance and Guarantee Fund (**EAGGF)[3]: Created in 1962, this fund supported agricultural restructuring, irrigation systems, rural diversification and modernization of the agri-food sector. It contributed significantly to the structural transformation of Portugal's rural economy (Mateus, 2013).
- **European Regional Development Fund** (ERDF)[4]: Introduced in 1975, the ERDF sought to correct regional imbalances by supporting infrastructure development, SMEs and territorial cohesion strategies. In Portugal, it played a crucial role in the development of road networks, industrial zones and public infrastructure (Pires, 2017).

The 1988 reform of the Structural Funds marked a turning point in cohesion policy. It introduced four guiding principles that remain central today: concentration, programming, partnership and additionality (Mateus, 2013). These reforms established the framework for multiannual planning through the Community Support Frameworks (CSF)[5], which allowed for more strategic and result-oriented use of the funds (Mateus, 2013).

The Maastricht Treaty of 1992 reinforced cohesion as a fundamental EU goal and led to the creation of the Cohesion Fund[6] (Mateus, 2013). This fund was designed to support Member States with a GDP per capita below 90% of the EU average, focusing on environmental and transport infrastructure. In Portugal, it financed metro expansions in Lisbon and Porto, wastewater treatment systems and motorway construction (Mateus, 2013).

The 2007-2013 financial framework introduced two additional funds:

- **European Agricultural Fund for Rural Development** (EAFRD)[7]: Replacing the EAGGF, the EAFRD promotes sustainable rural development, biodiversity protection and agricultural competitiveness. In Portugal, it contributed to multifunctional agriculture and the revitalization of rural communities (Mateus, 2013).
- **European Maritime and Fisheries Fund** (EMFF)[8]: This fund, later succeeded by the European Maritime, Fisheries and Aquaculture Fund (EMFAF)[9], was

[3] Fundo Europeu de Orientação e Garantia Agrícola (FEOGA).
[4] Fundo Europeu de Desenvolvimento Regional (FEDER).
[5] Quadros Comunitários de Apoio (QCAs).
[6] Fundo de Coesão.
[7] Fundo Europeu Agrícola de Desenvolvimento Rural (FEADER).
[8] Fundo Europeu dos Assuntos Marítimos e das Pescas (FEAMP).
[9] Fundo Europeu dos Assuntos Marítimos, das Pescas e da Aquicultura (FEAMPA)

created to modernize the fisheries sector and support sustainable maritime economies. In Portugal, it strengthened coastal communities and marine biodiversity protection (Mateus, 2013).

These five funds (ESF, ERDF, Cohesion Fund, EAFRD and EMFF) are governed by the Common Provisions Regulation, which harmonizes implementation rules across Member States. The regulation promotes strategic alignment, results-based programming and stronger monitoring and evaluation mechanisms (Mateus, 2013).

Over the past thirty years, Structural Funds have been organized in multiannual programming cycles, reflecting the strategic priorities of the European Union and the specific needs of the national territory (Mateus, 2013). Between 1989 and 2015, Portugal benefited from more than 100 billion euros in structural funding, achieving high execution rates and a significant presence of these funds in the national GDP (Pires, 2017). The impact was most visible in areas such as transport infrastructure, sanitation, education and administrative modernization, with tangible results across the country (Pires, 2017). However, doubts were also raised regarding the dispersion of resources and the implementation of projects with low economic returns or questionable sustainability (Pires, 2017).

2.2. Structural Funds Programming Cycles

CSF I (1989-1993)

The first programming cycle aimed to promote real convergence between the Portuguese economy and the European average, while fostering internal economic and social cohesion (Pires, 2017). It was structured around six priority axes: economic infrastructure, support to productive investment, human resources, agricultural modernization, industrial restructuring and regional development (Pires, 2017). During this period, EU funds supported landmark projects such as Autoeuropa and the Lisbon Congress Centre, alongside widespread investment in schools, sanitation and vocational training, which reached more than one million individuals (Pires, 2017). Despite its lower financial volume compared to later cycles, CSF I was perceived publicly as a transformative surge of investment, the so-called "rain of millions", that symbolized Portugal's new European trajectory (Mateus, 2013).

CSF II (1994-1999)

The second cycle maintained the overarching objectives of converge but restructured its approach into four areas: human capital and employment, competitiveness and innovation, social cohesion and the regional economic base (Mateus, 2013). Its main innovation was the introduction of Cohesion Fund, which financed emblematic projects such as the Vasco da Gama Bridge and the Greater Porto water system (Pires, 2017). The funding volumes more than doubled compared to CSF I, leading to an expansion in physical infrastructure, from sanitation networks to hospitals and schools connected to the internet (Pires, 2017). However, the focus on tangible outputs often came at the expense of strategic investment in skills and education, revealing an imbalance between infrastructure and human capital (Mateus, 2013).

CSF III (2000-2006)

The third programming cycle aimed to eliminate Portugal's structural gaps within a generation, prioritizing human capital, innovation, territorial enhancement and cohesion (Pires, 2017). It introduced a more regionalized logic through stronger Regional Operation Programs managed by the Regional Coordination and Development Commission (RCDC)[10], although central control remained dominant (Mateus, 2013). This cycle mobilized the highest absolute volume of EU funds to date, financing emblematic projects such as the Porto Metro, the Alqueva Multipurpose Project and the Centros Ciência Viva, as well as expanding renewable energy infrastructure (Pires, 2017). Nonetheless, criticisms were raised regarding implementation delays and bureaucratic complexity, particularly due to dual coordination by national and regional authorities (Mateus, 2013).

QREN (2007-2013)

The National Strategic Reference Framework (NSRF)[11] marked a qualitative shift in cohesion policy. It focused on three strategic agendas: human potential, competitiveness and territorial development, aligning national investment with medium and long-term EU objectives under the Lisbon Strategy (Mateus, 2013). During this period, the global financial crisis reshaped programming by raising co-financing ceilings and emphasizing support for education, science, technological development and social inclusion (Pires, 2017). Notable

[10] Comissões de Coordenação e Desenvolvimento Regional (CCDR).
[11] Quadro de Referência Estratégico Nacional (QREN).

outcomes include school rehabilitation, urban regeneration projects and the expansion of research capacity, with research and development (R&D) expenditure reaching 1.29% of GDP by 2014 (Mateus, 2013). Despite the progress, the fragmented governance model and limited capacity in less developed regions continued to constrain the strategic effectiveness of cohesion policy (Mateus, 2013).

Portugal 2020 (2014-2020)

In 2010, Europe found itself at a critical juncture marked by economic turmoil and the revelation of underlying structural weaknesses in its economy (European Commission, 2010). The aftermath of the crisis had erased years of economic and social progress, leading the European Commission to take swift action in the face of global challenges such as globalization, resource pressure and an ageing population (European Commission, 2010). It was against this backdrop that the Europe 2020 strategy emerged as a transformative initiative, sought to reshape the European Union into a smart, sustainable and inclusive economy, with a focus on achieving high levels of employment, productivity and social cohesion (European Commission, 2010).

Within this particular context, the Portugal 2020 initiative comes into focus. Portugal 2020 is the partnership agreement established between Portugal and the European Commission for the implementation of the five ESIF from 2014 to 2020 (Portugal 2020, n.d.). This initiative adopts the programming principles of the Europe 2020 strategy and encapsulates a comprehensive policy for economic, social, environmental and territorial development (Portugal 2020, n.d.).

With an earmarked reception of 25 billion euros until 2020, Portugal has outlined key objectives in the Portugal 2020 framework (Agência para o Desenvolvimento e Coesão, n.d.):

- Stimulating the production of tradable goods and services and exports;
- Enhancing human capital through education, training and knowledge transfer from the scientific system to the productive fabric;
- Promoting social inclusion by reducing early school leaving, integrating people at risk of poverty and social exclusion;
- Strengthening territorial cohesion, sustainable development and the modernization of Public Administration.

The design and implementation of Portugal 2020 revolve around four thematic domains: Competitiveness and Internationalization, Social Inclusion and Employment, Human

Capital, Sustainability and Efficiency in Resource Utilization. Moreover, it also considers cross-cutting domains pertaining to the reform of public administration and the territorialization of interventions (Portugal 2020, n.d.).

Regarding the operational structure of Portugal 2020, it is implemented through 16 Operational Programs, in addition to the European Territorial Cooperation Programs in which Portugal collaborates alongside other Member States (Portugal 2020, n.d.). In figure 1, we can overview the distribution of the 25 billion euros in the scope of each of the Operational, thematic and regional Programs (Portugal 2020, n.d.).

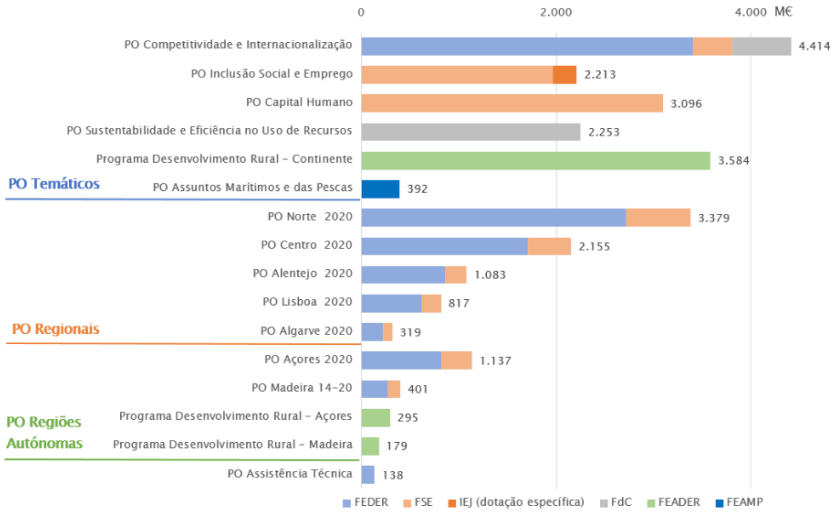

Figure 1: Portugal 2020 Financial Allocations by Program and Fund (Portugal 2020, n.d.)

As of the end of February 2024, Portugal 2020 achieved a commitment rate of 112% and an execution rate of 99.6% (Portugal 2020, n.d.). However, despite these quantitative accomplishments, Portugal 2020 has also faced several criticisms. Nishimura et al. (2021) argue that the programme pushed resources into non-tradable sectors, which limited productivity and competitiveness, while failing to build a clear territorial strategy. They also point out that sustainability goals were given less priority, with weak investment in renewable energy and circular economy initiatives, along with ongoing problems of bureaucracy and low transparency.

2.3. Characterisation of the Cork Sector in Portugal

This section presents a characterization of the cork sector, building primarily on the comprehensive study conducted by APCOR[12] (2023), which provides a detailed diagnosis of the industry between 2011 and 2021/2022. The analysis highlights the historical relevance of the sector, its business structure, economic performance, international positioning and current opportunities and challenges.

Historical Economic Importance

The cork sector represents a strategic and historically embedded industry in Portugal, deeply rooted in the country's natural resources and rural landscape. Its origin is drawn from the exploitation of cork oak forests, a unique agro-silvo-pastoral ecosystem known as the "montado", which spans over 737.000 hectares in Portuguese territory. Portugal is home to the world's largest cork oak forest area and is the leading producer, processor and exporter of cork worldwide (Pereira & Santos, 2019).

Over the decades, the cork industry has transitioned from a primarily artisanal activity to a modern, capital-intensive and technologically advanced system, integrated into global value chains (Pereira & Santos, 2019). It accounts for more than 50% of global cork production and approximately 62% of global cork exports. These figures are not merely symbolic but translate into a consistent contribution to Portugal's gross value added, trade balance, industrial employment and territorial cohesion (Pereira & Santos, 2019).

Business Structure

The Portuguese cork sector comprises a vertically integrated industrial system that encompasses the harvesting of raw cork, its processing, transformation and commercialisation. Statistically, the industrial dimension of the sector is captured primarily under three activity codes of the Portuguese Classification of Economic Activities (CAE Rev.3): 16293 (preparation of cork), 16294 (manufacture of cork stoppers), and 16295 (manufacture of other cork products).

The sector is predominantly composed of small and medium-sized enterprises (SMEs), which represent more than 99% of companies. Geographically, the cork industry is

[12] Associação Portuguesa da Cortiça.

characterised by a spatial dualism: the extraction of cork is concentrated in the south of Portugal, particularly the Alentejo region, where the "montado" ecosystems prevail, whereas industrial transformation activities are concentrated in the North, particularly in the Porto Metropolitan Area. Municipalities such as Santa Maria da Feira, São João da Madeira and Oliveira de Azeméis host dense clusters of cork processing units, reflecting decades of agglomeration, specialization and technological evolution.

The manufacture of cork stoppers continues to represent the largest share of the industrial base, both in terms of number of enterprises and value generated. However, the production of engineered cork products and applications in insulation, flooring and composite materials has been gaining traction, reinforcing the sector's diversification and innovation capacity.

Economic Evolution of the Sector

Between 2013 and 2023, the Portuguese cork sector recorded steady growth in its main economic indicators, with only a brief contraction during the COVID-19 pandemic. The decade was marked by rising turnover, improvements in productivity and greater technological intensity, supported by external demand, innovation strategies and EU co-financed investment.

The turnover of the sector reached 1.75 billion euros in 2022, a cumulative increase of more than 40% compared to 2013, with the strongest expansion after 2015, coinciding with the Portugal 2020 programme. The GVA surpassed 500 million euros in 2021, growing at an average annual rate of around 4%. In parallel, productivity per worker increased steadily, exceeding 50.000 euros per employee in 2021, reflecting capital deepening and process optimization.

Employment remained relatively stable at around 8.500-9.000 direct jobs, a noteworthy outcome given automation pressures in other industries. This resilience stems from the artisanal nature of some processes and growing demand for customized products, though skill shortages remain a structural challenge. Finally, investment in technological modernization gained momentum between 2016 and 2019, with more than 180 million euros channelled into industrial modernization and digital transformation projects, many co-financed under Portugal 2020.

International Trade and Global Positioning

Portugal remains the global leader in cork exports, both in volume and in the diversity of high-value-added products, with sales exceeding 1.2 billion euros in 2022. The sector contributes decisively to the national trade surplus, with a coverage ratio of exports to imports consistently exceeding 500%.

Portuguese cork products are exported to over 130 countries. The five main destinations in 2022 were France (19%), the United States (17%), Spain (12%), Germany (10%) and Italy (9%), collectively absorbing over two-thirds of total exports. This geographic pattern reflects both historical trade relationships and evolving market segmentation.

The product composition of exports has also evolved. Natural cork stoppers remain the dominant category, accounting for nearly 40% of the sector's exports. However, engineered cork products for flooring, insulation, transport and even aerospace have expanded significantly. This reflects a strategic reorientation towards innovation, quality and sustainability, attributes with increasing value in international markets.

Opportunities and Challenges

The cork sector is well positioned to thrive in the context of global ecological transition. Cork's natural characteristics (100% natural, recyclable and biodegradable material) offer compelling advantages for industries seeking sustainable raw materials. As environmental regulations in the European Union and beyond become more stringent, cork emerges as a viable alternative to synthetic materials in construction, packaging, automotive and consumer goods.

Innovation and research have expanded cork applications through partnerships with universities and research centres, leading to advanced composites and new markets, including lifestyle and luxury segments. However, the sector faces persistent challenges: labour shortages and workforce ageing, rising energy and logistics costs and growing competition from Mediterranean and North African producers, particularly in lower-value segments.

2.4. Cork Sector in Portugal 2020

This section examines how Portugal 2020 funds were channelled to the cork sector, providing a descriptive analysis of the approved operations up to 31 December 2024. By analysing the volume, nature and distribution of public co-financing, the objective is to assess how structural funds have interacted with this strategic industry and the extent to which they reflect its industrial and regional characteristics.

Data Sources and Approach

Two primary data sources were used: (i) the first was the official list of approved operations under Portugal 2020, publicly available on the programme's website, which include project-level financial and geographic information; (ii) the second was a dataset extracted from the SABI ("Sistema de Análise de Balanços Ibéricos"), which provided key identifiers (such as NIF and CAE codes) for companies operating in the cork sector.

By cross-referencing these two sources through the tax identification number (NIF), it was possible to isolate the subset of projects associated with companies whose main activity corresponds to one of the following CAE codes: 16293, 16294 and 16295.

The filtered dataset was then analysed using Python (pandas and matplotlib), enabling the calculation of descriptive statistics and the production of summary tables and graphs.

Descriptive Analysis

A total of 141 projects were approved for companies in the cork sector under Portugal 2020, distributed across 65 distinct beneficiary firms. This represents an average of 2.17 projects per company. The total eligible investment associated with these projects amounted to approximately 190.5 million euros, with approved incentives totalling 65 million euros. This corresponds to an average co-financing rate of 34.1%.

The average investment per project was approximately 1.35 million euros, while the average incentive reached 461,120 euros. These figures highlight the capital-intensive nature of the sector and the relatively modest public contribution, suggesting a high degree of private investment leverage.

For comparative context, the global Portugal 2020 dataset (all sectors) recorded over 73,000 projects with a co-financing rate of 69.1% and average investment per project of 456,673 euros. Thus, cork sector projects, while fewer in number, show significantly higher individual investment amounts and a lower public support ratio. This divergence reflects the

maturity and financial autonomy of the cork industry, which despite its strategic role, operates with a reduced dependence on public grants compared to the broader spectrum of Portuguese firms.

At the regional level (NUTS II), the distribution of cork sector projects reveals a clear concentration in the North of Portugal, which accounted for 106 of the 141 approved projects. This is consistent with the sector's industrial geography, where processing and transformation activities are highly clustered in the Porto Metropolitan Area. The Alentejo region, which dominates cork extraction, recorded 13 projects, followed by the Centre (6), Algarve (3) and the Lisbon Metropolitan Area (2).

At municipal level, the data further highlights this spatial concentration. Santa Maria da Feira alone hosted 94 approved projects, representing two-thirds of the total for the entire sector. Other municipalities with notable activity include Vendas Novas (9 projects), Ovar (4) and Vila Nova de Gaia (3), with a long tail of municipalities with one or two approved operations. These spatial patterns are coherent with the historical evolution and specialisation of the cork industry, which remains deeply rooted in regional industrial ecosystems. The combination of raw material availability in the south and industrial transformation capacity in the north reflects the dualistic nature of the sector.

An analysis by CAE reveals that most projects approved under Portugal 2020 were associated with the manufacture of cork stoppers (CAE 16294), which accounted for 94 of the 141 projects. This was followed by the manufacture of other cork products (CAE 16295), with 39 projects and the preparation of cork (CAE 16293) with 8 projects.

In terms of financial volume, CAE 16294 also registered the highest eligible investment and approved incentive, exceeding 128 million euros and 40 million euros, respectively. CAE 16295 accounted for approximately 57 million euros in investment and 23 million euros in incentives, while CAE 16293 represented a smaller share, with just over 4 million euros in investment. These results are consistent with the industrial structure of the sector, where stopper manufacturing continues to dominate both in scale and technological investment. Nevertheless, the presence of investment across all three CAEs indicates a diversification trend that extends beyond the traditional stopper segment.

Projects in the cork sector under Portugal 2020 were supported through a variety of incentive mechanisms. The most prominent were the Incentives for Research and Technological Development (SI I&DT), which supported 57 projects. This reflects the sector's increasing focus on innovation and technological upgrading. This was followed by

the Incentives for Productive Innovation (SI Inovação Produtiva), with 29 projects, and a smaller number of operations in categories such as Entrepreneurship and Incubation, Energy Efficiency and others. Approximately 49 projects were categorised under more generic or uncategorised domains.

Regarding thematic objectives, most projects were aligned with Objective 3: "Enhancing the competitiveness of small and medium-sized enterprises (SMEs)". This alignment confirms the role of EU funds in reinforcing the competitive positioning of cork-related businesses within and beyond national borders.

The chronological distribution of project start dates indicates two peak years: 2016 and 2020, with 48 and 20 projects initiated respectively. The initial peak corresponds to the early operationalisation of Portugal 2020, while the second may reflect stimulus efforts linked to broader economic recovery strategies.

In terms of project duration, the majority fell within the 12-to-36-month range. Specifically, 26 projects had a 24-month duration, 23 lasted 12 months and 16 projects spanned 36 months. A long tail of durations extended from short (6 months) to medium-long term (over 48 months), suggesting a mix of quick implementation and more structurally transformative initiatives.

Three companies stood out for having six or more approved projects:

i. SEDACOR - Sociedade Exportadora de Artigos de Cortiça, with 10 projects;
ii. UNICOR - Produtos de Cortiça, Lda., with 6 projects;
iii. Amorim Cork, S.A., also with 6 projects.

These firms demonstrate strong engagement with public funding mechanisms and illustrate differentiated strategies. For instance, Amorim Cork concentrated its support in I&DT projects with high individual investment amounts, while SEDACOR distributed its incentives across I&DT, productive innovation and smaller initiatives.

Key Insights

The analysis of the cork sector within the Portugal 2020 framework reveals a pattern of selective but highly significant engagement with public funding. Although the number of approved projects and beneficiary firms is relatively modest, the sector demonstrates substantial average investment levels, a strong focus on innovation and geographical coherence with its industrial and ecological roots.

The comparatively low co-financing rate observed suggests a mature and self-reliant business fabric, capable of mobilising private capital with reduced dependency on public support. Simultaneously, the prioritization of R&D, as evidenced by the prominence of SI I&DT, signals a strategic orientation toward competitiveness through technological upgrading and product diversification.

The findings underscore the dual nature of the cork industry: rooted in traditional resources yet evolving toward high-value and knowledge-intensive activities. The targeted application of EU structural funds in this context appears to have reinforced endogenous development dynamics, supported industrial modernisation and amplified the sector's resilience and international projection.

3. Literature Review

The literature on the effects of European funds on firm performance has grown in recent years, reflecting their important role in EU cohesion and industrial policy. The main question is whether this financial support improves outcomes such as gross value added, employment, productivity and exports. Since it is not feasible to know how supported firms would have evolved without the funds, most studies rely on robust counterfactual methods, most often combining matching techniques with DiD estimators, frequently in staggered designs that can accommodate the fact that firms receive support at different points in time. Evidence is generally consistent in showing positive effects on firm size and survival, such as employment, turnover, and value added, while results on productivity remain mixed.

Cross-country studies provide an overview of these dynamics. Bachtrögler et al. (2020), covering seven member states in the 2007-2013 period, find that support from cohesion policy increased employment and GVA but did not translate into productivity gains. Similarly, Dvouletý et al. (2021), in a review of 30 studies from 13 countries, conclude that grants consistently improved survival, employment, assets and turnover, whereas results for productivity are less conclusive. This suggests that EU funds generally expand firm scale, but efficiency gains are far from guaranteed.

Firm-level analyses relying on counterfactual methods provide more detail. Banai et al. (2020), focusing on Hungarian SMEs in the 2007-2013 programming period, use propensity score matching combined with DiD regressions to estimate causal effects of EU enterprise subsidies. They find significant positive impacts on employment, sales and GVA, and in some cases operating profit, but no effect on labour productivity. Muraközy and Telegdy (2022), examining the 2004-2014 period in Hungary with a similar identification strategy, conclude that subsidised firms, compared with non-selected applicants, experienced higher employment, sales, total assets and labour productivity. Focusing on human capital, Martins (2021) examines the effects of an extensive ESF training programme implemented in Portugal between 2007 and 2011. Using a DiD approach with longitudinal firm-level data, he finds significant increases in training hours and training expenditure, which in turn translated into higher sales, value added, employment, productivity and exports for beneficiary firms.

In Portugal, the evaluations provide consistent evidence of positive impacts. At the macro level, AD&C (2021) concludes that Portugal 2020 contributed positively to GDP, investment and employment, confirming that the effects go beyond the firm level. Cabral and Campos (2023) show that COMPETE 2007-2013 increased employment, turnover, value added and exports for supported firms, compared with rejected applicants, using a dynamic DiD methodology. EY-Parthenon (2023), focusing on Portugal 2020's SI Innovation and Competitiveness programme, find strong positive effects on exports, value added and employment, already during project execution but stronger in the years after completion. SMEs and innovative firms benefited relatively more, although absolute gains were larger among large firms. Importantly, the report highlights that manufacturing was the only sector with statistically significant productivity gains, showing that impacts vary substantially across industries.

Largely, the literature converges on positive impacts of EU funds on employment, sales, value added and exports, while diverging on productivity effects. However, heterogeneity is a common finding: SMEs often benefit more in relative terms, regional effects vary with initial conditions and sectoral results differ. Additionally, timing also matters, as effects typically strengthen in the years following project completion. Despite this growing body of work, sector-specific evidence remains limited. Most studies examine all firms in the economy or focus on innovation, overlooking industries with distinct structures and competitive dynamics, such as the Portuguese cork sector, which plays a key role in value added. This dissertation seeks to fill that gap by applying a staggered difference-in-differences estimator (Callaway & Sant'Anna, 2021) combined with propensity score matching, to assess the effects of Portugal 2020 support on cork-sector firms.

4. Methodology

4.1. Data

To assess the impact of Portugal 2020 on the performance of companies in the cork sector, the econometric analysis combines the operations database of Portugal 2020 with firm-level financial information. The operations database, already introduced in the descriptive analysis, provides information on all approved projects, including firm identifiers, project start dates and funding amounts. For the econometric study, this information was consolidated at the firm level by retaining only the first approved project per firm. This choice ensures that treatment is consistently defined at the first support moment, prevents multiple counting of the same beneficiary and aligns with best practices in policy evaluation (Cerqua & Pellegrini, 2014; Callaway & Sant'Anna, 2021).

The second source is the Sistema de Análise de Balanços Ibéricos (SABI), which provides detailed financial and accounting information on Portuguese firms. For the purposes of this dissertation, the extraction was restricted to companies operating in the cork sector, identified by the CAE codes 16293, 16294 and 16295. In order to ensure that the panel captures firms with a consistent operating history before the programme, only firms established up to 2013 were considered.

By merging the two sources through the firm's tax identification number (NIF), it was possible to construct a longitudinal dataset covering the period 2013-2023. The choice of this interval reflects both the institutional design of Portugal 2020 and the specific dynamics of the cork sector. Although the programme was in force from 2014 to 2020, the first approved projects in the cork industry only began in 2015. Consequently, the years 2013 and 2014 were retained as a clean pre-treatment window, with 2015 serving as the cut-off point between pre- and post-treatment periods. Extending the dataset until 2023 allows the analysis to capture not only immediate but also medium-term effects of EU support. The firms included in the Portugal 2020 approvals list constitute the treated group, while all other cork sector firms in SABI that never appear in the approvals list form the control group.

In addition, two treatment indicators were created: a dummy variable identifying whether a firm ever received Portugal 2020 support and a variable marking the first year of treatment. Together, these define not only which firms are treated but also when they received it, which is crucial for the difference-in-differences strategy applied later (Callaway & Sant'Anna, 2021).

4.2. Sample Construction and Data Treatment

To guarantee the existence of a valid baseline, firms were retained only if they had available financial information in at least one early year (2013 or 2014). This requirement provides a reliable pre-treatment reference point, which is essential for causal inference in difference-in-differences designs (Angrist & Pischke, 2009).

Secondly, several derived variables were constructed to capture key dimensions of firm performance: productivity, measured as gross value added per employee; firm size, measured as the logarithm of total assets; profitability, proxied by return on assets (ROA, defined as net income over assets); and leverage, defined as the debt-to-assets ratio. These indicators are widely employed in the literature on firm performance and policy evaluation (Caliendo & Kopeinig, 2008; Cerqua & Pellegrini, 2014) and they align with the eligibility and evaluation criteria typically used in EU funding programmes, such as financial soundness, growth potential and employment generation.

However, all monetary variables were expressed in constant terms. To this end, a specific deflator was constructed using the official series "Índices de preços na produção industrial - Total - bruto (Base 2021), por atividade económica (CAE Rev. 3); Mensal" published by INE. The monthly index was first aggregated into annual averages and then normalised to 2021 as the base year (2021=100). The use of this industrial production price index is particularly appropriate given that it reflects price dynamics relevant to the manufacturing sector, thus providing a more accurate adjustment of firm-level financial variables. By applying this deflator, performance indicators such as gross value added, sales, net income and EBITDA are measured in real terms, removing distortions caused by inflation and ensuring comparability across years (Wooldridge, 2010).

Additionally, to limit the influence of extreme values while avoiding data loss, all core variables and ratios were winsorised at the 1st and 99th percentiles. Winsorization is a common practice in applied micro econometrics and corporate finance, improving robustness of estimations when using firm-level data (Kothari, Leone & Wasley, 2005).

Finally, treated firms were required to have at least one pre-treatment and one post-treatment observation, while untreated firms were required to have data before and after 2015. This filtering ensured a balanced panel structure with meaningful pre- and post-periods for both groups.

At this stage, the panel already offered a balanced dataset of cork sector firms in constant prices, enriched with derived performance measures and with clearly defined

treatment status. Yet, before moving to the econometric analysis, descriptive statistics showed important differences between treated and untreated groups (see Appendix 1). On average, treated firms were larger, more profitable and less leveraged than their untreated peers. This reflects the fact that support allocation is not random and often favours financially stronger firms (Caliendo & Kopeinig, 2008).

To mitigate these imbalances, we applied *Propensity Score Matching (PSM)* as a preprocessing step. PSM allows treated firms to be paired with untreated ones that display similar observable characteristics before treatment, thus increasing comparability and improving the credibility of causal inference (Rosenbaum & Rubin, 1983). Propensity scores were estimated through a logistic regression model using only pre-treatment years (2013-2014), with the following specification:

$$Pr(Treatedi = 1) = \alpha 0 + \alpha 1 \cdot ln(Assetsi) + \alpha 2 \cdot ROAi + \alpha 3 \cdot Leveragei + \alpha 4 \cdot Employeesi + \varepsilon i$$

As stated before, the covariates capture size, profitability, capital structure and employment, which reflect both firm fundamentals and the eligibility criteria established in Decree Law No. 159/2014 (Portugal, 2014). The matching was implemented using a nearest-neighbour 1:1 algorithm, without replacement and with a caliper of 0.1.

Before matching, descriptive statistics revealed clear imbalances. After matching, these differences were largely eliminated (see Appendix 2). In total, the PSM yielded 38 treated firms paired with 38 controls, producing a final analytical panel of 76 cork sector firms followed from 2013 to 2023. The post-matching statistics confirm the improved balance, demonstrating that the treated and control groups became much more comparable. This matched sample serves as the empirical basis for the difference-in-differences analysis presented next.

4.3. Econometric Model: Staggered Difference-in-Differences

After constructing a balanced and matched panel, the causal impact of Portugal 2020 support on cork sector firms was estimated using a staggered Difference-in-Differences (DiD) approach. This method is particularly appropriate in this setting, since firms did not all receive support at the same time: while the first projects began in 2015, treatment occurred

in different years across firms. In such contexts, conventional two-way fixed effects (TWFE) DiD models may produce biased results, especially when treatment effects vary over time (Goodman-Bacon, 2021).

Yet, before estimating the model, additional post-PSM filtering was applied to ensure the consistency of the sample. For treated firms, we required at least two years of observations in the pre-treatment period and at least one in the post-treatment period. For control firms, the same criterion was applied, taking 2015 as the cut-off year. This step led to the exclusion of six control firms that only had a single observation before 2015. Although retaining them would have preserved numerical balance (38 treated and 38 controls), their lack of sufficient pre-treatment data would undermine the credibility of causal inference. The final dataset thus includes 38 treated firms and 32 controls, each with at least two valid pre-treatment points, which strengthens the plausibility of the parallel trend's assumption. For sensitivity, estimations using the more flexible criterion (≥1 pre-treatment year) were also performed, but the main analysis relies on the stricter version.

To estimate treatment effects, the dissertation adopts the estimator proposed by Callaway and Sant'Anna (2021). This approach estimates effects separately by cohort (defined by the year of first support) and then aggregates them into an overall Average Treatment Effect on the Treated (ATT). For expository purposes, the canonical two-way fixed effects DiD specification is presented below:

$$Yit = \beta 0 + \beta 1 Treatedi + \beta 2 Afterit + \beta 3 (Treatedi \times Afterit) + \mu i + \lambda t + \varepsilon it,$$

where Yit represents the outcome of firm i in year t; Treatedi indicates whether the firm ever received support; Afterit identifies years at or after treatment; and the interaction term captures the programme effect. Firm fixed effects (μi) control for unobserved heterogeneity, while year fixed effects (λt) absorb common shocks and sectoral trends.

However, since treatment was staggered across firms, the actual estimation relies on the Callaway and Sant'Anna (2021) method, implemented in *Stata* through the *csdid* package. This estimator identifies treatment effects by cohort and time, formally defined as:

$$\mathrm{ATT}(g, t) = \mathrm{E}[\mathrm{Yt}(1) - \mathrm{Yt}(0) \mid \mathrm{G} = g],$$

where G=g denotes the cohort of firms first treated in year g, Yt(1) is the outcome under treatment, and Yt(0) the counterfactual without treatment. By averaging these cohort-time effects, the method produces consistent aggregate ATT estimates in settings with staggered adoption, thus avoiding the biases of conventional TWFE estimators (Goodman-Bacon, 2021).

Consistent with the aim of this dissertation, to evaluate the impact of Portugal 2020 on the performance of cork sector firms, the analysis focused on three key outcome variables. The choice of these indicators is grounded both in the academic literature on firm performance and policy evaluation (Cabral & Campos, 2023; Lebas, 1995) and in the eligibility and assessment criteria established in the regulatory framework of Portugal 2020 (Portugal, 2014).

1. Gross Value Added: GVA represents the total economic value created by firms and is widely regarded as a central indicator of productive performance. Its use is consistent with Portugal 2020's emphasis on the creation of value added as a central criterion for accessing supported projects, as well as its alignment with the EU's strategic objective of promoting regional growth and competitiveness.
2. Productivity: Labour productivity captures the efficiency with which human resources are used. It is directly connected to policy goals that prioritize qualified employment and the technological and organizational upgrading of companies.
3. Turnover: Sales reflect the commercial performance of firms, indicating their ability to expand market presence and respond to demand. This indicator is consistent with Portugal 2020's focus on competitiveness and internationalisation as central objectives of business support.

In addition to estimating average treatment effects, an event-study specification was employed as a robustness check. Event studies allow for a dynamic assessment of treatment effects by tracing the trajectory of outcomes before and after support. This approach not only provides a visual test of the parallel trends assumption but also makes it possible to distinguish between immediate and medium-term effects of the intervention (Callaway & Sant'Anna, 2021). In the context of public policy evaluation, event studies are especially valuable because they allow researchers to distinguish between short-run and long-run

dynamics, thereby offering a more nuanced understanding of programme impacts (Goodman-Bacon, 2021).

5. Results

This chapter presents the results of the econometric analysis of the impact of Portugal 2020 on cork sector firms. The estimations rely on the staggered DiD framework, which allows for variation in the timing of treatment across firms. The analysis focuses on the three performance indicators: GVA, productivity and sales.

For each outcome, results are reported in three steps. First, the average treatment effect on the treated is presented. Secondly, estimates are disaggregated by treatment cohort and by calendar year to capture potential heterogeneity across groups and over time. Finally, the event-study specification is discussed, providing a dynamic view of treatment effects and evidence on the plausibility of the parallel trend's assumption.

To assess the robustness of the findings, additional tests are conducted for GVA. These include a placebo test using pre-treatment periods and the exclusion of the 2021 treatment cohort, both aimed at verifying the stability of the results and reducing concerns about spurious effects.

5.1. Gross Value Added

Gross Value Added is a central indicator of firm performance, capturing the total value created by production. It is particularly relevant in the context of Portugal 2020, as structural funds are designed to strengthen firms' productive capacity and long-term growth.

The econometric results show that, on average, Portugal 2020 support was associated with moderate but positive effects on GVA. The overall ATT is estimated at 231 thousand euros, although this estimate is not statistically significant at the 10% level (Table 1). This aggregate result suggests that the programme did not generate uniform improvements across all beneficiaries.

Table 1 - Estimated Effects of Portugal 2020 Support on GVA.

Estimator	ATT (000€)	Std. Error	z-stat	p-value
Overall ATT (simple)	231.1	144.6	1.60	0.110
By Cohort				
2015	648.0	322.9	2.01	0.045 **
2016	-53.0	216.0	-0.25	0.806
2018	-35.1	221.9	-0.16	0.874
2019	443.2	524.0	0.85	0.398
2020	102.4	234.3	0.44	0.662
2021	212.3	141.4	1.50	0.133
2022	6.0	150.4	0.04	0.968
By Calendar Year				
2015	425.4	267.1	1.59	0.111
2016	197.3	112.6	1.75	0.080 *
2017	-203.2	484.9	-0.42	0.675
2018	114.3	267.4	0.43	0.669
2019	255.1	108.0	2.36	0.018 **
2020	205.0	164.8	1.24	0.214
2021	368.9	227.3	1.62	0.105
2022	284.2	280.7	1.01	0.311
2023	424.3	252.1	1.68	0.092 *

Source: Author's elaboration based on Stata output.

Notes: ATT = Average Treatment Effect on the Treated. Significance levels: * p<0.10, ** p<0.05.

However, disaggregated estimates reveal heterogeneity. The firms supported in the 2015 cohort experienced substantial and statistically significant gains in GVA, with an average effect above 648 thousand euros ($p<0.05$). Other cohorts did not display significant changes, indicating that early entrants were better positioned to transform support into sustained value creation. Looking at results by calendar year, positive and significant effects emerge in 2019 (approximately 255 thousand euros, $p<0.05$), while other years show less precise estimates. This pattern indicates that programme benefits were not immediate but materialised gradually.

The dynamic analysis through the event-study further reinforces this interpretation (Figure 2). Pre-treatment coefficients remain close to zero, with no evidence of systematic

divergence between treated and untreated firms, which supports the plausibility of the parallel trend's assumption. After treatment, the coefficients increase steadily and reach significance in the later years, especially between 2021 and 2023. This trajectory confirms that Portugal 2020 generated progressive medium-term effects, rather than short-term impacts.

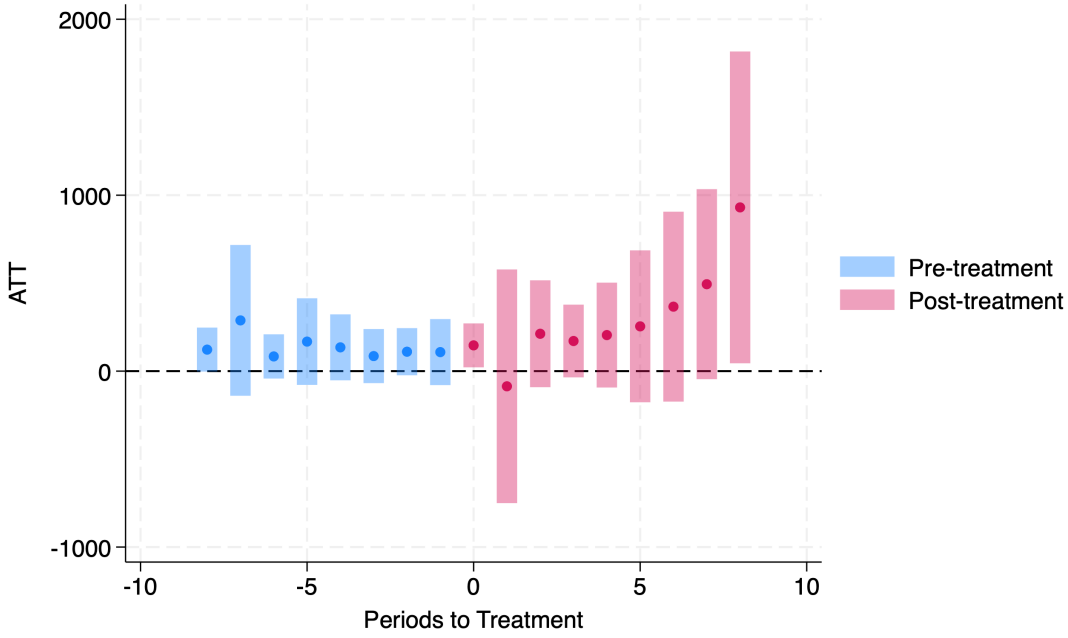

Figure 2 - Event-study estimates for GVA (ATT coefficients and confidence intervals). Source: Stata output.

Therefore, these results indicate that Portugal 2020 support contributed to enhancing productive performance in the cork sector, although the effects were not evenly distributed. Early beneficiaries achieved the largest gains, and positive impacts became visible only after a few years. This pattern is consistent with the long-term nature of investment support programmes, which typically require time before translating into measurable improvements in firm-level outcomes. Consequently, the evidence provides support for **H1**, confirming a positive impact of Portugal 2020 on the GVA of supported firms.

5.2. Productivity

Productivity, measured as GVA per employee, reflects the efficiency with which firms transform labour into value. This indicator is particularly relevant in the context of cohesion policy, since one of the main objectives of European funding is to stimulate technological upgrading, organizational improvements and efficiency gains within firms.

The econometric analysis does not provide evidence of a systematic effect of Portugal 2020 on productivity. The average treatment effect is estimated at -2.24 and is not statistically significant (Table 2), which suggests that, taken as a whole, the supported firms did not become more efficient than those that did not benefit from the programme.

Table 2 - Estimated Effects of Portugal 2020 Support on Productivity.

Estimator	ATT	Std. Error	z-stat	p-value
Overall ATT (simple)	-2.24	4.40	-0.51	0.610
By Cohort				
2015	2.24	7.15	0.31	0.754
2016	-6.66	5.36	-1.24	0.214
2018	1.52	5.05	0.30	0.764
2019	17.99	6.88	2.62	0.009 **
2020	-9.66	5.94	-1.62	0.104 *
2021	-17.64	3.48	-5.07	0.000 **
2022	13.51	7.38	1.83	0.067 *
By Calendar Year				
2015	5.27	5.89	0.89	0.371
2016	-1.61	6.51	-0.25	0.805
2017	-11.42	8.27	-1.38	0.167
2018	-16.65	8.20	-2.03	0.042 **
2019	1.92	6.96	0.28	0.782
2020	3.89	5.98	0.65	0.516
2021	-6.15	6.74	-0.91	0.362
2022	-5.28	6.44	-0.82	0.412
2023	10.66	7.02	1.52	0.129

Source: Author's elaboration based on Stata output.

Notes: ATT = Average Treatment Effect on the Treated. Significance levels: * p<0.10, ** p<0.05.

When the analysis is disaggregated by treatment cohort, however, a more nuanced picture emerges. Firms entering the programme in 2019 show a significant improvement of about 18 points ($p<0.01$), while those first supported in 2021 display a strong and negative effect of -17.6 ($p<0.01$). The other cohorts, including the early entrants of 2015 and 2016, do not present statistically significant results. These differences point to the fact that the impact of support on productivity was highly uneven across firms, which may reflect variations in project type, scale or implementation timing.

Looking at results across calendar years, there is no clear trajectory of consistent gains. A negative and statistically significant effect appears in 2018 (-16.6, $p<0.05$), while other years oscillate between small positive and negative coefficients without showing a stable pattern. This reinforces the idea that Portugal 2020 support did not uniformly translate into efficiency improvements throughout the period under analysis.

The event-study analysis (Figure 3) adds further context. Coefficients in the pre-treatment period are generally close to zero, with some slightly positive values, suggesting no major violation of the parallel trend's assumption. After treatment, effects remain modest and statistically imprecise, and there is no evidence of a progressive upward trend. In contrast to the findings for GVA, the trajectory of productivity does not indicate gradual medium-term improvements.

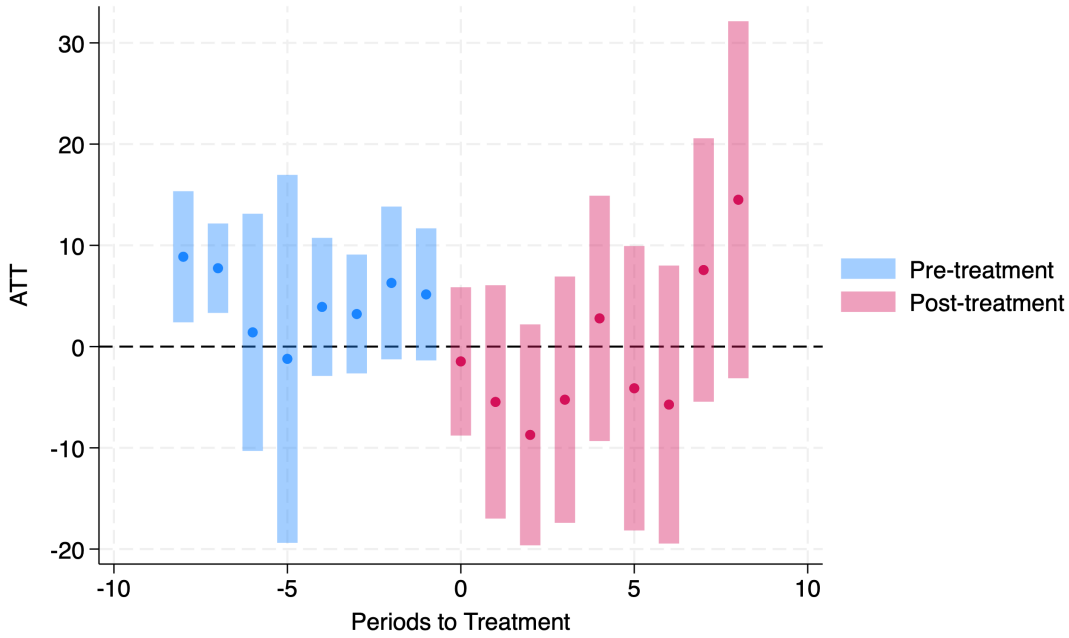

Figure 3 - Event-study estimates for Productivity (ATT coefficients and confidence intervals). Source: Stata output.

The results suggest that Portugal 2020 support was not consistently associated with productivity gains in the cork sector. Some firms were able to translate funding into efficiency improvements, while others registered neutral or even negative outcomes, and the aggregate effect remains non-significant. This pattern is in line with the notion that productivity gains often require deeper structural transformations, such as investment in new technologies, skills upgrading or organizational change, which may not occur uniformly across all beneficiaries of public support. Consequently, the evidence does not provide support for **H2**, indicating that Portugal 2020 did not lead to measurable gains in productivity among supported firms.

5.3. Sales

Sales provide a direct measure of firms' commercial performance, reflecting their ability to generate revenue and expand market presence. Within the scope of Portugal 2020, this outcome is particularly relevant, as one of the programme's objectives was to strengthen competitiveness in both domestic and international markets.

The econometric results show that, on average, support did not translate into significant improvements in sales. The estimated ATT is close to zero and statistically insignificant (Table 3), which indicates that treated firms, when considered as a group, did not systematically outperform those without support in terms of turnover.

Table 3 - Estimated Effects of Portugal 2020 Support on Sales.

Estimator	ATT (000€)	Std. Error	z-stat	p-value
Overall ATT (simple)	23.1	1132.5	0.02	0.984
By Cohort				
2015	1766.3	1372.1	1.29	0.198
2016	-1390.5	1586.2	-0.88	0.381
2018	-853.0	653.1	-1.31	0.192
2019	557.2	706.4	0.79	0.430
2020	1030.0	592.0	1.74	0.082 *
2021	-55.7	340.4	-0.16	0.870
2022	1296.1	287.7	4.50	0.000 **
By Calendar Year				
2015	1955.8	928.6	2.11	0.035 **
2016	265.3	597.1	0.44	0.657

2017	207.1	815.3	0.25	0.799
2018	100.4	1174.5	0.09	0.932
2019	-342.8	1420.8	-0.24	0.809
2020	-159.8	1021.4	-0.16	0.876
2021	234.7	1556.4	0.15	0.880
2022	-368.0	1621.7	-0.23	0.820
2023	-211.9	1501.7	-0.14	0.888

Source: Author's elaboration based on Stata output.

Notes: ATT = Average Treatment Effect on the Treated. Significance levels: * $p<0.10$, ** $p<0.05$.

When the analysis is broken down by cohorts, some differences emerge. Firms that entered in 2015 recorded positive and sizeable effects, although without statistical precision, while the 2022 cohort shows a strong and significant increase of more than 1.29 million euros ($p<0.01$). Other cohorts did not present consistent results, with some even displaying negative though non-significant estimates. This pattern suggests that commercial gains were concentrated in specific groups of firms rather than being broadly distributed across all beneficiaries.

The results by calendar year also point to a heterogeneous trajectory. A positive and statistically significant effect appears in 2015 (around 1.96 million euros, $p<0.05$), but this is not sustained in subsequent years. Instead, the estimates fluctuate and lose significance, indicating that initial improvements did not develop into a stable trend over time.

The event-study analysis adds further perspective (Figure 4). In this case, some coefficients before treatment are already positive and significant, which raises doubts about the strict validity of the parallel trend's assumption for sales. After treatment, the effects remain volatile and do not reveal a consistent upward path, with no indication of progressive medium-term accumulation.

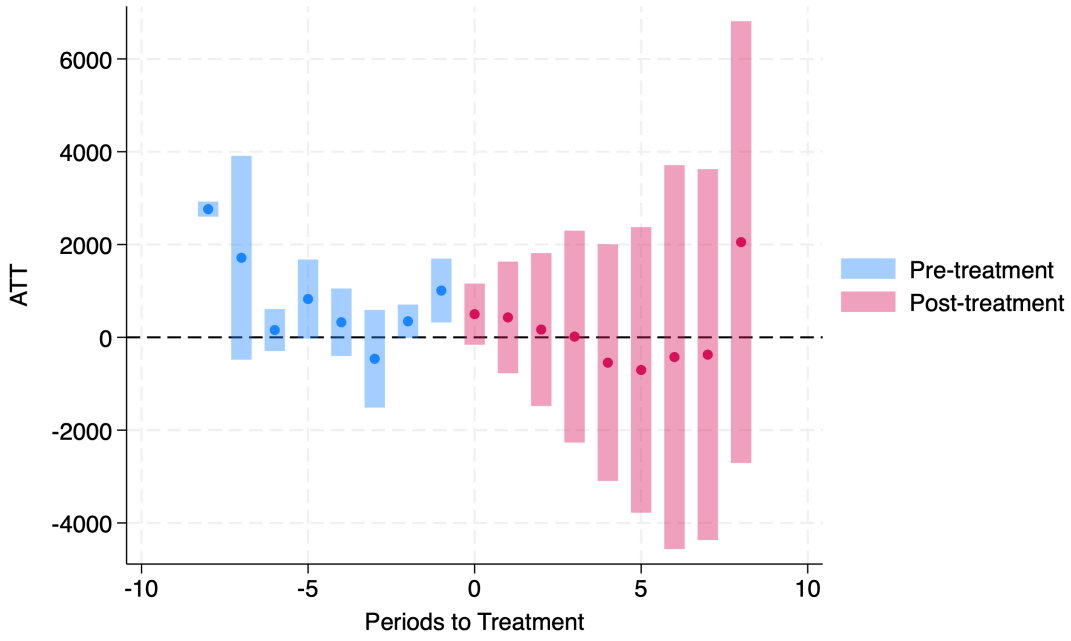

Figure 4 - Event-study estimates for Sales (ATT coefficients and confidence intervals). Source: Stata output.

The results indicate that Portugal 2020 support had limited impact on sales in the cork sector. Although certain cohorts and years registered temporary gains, these were not sufficient to establish a sustained trajectory of commercial expansion, in contrast with the clearer medium-term improvements observed for GVA. Consequently, the evidence does not provide support for **H3**, suggesting that Portugal 2020 did not lead to significant improvements in sales performance among supported firms.

5.4. Robustness Tests

To further validate the main findings, two additional robustness tests were carried out for the GVA outcome. The placebo tests, often implemented through pre-treatment event-study coefficients, are recommended in DiD applications to test the credibility of the parallel trend's assumption (Callaway & Sant'Anna, 2021). In addition, cohort exclusion exercises are suggested in the broader causal inference literature to assess whether estimated effects are driven by atypical subgroups (Abadie, 2021).

5.4.1 Placebo Test

The placebo test was implemented on GVA by artificially shifting the treatment start date three years earlier for supported firms, while controls remained unchanged. The purpose

of this exercise is to verify whether the estimator would detect programme effects before they could plausibly occur.

The Figure 5.4 displays the dynamic coefficients from this placebo specification. The results show no evidence of systematic effects before the false treatment date: the pre-treatment estimates fluctuate around zero and are generally statistically insignificant. Post-treatment coefficients also lack consistency, with occasional large deviations but without a stable trajectory.

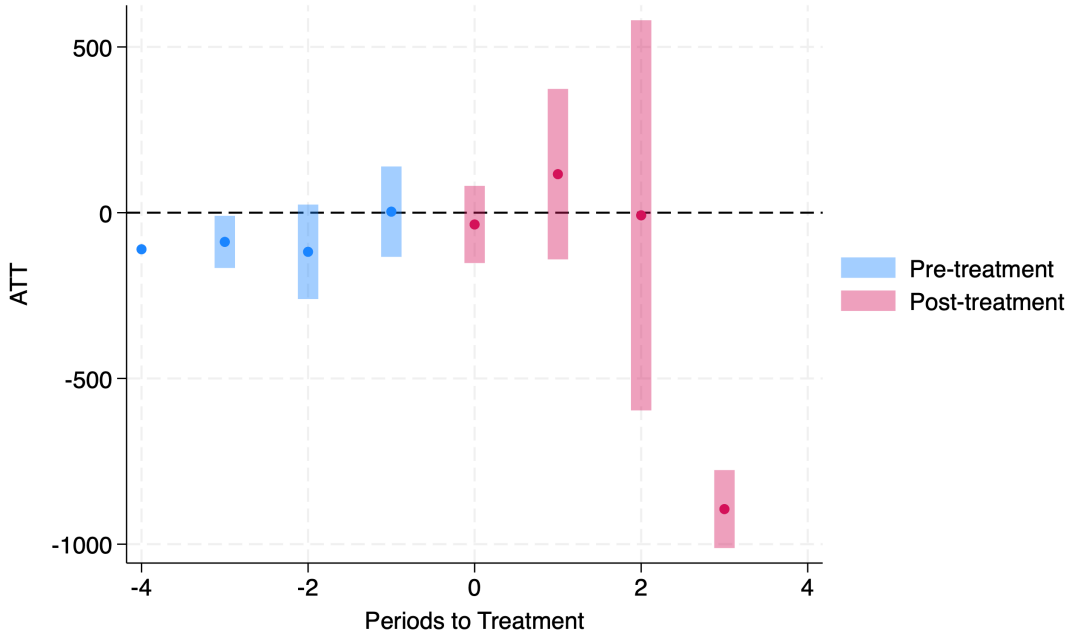

Figure 5 - Event-study estimates for GVA - Placebo Test (ATT coefficients and confidence intervals). Source: Stata output.

As detailed in Appendix 6, some individual coefficients reach significance in isolated periods or cohorts, but they are inconsistent in sign and magnitude. This absence of coherent dynamics contrasts with the sustained medium-term gains observed in the baseline analysis of GVA.

Therefore, these results support the validity of the main findings: when treatment is artificially reassigned, the estimator does not reproduce patterns similar to those obtained under the true timing of Portugal 2020 support.

5.4.2 Exclusion of the 2021 Cohort

The second robustness test re-estimated the model excluding the 2021 cohort. This group received support during the Covid-19 pandemic, a period of extraordinary volatility in

global demand for cork products, particularly in the wine and hospitality sectors. The aim of this exercise is to assess whether the main findings rely disproportionately on this atypical cohort.

The event-study estimates presented in Figure 5.5 show that the overall trajectory remains consistent with the baseline analysis. Pre-treatment coefficients fluctuate around zero and do not reveal systematic divergences, while post-treatment values are positive and increase gradually over time. Although some estimates lose precision, the pattern of delayed but substantial improvements in value added is still evident.

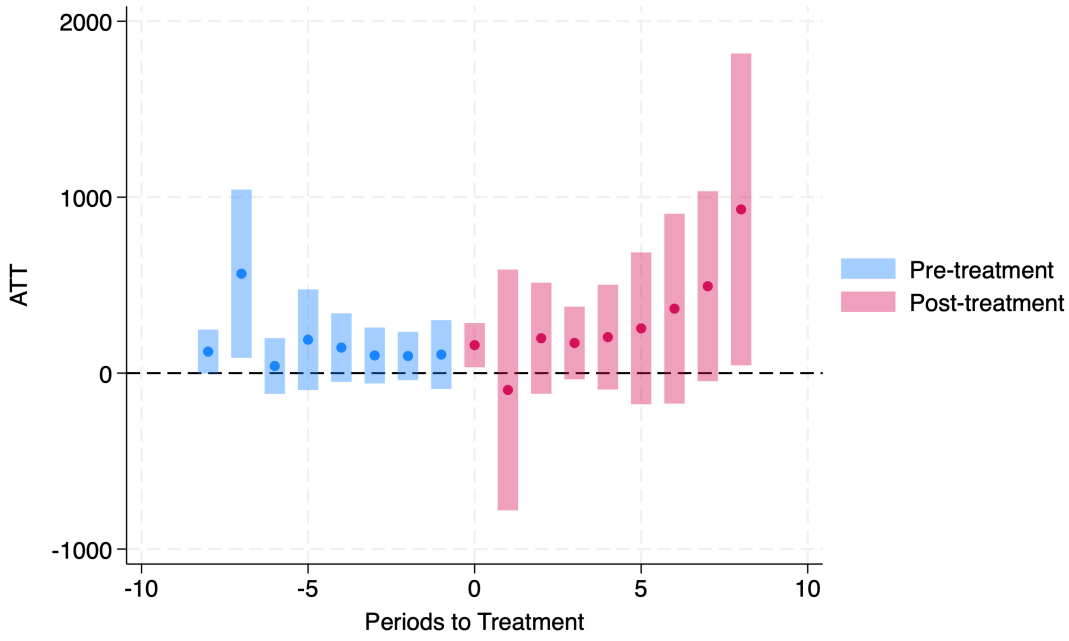

Figure 6 - Event-study estimates for GVA - Exclusion 2021 Cohort (ATT coefficients and confidence intervals). Source: Stata output.

As reported in Appendix Table 7, the 2015 and 2019 cohorts continue to display statistically significant medium-run effects, with impacts close to one million euros. Other cohorts yield less precise estimates, but their direction and timing remain similar to the baseline.

Therefore, excluding the 2021 cohort indicates that the main conclusions are not driven by the specific conditions of the pandemic period. This reinforces the robustness of the findings and supports the interpretation that Portugal 2020 contributed to sustained improvements in firm performance.

6. Conclusion

The literature on the impact of European funds on companies' performance has grown steadily, showing evidence that these instruments can generate positive effects on variables such as turnover, gross value added or employment. However, little is known about their impact on a specific sector such as cork, which holds particular relevance for the Portuguese economy and has not yet been the subject of a systematic causal evaluation. It is within this context that this dissertation set out to contribute, by analyzing the effect of Portugal 2020 on firms in the cork sector through an econometric approach.

The results suggest that Portugal 2020 support had a positive effect on gross value added, particularly for firms that received funding at earlier stages. These gains became visible mainly in the medium term, which is consistent with the nature of investment support, as such programmes typically require time before results materialize. In contrast, productivity did not show consistent improvements, while sales effects were weak and imprecise, offering no robust evidence of an impact. Taken together, these findings reinforce the idea that the effects of European funds are neither automatic nor homogeneous, depending both on the timing of entry into the programme and on the period needed for supported investments to generate measurable outcomes.

From an academic perspective, this dissertation contributes by offering a first causal evaluation of the impact of Portugal 2020 specifically on the cork sector. The use of firm-level data, combined with matching techniques in the construction of the sample and a staggered difference-in-differences estimator, made it possible to credibly approximate a counterfactual for untreated firms.

While the results provide a relevant reflection on the impact of Portugal 2020 on cork sector firms, it is important to highlight some limitations of the analysis. First, the sample size is relatively small, with only 38 treated and 32 controls, which constrains the statistical precision of some estimates. In addition, the treatment date was defined using the start year of each firm's first approved project, which does not necessarily correspond to the exact moment when the support was received or implemented. This approximation is common in the literature but leaves room for future research to exploit more detailed administrative data.

These limitations also open avenues for further research. Future studies could examine other indicators of business performance, such as exports, employment or innovation, thereby complementing the three core dimensions analyzed here. A deeper disaggregation within the cork sector itself by firm size, geographical location or type of activity could also reveal important patterns of heterogeneity for policy design. Finally, extending the analysis to other sectors of activity would allow for comparative insights into how European funds affect different business dynamics.

It is also important to note that the period under analysis coincided with the Covid-19 pandemic, which had a major impact on sectors such as cork, given its strong links to restaurants, tourism and wine. This exceptional context may have conditioned firms' trajectories, making it more difficult to isolate the specific effects of the programme. It is therefore relevant that future studies, using more recent data, reassess the impact in post-pandemic periods, in order to clarify the persistence and the true magnitude of the observed effects.

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Appendix

Appendix 1 - Descriptive statistics pre–Propensity *Score Matching*. Own Author's elaboration based on *Python* output.

		mean	median	min	max	std
Total Group						
	VAB	481.57	76.2	-179.39	11029.32	1460.19
	Sales	2296.67	331.53	0	51611.22	6971.58
	Net Income	97.17	6.35	-715.63	3793.19	471.39
	EBITDA	207.39	21.47	-442.55	5809.5	747.45
	Equity	1167.19	150.45	-1440.44	36282.25	4355.78
	Employees	12.97	4	0	276.22	34.55
	Assets	2900.64	452.46	3.1	79080.81	9721.46
	VAB_real	497.74	81.44	-204.84	11151.06	1488.04
	Sales_real	2375.42	351.36	0	52047.66	7089.24
	Net Income_real	98.54	6.79	-789.23	3876.78	481.47
	EBITDA_real	217.95	22.8	-493.77	6404.38	798.97
	Productivity	27.09	23.46	-37.89	138.06	24.06
	Productivity_real	28.41	24.81	-40.5	138.08	24.62
	ln_Assets	6.16	6.12	1.34	11.3	1.85
	ROA	0.01	0.01	-0.79	0.33	0.14
	Leverage	0.83	0.62	0	9.38	1.23
Treated Group						
	VAB	2534.6	1242.06	-179.39	11029.32	3163.03
	Sales	11748.8	5634.43	0	51611.22	14839.14
	Net Income	578.08	115.76	-715.63	3793.19	1076.17
	EBITDA	1127.56	462.68	-442.55	5809.5	1631.49
	Equity	6575.58	2049.11	-1396.31	36282.25	10188.58
	Employees	60.02	28	0	276.22	76.16
	Assets	15417.85	6323.22	100	79080.81	22108.25
	VAB_real	2602.26	1229.87	-204.84	11151.06	3214.9
	Sales_real	12040.77	5956.28	0	52047.66	15030.43
	Net Income_real	589.69	124.98	-789.23	3876.78	1099.32
	EBITDA_real	1190.26	473.28	-493.77	6404.38	1760.37
	Productivity	41.23	35.75	-37.89	138.06	23.68
	Productivity_real	42.7	38.16	-40.5	138.08	23.8
	ln_Assets	8.64	8.75	4.61	11.3	1.55
	ROA	0.04	0.03	-0.49	0.33	0.08
	Leverage	0.62	0.61	0	2.54	0.25
Control Group						
	VAB	224.56	57.48	-179.39	11029.32	744.77

Sales	1113.38	245.19	0	51611.22	3817.89
Net Income	36.96	4.41	-715.63	3793.19	269.59
EBITDA	92.19	15.59	-442.55	5809.5	420.25
Equity	490.13	118.24	-1440.44	36282.25	2061.91
Employees	7.08	3	0	276.22	17.5
Assets	1333.63	371.34	3.1	79080.81	4813.4
VAB_real	234.28	62.22	-204.84	11151.06	758.67
Sales_real	1165.43	262.39	0	52047.66	3892.2
Net Income_real	37.05	4.67	-789.23	3876.78	275.3
EBITDA_real	96.22	16.57	-493.77	6404.38	444.67
Productivity	24.96	21.73	-37.89	138.06	23.39
Productivity_real	26.26	23.43	-40.5	138.08	24.02
ln_Assets	5.84	5.93	1.34	11.3	1.64
ROA	0.01	0.01	-0.79	0.33	0.15
Leverage	0.86	0.62	0	9.38	1.3

Appendix 2 - Descriptive statistics post *Propensity Score Matching*. Own Author's elaboration based on *Python* output.

		mean	**median**	**min**	**max**	**std**
Total Group						
	VAB	1265.62	452.01	-179.39	11029.32	2222.86
	Sales	6668.53	2334.67	0	51611.22	11434.03
	Net Income	263.08	40.91	-715.63	3793.19	744.78
	EBITDA	562.41	141.11	-442.55	5809.5	1164.3
	Equity	2943.8	863.22	-1440.44	36282.25	6222.46
	Employees	32.65	16	0	276.22	54.01
	Assets	7815.26	2590.52	3.1	79080.81	14797.01
	VAB_real	1293.98	485.15	-204.84	11151.06	2238.03
	Sales_real	6856.98	2394.75	0	52047.66	11586.06
	Net Income_real	263.95	43.86	-789.23	3876.78	756.93
	EBITDA_real	581.56	150.87	-493.77	6404.38	1224.07
	Productivity	37.17	32.84	-37.89	138.06	25.75
	Productivity_real	38.8	34.38	-40.5	138.08	26.35
	ln_Assets	7.87	7.87	3.73	11.3	1.53
	ROA	0.02	0.02	-0.79	0.33	0.12
	Leverage	0.64	0.61	0	9.38	0.49
Treated Group						
	VAB	1510.5	722.45	-179.39	11029.32	2233.01
	Sales	7727.71	3526.08	0	51611.22	11580.14
	Net Income	336.11	68.75	-715.63	3793.19	729.33
	EBITDA	673.49	247.02	-442.55	5809.5	1127.05
	Equity	3265.11	1069.11	-1396.31	36282.25	6150.37

	Employees	37.55	20	0	276.22	54.96
	Assets	8466.64	3386.31	100	79080.81	14834.74
	VAB_real	1539.68	755.03	-204.84	11151.06	2251.58
	Sales_real	7935.46	3696.93	0	52047.66	11834.98
	Net Income_real	335.27	77.31	-789.23	3876.78	729.07
	EBITDA_real	688.3	241.1	-493.77	6404.38	1164.9
	Productivity	39.55	34.51	-37.89	138.06	22.84
	Productivity_real	40.79	36.46	-40.5	138.08	22.63
	ln_Assets	8.1	8.13	4.61	11.3	1.41
	ROA	0.04	0.03	-0.49	0.33	0.09
	Leverage	0.64	0.65	0	2.54	0.28
Control Group						
	VAB	940.17	211.37	-179.39	11029.32	2170.42
	Sales	5260.85	952.02	0	51611.22	11099.71
	Net Income	166.03	19.64	-715.63	3793.19	755.13
	EBITDA	414.78	63.61	-442.55	5809.5	1197.99
	Equity	2516.77	641.07	-1440.44	36282.25	6301.6
	Employees	26.14	8	0	276.22	52.1
	Assets	6949.56	1590.03	3.1	79080.81	14726.02
	VAB_real	967.43	232.94	-204.84	11151.06	2180.96
	Sales_real	5423.65	1034.83	0	52047.66	11104.27
	Net Income_real	169.16	19.54	-789.23	3876.78	783.64
	EBITDA_real	439.71	66.87	-493.77	6404.38	1286.81
	Productivity	33.87	30.62	-37.89	138.06	29.03
	Productivity_real	36.04	31.85	-40.5	138.08	30.59
	ln_Assets	7.56	7.38	3.73	11.3	1.64
	ROA	0	0.01	-0.79	0.3	0.15
	Leverage	0.63	0.59	0	9.38	0.68

Appendix 3 - Full econometric outputs for GVA. Own Author's elaboration based on *Stata* output.

Cohort	Period	ATT	Std. Err.	z	p-value	95% CI (Lower)	95% CI (Upper)
g2015	t_2013_2014	22.10	138.87	0.16	0.874	-250.08	294.27
g2015	t_2014_2015	425.40	267.10	1.59	0.111	-98.10	948.91
g2015	t_2014_2016	435.53	236.41	1.84	0.065	-27.82	898.88
g2015	t_2014_2017	484.89	343.80	1.41	0.158	-188.94	1158.72
g2015	t_2014_2018	386.53	438.99	0.88	0.379	-473.87	1246.94
g2015	t_2014_2019	536.57	348.80	1.54	0.124	-147.06	1220.21
g2015	t_2014_2020	763.35	436.39	1.75	0.080	-91.96	1618.66
g2015	t_2014_2021	947.80	434.14	2.18	0.029	96.91	1798.69
g2015	t_2014_2022	921.34	418.91	2.20	0.028	100.29	1742.40
g2015	t_2014_2023	930.67	452.08	2.06	0.040	44.60	1816.74
g2016	t_2013_2014	50.53	77.36	0.65	0.514	-101.10	202.16
g2016	t_2014_2015	175.19	250.15	0.70	0.484	-315.09	665.46
g2016	t_2015_2016	48.36	139.34	0.35	0.729	-224.74	321.45
g2016	t_2015_2017	-633.27	716.99	-0.88	0.377	-2038.56	772.01
g2016	t_2015_2018	-42.87	225.37	-0.19	0.849	-484.58	398.84
g2016	t_2015_2019	82.93	119.83	0.69	0.489	-151.94	317.79
g2016	t_2015_2020	-63.70	222.17	-0.29	0.774	-499.14	371.74
g2016	t_2015_2021	-46.19	280.82	-0.16	0.869	-596.59	504.21
g2016	t_2015_2022	3.18	393.46	0.01	0.994	-767.99	774.35
g2016	t_2015_2023	227.16	372.09	0.61	0.542	-502.14	956.45
g2018	t_2013_2014	1.30	63.84	0.02	0.984	-123.82	126.42
g2018	t_2014_2015	190.68	244.29	0.78	0.435	-288.12	669.49
g2018	t_2015_2016	-115.71	127.59	-0.91	0.364	-365.79	134.37
g2018	t_2016_2017	-8.84	130.87	-0.07	0.946	-265.33	247.65
g2018	t_2017_2018	-94.48	74.67	-1.27	0.206	-240.84	51.88
g2018	t_2017_2019	65.88	148.16	0.44	0.657	-224.50	356.27
g2018	t_2017_2020	88.30	171.76	0.51	0.607	-248.35	424.96
g2018	t_2017_2021	-118.19	243.29	-0.49	0.627	-595.02	358.64
g2018	t_2017_2022	-133.74	422.96	-0.32	0.752	-962.73	695.24
g2018	t_2017_2023	-18.54	400.72	-0.05	0.963	-803.94	766.86
g2019	t_2013_2014	21.67	78.94	0.27	0.784	-133.06	176.40

g2019	t_2014_2015	558.83	268.03	2.08	0.037	33.50	1084.16
g2019	t_2015_2016	53.62	122.36	0.44	0.661	-186.20	293.44
g2019	t_2016_2017	656.01	261.71	2.51	0.012	143.06	1168.95
g2019	t_2017_2018	-260.23	197.75	-1.32	0.188	-647.81	127.35
g2019	t_2018_2019	297.96	312.83	0.95	0.341	-315.18	911.11
g2019	t_2018_2020	90.80	254.42	0.36	0.721	-407.86	589.46
g2019	t_2018_2021	850.32	815.44	1.04	0.297	-747.92	2448.55
g2019	t_2018_2022	342.24	678.56	0.50	0.614	-987.71	1672.18
g2019	t_2018_2023	730.19	785.23	0.93	0.352	-808.82	2269.21
g2020	t_2013_2014	6.13	74.04	0.08	0.934	-139.00	151.25
g2020	t_2014_2015	290.83	258.07	1.13	0.260	-214.98	796.64
g2020	t_2015_2016	6.62	142.30	0.05	0.963	-272.28	285.51
g2020	t_2016_2017	93.68	158.87	0.59	0.555	-217.70	405.05
g2020	t_2017_2018	25.53	144.86	0.18	0.860	-258.39	309.45
g2020	t_2018_2019	344.32	267.21	1.29	0.198	-179.41	868.05
g2020	t_2019_2020	-14.07	110.73	-0.13	0.899	-231.09	202.95
g2020	t_2019_2021	511.55	511.71	1.00	0.317	-491.39	1514.49
g2020	t_2019_2022	29.06	355.21	0.08	0.935	-667.15	725.26
g2020	t_2019_2023	-69.48	307.29	-0.23	0.821	-671.75	532.79
g2021	t_2013_2014	12.02	63.78	0.19	0.850	-112.99	137.04
g2021	t_2014_2015	341.66	243.92	1.40	0.161	-136.40	819.73
g2021	t_2015_2016	-31.08	121.75	-0.26	0.799	-269.71	207.55
g2021	t_2016_2017	25.34	130.87	0.19	0.846	-231.15	281.83
g2021	t_2017_2018	-76.30	74.67	-1.02	0.307	-222.65	70.06
g2021	t_2018_2019	462.60	211.24	2.19	0.029	48.57	876.62
g2021	t_2019_2020	206.92	77.54	2.67	0.008	54.95	358.90
g2021	t_2020_2021	-307.69	83.93	-3.67	0.000	-472.20	-143.19
g2021	t_2020_2022	242.78	204.79	1.19	0.236	-158.60	644.16
g2021	t_2020_2023	701.72	169.06	4.15	0.000	370.36	1033.07
g2022	t_2013_2014	122.31	63.78	1.92	0.055	-2.70	247.32
g2022	t_2014_2015	564.98	243.92	2.32	0.021	86.92	1043.05
g2022	t_2015_2016	213.09	121.75	1.75	0.080	-25.54	451.72
g2022	t_2016_2017	190.58	130.87	1.46	0.145	-65.91	447.07
g2022	t_2017_2018	-114.61	74.67	-1.53	0.125	-260.97	31.74
g2022	t_2018_2019	91.80	211.24	0.43	0.664	-322.22	505.83
g2022	t_2019_2020	-45.58	77.54	-0.59	0.557	-197.56	106.39

g2022	t_2020_2021	-158.21	83.93	-1.88	0.059	-322.71	6.30
g2022	t_2021_2022	-31.11	160.12	-0.19	0.846	-344.94	282.72
g2022	t_2021_2023	43.18	147.22	0.29	0.769	-245.37	331.72

Appendix 4 - Full econometric outputs for Productivity. Own Author's elaboration based on *Stata* output.

Cohort	**Period**	**ATT**	**Std. Err.**	**z**	**p-value**	**95% CI (Lower)**	**95% CI (Upper)**
g2015	t_2013_2014	1.17	3.72	0.32	0.753	-6.12	8.46
g2015	t_2014_2015	5.27	5.89	0.89	0.371	-6.27	16.81
g2015	t_2014_2016	3.90	8.55	0.46	0.648	-12.85	20.65
g2015	t_2014_2017	-3.91	8.19	-0.48	0.633	-19.97	12.15
g2015	t_2014_2018	-14.86	10.15	-1.46	0.143	-34.75	5.04
g2015	t_2014_2019	4.98	9.60	0.52	0.604	-13.84	23.80
g2015	t_2014_2020	9.28	9.23	1.01	0.315	-8.82	27.37
g2015	t_2014_2021	1.11	10.84	0.10	0.919	-20.15	22.36
g2015	t_2014_2022	-0.13	9.88	-0.01	0.989	-19.49	19.23
g2015	t_2014_2023	14.50	9.00	1.61	0.107	-3.13	32.14
g2016	t_2013_2014	2.86	5.85	0.49	0.625	-8.61	14.33
g2016	t_2014_2015	3.66	7.00	0.52	0.601	-10.06	17.38
g2016	t_2015_2016	-5.05	7.25	-0.70	0.486	-19.26	9.16
g2016	t_2015_2017	-16.11	10.09	-1.60	0.110	-35.89	3.67
g2016	t_2015_2018	-18.12	8.38	-2.16	0.031	-34.54	-1.69
g2016	t_2015_2019	-2.20	7.53	-0.29	0.770	-16.97	12.56
g2016	t_2015_2020	-0.31	7.48	-0.04	0.966	-14.97	14.34
g2016	t_2015_2021	-13.47	7.63	-1.77	0.077	-28.43	1.48
g2016	t_2015_2022	-10.00	7.60	-1.32	0.188	-24.89	4.90
g2016	t_2015_2023	12.37	8.50	1.46	0.145	-4.28	29.03
g2018	t_2013_2014	6.76	3.32	2.04	0.042	0.25	13.27
g2018	t_2014_2015	-1.24	5.84	-0.21	0.832	-12.70	10.21
g2018	t_2015_2016	5.08	6.03	0.84	0.400	-6.75	16.91
g2018	t_2016_2017	7.66	5.23	1.46	0.143	-2.60	17.91
g2018	t_2017_2018	-11.03	4.50	-2.45	0.014	-19.86	-2.20
g2018	t_2017_2019	2.23	5.20	0.43	0.667	-7.95	12.42
g2018	t_2017_2020	6.00	5.16	1.16	0.245	-4.11	16.12
g2018	t_2017_2021	-0.51	5.36	-0.10	0.924	-11.02	10.00

g2018	t_2017_2022	0.76	8.93	0.08	0.932	-16.74	18.25
g2018	t_2017_2023	11.65	8.67	1.34	0.179	-5.34	28.65
g2019	t_2013_2014	-20.30	20.31	-1.00	0.317	-60.11	19.50
g2019	t_2014_2015	14.39	6.36	2.26	0.024	1.92	26.86
g2019	t_2015_2016	-0.81	5.39	-0.15	0.880	-11.37	9.75
g2019	t_2016_2017	16.11	7.04	2.29	0.022	2.31	29.92
g2019	t_2017_2018	-9.40	5.16	-1.82	0.069	-19.52	0.72
g2019	t_2018_2019	13.62	6.33	2.15	0.031	1.21	26.03
g2019	t_2018_2020	18.99	5.82	3.26	0.001	7.57	30.40
g2019	t_2018_2021	25.24	10.35	2.44	0.015	4.97	45.52
g2019	t_2018_2022	15.36	12.63	1.22	0.224	-9.38	40.10
g2019	t_2018_2023	16.08	10.53	1.53	0.127	-4.56	36.72
g2020	t_2013_2014	-0.71	5.28	-0.13	0.893	-11.05	9.63
g2020	t_2014_2015	16.70	7.50	2.23	0.026	2.01	31.39
g2020	t_2015_2016	-0.35	6.76	-0.05	0.959	-13.61	12.91
g2020	t_2016_2017	5.37	5.85	0.92	0.359	-6.10	16.84
g2020	t_2017_2018	4.96	10.21	0.49	0.627	-15.05	24.96
g2020	t_2018_2019	24.18	9.36	2.58	0.010	5.84	42.52
g2020	t_2019_2020	-3.76	5.00	-0.75	0.452	-13.56	6.03
g2020	t_2019_2021	-10.89	7.71	-1.41	0.158	-25.99	4.22
g2020	t_2019_2022	-14.27	5.37	-2.66	0.008	-24.79	-3.75
g2020	t_2019_2023	-10.02	22.70	-0.44	0.659	-54.52	34.48
g2021	t_2013_2014	9.17	3.30	2.77	0.006	2.69	15.64
g2021	t_2014_2015	29.74	5.63	5.29	0.000	18.72	40.77
g2021	t_2015_2016	-17.22	5.35	-3.22	0.001	-27.70	-6.74
g2021	t_2016_2017	-6.98	5.23	-1.33	0.182	-17.24	3.27
g2021	t_2017_2018	0.99	4.50	0.22	0.826	-7.84	9.82
g2021	t_2018_2019	37.98	5.49	6.92	0.000	27.22	48.74
g2021	t_2019_2020	30.78	3.53	8.72	0.000	23.86	37.70
g2021	t_2020_2021	-42.55	3.36	-12.67	0.000	-49.13	-35.97
g2021	t_2020_2022	-15.11	5.64	-2.68	0.007	-26.16	-4.06
g2021	t_2020_2023	4.72	7.00	0.67	0.500	-9.00	18.45
g2022	t_2013_2014	8.87	3.30	2.69	0.007	2.40	15.35
g2022	t_2014_2015	6.32	5.63	1.12	0.261	-4.70	17.34
g2022	t_2015_2016	-16.34	5.35	-3.06	0.002	-26.82	-5.86
g2022	t_2016_2017	0.41	5.23	0.08	0.937	-9.84	10.67

g2022	t_2017_2018	-5.20	4.50	-1.15	0.248	-14.02	3.63
g2022	t_2018_2019	17.86	5.49	3.25	0.001	7.10	28.62
g2022	t_2019_2020	-1.31	3.53	-0.37	0.712	-8.22	5.61
g2022	t_2020_2021	-12.18	3.36	-3.63	0.000	-18.76	-5.60
g2022	t_2021_2022	5.49	6.68	0.82	0.411	-7.61	18.59
g2022	t_2021_2023	21.53	9.42	2.28	0.022	3.06	40.00

Appendix 5 - Full econometric outputs for Sales. Own Author's elaboration based on *Stata* output.

Cohort	**Period**	**ATT**	**Std. Err.**	**z**	**p-value**	**95% CI (Lower)**	**95% CI (Upper)**
g2015	t_2013_2014	715.45	554.34	1.29	0.197	-371.04	1801.94
g2015	t_2014_2015	1955.77	928.61	2.11	0.035	135.73	3775.81
g2015	t_2014_2016	1479.96	739.81	2.00	0.045	29.96	2929.96
g2015	t_2014_2017	1296.95	756.29	1.71	0.086	-185.35	2779.26
g2015	t_2014_2018	1798.11	1315.42	1.37	0.172	-780.07	4376.28
g2015	t_2014_2019	901.27	1441.59	0.63	0.532	-1924.20	3726.73
g2015	t_2014_2020	1081.19	1330.12	0.81	0.416	-1525.80	3688.19
g2015	t_2014_2021	3001.34	2576.46	1.16	0.244	-2048.43	8051.11
g2015	t_2014_2022	2330.44	2547.72	0.91	0.360	-2663.00	7323.88
g2015	t_2014_2023	2051.56	2428.71	0.84	0.398	-2708.61	6811.74
g2016	t_2013_2014	451.04	190.03	2.37	0.018	78.59	823.49
g2016	t_2014_2015	1560.51	787.28	1.98	0.047	17.47	3103.55
g2016	t_2015_2016	-493.80	788.47	-0.63	0.531	-2039.18	1051.58
g2016	t_2015_2017	-474.09	1101.76	-0.43	0.667	-2633.51	1685.32
g2016	t_2015_2018	-903.90	1450.90	-0.62	0.533	-3747.61	1939.81
g2016	t_2015_2019	-1244.66	1933.00	-0.64	0.520	-5033.27	2543.96
g2016	t_2015_2020	-1560.14	1597.90	-0.98	0.329	-4691.97	1571.69
g2016	t_2015_2021	-1828.81	2009.25	-0.91	0.363	-5766.88	2109.25
g2016	t_2015_2022	-2567.79	2303.81	-1.11	0.265	-7083.17	1947.60
g2016	t_2015_2023	-2061.76	2128.44	-0.97	0.333	-6233.43	2109.91
g2018	t_2013_2014	189.18	101.50	1.86	0.062	-9.76	388.13
g2018	t_2014_2015	1008.01	721.53	1.40	0.162	-406.17	2422.18
g2018	t_2015_2016	-260.72	739.02	-0.35	0.724	-1709.17	1187.73
g2018	t_2016_2017	-491.02	219.76	-2.23	0.025	-921.73	-60.30
g2018	t_2017_2018	-808.82	409.11	-1.98	0.048	-1610.67	-6.98

g2018	t_2017_2019	-1059.80	663.57	-1.60	0.110	-2360.38	240.77
g2018	t_2017_2020	-433.77	513.96	-0.84	0.399	-1441.12	573.58
g2018	t_2017_2021	-1091.50	874.81	-1.25	0.212	-2806.10	623.10
g2018	t_2017_2022	-1199.10	984.15	-1.22	0.223	-3128.00	729.81
g2018	t_2017_2023	-524.90	794.49	-0.66	0.509	-2082.07	1032.27
g2019	t_2013_2014	678.99	389.49	1.74	0.081	-84.39	1442.37
g2019	t_2014_2015	1797.86	854.77	2.10	0.035	122.54	3473.18
g2019	t_2015_2016	-593.26	735.93	-0.81	0.420	-2035.66	849.14
g2019	t_2016_2017	378.65	394.92	0.96	0.338	-395.37	1152.68
g2019	t_2017_2018	959.08	693.66	1.38	0.167	-400.47	2318.63
g2019	t_2018_2019	559.63	979.86	0.57	0.568	-1360.86	2480.13
g2019	t_2018_2020	629.43	733.56	0.86	0.391	-808.32	2067.18
g2019	t_2018_2021	1203.54	767.81	1.57	0.117	-301.33	2708.42
g2019	t_2018_2022	105.29	957.64	0.11	0.912	-1771.65	1982.24
g2019	t_2018_2023	153.37	1238.26	0.12	0.901	-2273.58	2580.33
g2020	t_2013_2014	167.04	124.50	1.34	0.180	-76.97	411.05
g2020	t_2014_2015	1038.95	838.22	1.24	0.215	-603.94	2681.83
g2020	t_2015_2016	-597.23	758.14	-0.79	0.431	-2083.16	888.70
g2020	t_2016_2017	44.24	362.87	0.12	0.903	-666.98	755.46
g2020	t_2017_2018	94.63	496.36	0.19	0.849	-878.22	1067.49
g2020	t_2018_2019	401.02	756.92	0.53	0.596	-1082.53	1884.56
g2020	t_2019_2020	1140.26	541.54	2.11	0.035	78.86	2201.67
g2020	t_2019_2021	1517.19	1013.98	1.50	0.135	-470.18	3504.56
g2020	t_2019_2022	704.52	715.30	0.98	0.325	-697.45	2106.49
g2020	t_2019_2023	811.75	959.48	0.85	0.398	-1068.79	2692.30
g2021	t_2013_2014	221.97	83.12	2.67	0.008	59.06	384.88
g2021	t_2014_2015	1144.31	719.09	1.59	0.112	-265.07	2553.69
g2021	t_2015_2016	-867.92	727.11	-1.19	0.233	-2293.03	557.18
g2021	t_2016_2017	-62.44	219.76	-0.28	0.776	-493.16	368.27
g2021	t_2017_2018	-304.55	409.11	-0.74	0.457	-1106.39	497.30
g2021	t_2018_2019	790.29	600.03	1.32	0.188	-385.75	1966.33
g2021	t_2019_2020	1818.94	280.91	6.48	0.000	1268.38	2369.51
g2021	t_2020_2021	-1127.15	396.90	-2.84	0.005	-1905.06	-349.25
g2021	t_2020_2022	137.11	415.69	0.33	0.742	-677.63	951.84
g2021	t_2020_2023	822.89	377.10	2.18	0.029	83.78	1562.00
g2022	t_2013_2014	2762.98	83.12	33.24	0.000	2600.07	2925.89

g2022	t_2014_2015	3207.52	719.09	4.46	0.000	1798.13	4616.90
g2022	t_2015_2016	-879.10	727.11	-1.21	0.227	-2304.21	546.00
g2022	t_2016_2017	1897.74	219.76	8.64	0.000	1467.02	2328.45
g2022	t_2017_2018	1178.45	409.11	2.88	0.004	376.60	1980.29
g2022	t_2018_2019	-5695.55	600.03	-9.49	0.000	-6871.59	-4519.51
g2022	t_2019_2020	582.18	280.91	2.07	0.038	31.61	1132.75
g2022	t_2020_2021	-1026.69	396.90	-2.59	0.010	-1804.59	-248.78
g2022	t_2021_2022	1386.66	240.80	5.76	0.000	914.70	1858.62
g2022	t_2021_2023	1205.63	448.78	2.69	0.007	326.04	2085.21

Appendix 6 – Full econometric outputs of robustness check on GVA - Placebo Test. Own Author's elaboration based on *Stata* output.

Cohort	**Period**	**ATT**	**Std. Err.**	**z**	**p-value**	**95% CI (Lower)**	**95% CI (Upper)**
g2015	t_2013_2014	-21.69985	25.87345	-0.84	0.402	-72.41087	29.01117
g2015	t_2014_2015	-213.0419	68.76682	-3.10	0.002	-347.8224	-78.26145
g2015	t_2014_2016	-293.0041	126.1898	-2.32	0.020	-540.3317	-45.6766
g2015	t_2014_2017	-513.0066	223.702	-2.29	0.022	-951.4545	-74.55862
g2015	t_2014_2018	-894.0987	60.00555	-14.90	0.000	-1011.707	-776.4899
g2016	t_2013_2014	-1.89959	55.84125	-0.03	0.973	-111.3464	107.5473
g2016	t_2014_2015	221.5738	131.3346	1.69	0.092	-35.83726	478.9848
g2016	t_2015_2016	22.89556	61.08724	0.37	0.708	-96.83324	142.6243
g2016	t_2015_2017	510.6683	258.8209	1.97	0.048	3.38868	1017.948
g2016	t_2015_2018	160.3503	341.946	0.47	0.639	-509.8516	830.5522
g2017	t_2013_2014	-61.03871	54.17132	-1.13	0.260	-167.2125	45.13512
g2017	t_2014_2015	-162.4958	115.4965	-1.41	0.159	-388.8648	63.87312
g2017	t_2015_2016	-84.38891	113.4764	-0.74	0.457	-306.7986	138.0207
g2017	t_2016_2017	-14.2796	107.3587	-0.13	0.894	-224.6987	196.1395
g2017	t_2016_2018	43.24589	104.9626	0.41	0.680	-162.4771	248.9689
g2018	t_2013_2014	-110.285	.	.	.	.	.
g2018	t_2014_2015	-223.3173	.	.	.	.	.
g2018	t_2015_2016	-244.1684	.	.	.	.	.
g2018	t_2016_2017	-165.2393	.	.	.	.	.
g2018	t_2017_2018	38.31662	.	.	.	.	.

Appendix 7 – Full econometric outputs of robustness check on GVA - Exclusion 2021 Cohort. Own Author's elaboration based on *Stata* output.

Cohort	Period	ATT	Std. Err.	z	p-value	95% CI (Lower)	95% CI (Upper)
g2015	t_2013_2014	22.09591	138.8656	0.16	0.874	-250.0756	294.2675
g2015	t_2014_2015	425.404	267.0973	1.59	0.111	-98.09705	948.9051
g2015	t_2014_2016	435.5315	236.4079	1.84	0.065	-27.81936	898.8824
g2015	t_2014_2017	484.8901	343.7976	1.41	0.158	-188.9407	1158.721
g2015	t_2014_2018	386.5342	438.9912	0.88	0.379	-473.8727	1246.941
g2015	t_2014_2019	536.5741	348.7985	1.54	0.124	-147.0584	1220.207
g2015	t_2014_2020	763.3502	436.3905	1.75	0.080	-91.95943	1618.66
g2015	t_2014_2021	947.8002	434.1351	2.18	0.029	96.9111	1798.689
g2015	t_2014_2022	921.3448	418.913	2.20	0.028	100.2904	1742.399
g2015	t_2014_2023	930.6666	452.0841	2.06	0.040	44.59806	1816.735
g2016	t_2013_2014	50.5313	77.36412	0.65	0.514	-101.0996	202.1622
g2016	t_2014_2015	175.1872	250.1451	0.70	0.484	-315.0882	665.4625
g2016	t_2015_2016	48.35788	139.3374	0.35	0.729	-224.7384	321.4542
g2016	t_2015_2017	-633.274	716.9944	-0.88	0.377	-2038.557	772.0092
g2016	t_2015_2018	-42.87119	225.3682	-0.19	0.849	-484.5848	398.8424
g2016	t_2015_2019	82.92573	119.8297	0.69	0.489	-151.9361	317.7876
g2016	t_2015_2020	-63.69746	222.1683	-0.29	0.774	-499.1393	371.7443
g2016	t_2015_2021	-46.18571	280.8218	-0.16	0.869	-596.5862	504.2148
g2016	t_2015_2022	3.182331	393.4605	0.01	0.994	-767.986	774.3507
g2016	t_2015_2023	227.1569	372.0947	0.61	0.542	-502.1354	956.4492
g2018	t_2013_2014	1.296772	63.83813	0.02	0.984	-123.8237	126.4172
g2018	t_2014_2015	190.6844	244.292	0.78	0.435	-288.1192	669.488
g2018	t_2015_2016	-115.7082	127.5935	-0.91	0.364	-365.7869	134.3704
g2018	t_2016_2017	-8.843264	130.8652	-0.07	0.946	-265.3344	247.6479
g2018	t_2017_2018	-94.48155	74.67309	-1.27	0.206	-240.8381	51.87502
g2018	t_2017_2019	65.88075	148.1582	0.44	0.657	-224.504	356.2655
g2018	t_2017_2020	88.30404	171.7642	0.51	0.607	-248.3476	424.9557
g2018	t_2017_2021	-118.1885	243.2862	-0.49	0.627	-595.0207	358.6437
g2018	t_2017_2022	-133.7448	422.958	-0.32	0.752	-962.7272	695.2377
g2018	t_2017_2023	-18.53766	400.7213	-0.05	0.963	-803.9371	766.8617
g2019	t_2013_2014	21.66691	78.9448	0.27	0.784	-133.0621	176.3959

g2019	t_2014_2015	558.828	268.0289	2.08	0.037	33.50109	1084.155
g2019	t_2015_2016	53.62168	122.3598	0.44	0.661	-186.1992	293.4426
g2019	t_2016_2017	656.0072	261.7105	2.51	0.012	143.064	1168.95
g2019	t_2017_2018	-260.2267	197.7488	-1.32	0.188	-647.8073	127.3538
g2019	t_2018_2019	297.964	312.8338	0.95	0.341	-315.1791	911.107
g2019	t_2018_2020	90.79937	254.4219	0.36	0.721	-407.8583	589.4571
g2019	t_2018_2021	850.3164	815.4414	1.04	0.297	-747.9193	2448.552
g2019	t_2018_2022	342.2374	678.5569	0.50	0.614	-987.7097	1672.184
g2019	t_2018_2023	730.1922	785.226	0.93	0.352	-808.8225	2269.207
g2020	t_2013_2014	6.126869	74.04373	0.08	0.934	-138.9962	151.2499
g2020	t_2014_2015	290.8268	258.0704	1.13	0.260	-214.9818	796.6355
g2020	t_2015_2016	6.615009	142.2973	0.05	0.963	-272.2827	285.5127
g2020	t_2016_2017	93.67706	158.8666	0.59	0.555	-217.6957	405.0498
g2020	t_2017_2018	25.53255	144.8599	0.18	0.860	-258.3875	309.4526
g2020	t_2018_2019	344.3203	267.2148	1.29	0.198	-179.411	868.0516
g2020	t_2019_2020	-14.0695	110.7266	-0.13	0.899	-231.0897	202.9507
g2020	t_2019_2021	511.55	511.7124	1.00	0.317	-491.388	1514.488
g2020	t_2019_2022	29.05754	355.2124	0.08	0.935	-667.1459	725.261
g2020	t_2019_2023	-69.48034	307.2865	-0.23	0.821	-671.7509	532.7902
g2022	t_2013_2014	122.3081	63.78315	1.92	0.055	-2.704606	247.3208
g2022	t_2014_2015	564.9813	243.9154	2.32	0.021	86.91592	1043.047
g2022	t_2015_2016	213.0881	121.7535	1.75	0.080	-25.54436	451.7206
g2022	t_2016_2017	190.5763	130.8652	1.46	0.145	-65.91488	447.0675
g2022	t_2017_2018	-114.6126	74.67309	-1.53	0.125	-260.9691	31.744
g2022	t_2018_2019	91.80391	211.2417	0.43	0.664	-322.2221	505.8299
g2022	t_2019_2020	-45.58486	77.5398	-0.59	0.557	-197.5601	106.3904
g2022	t_2020_2021	-158.2081	83.93176	-1.88	0.059	-322.7113	6.295156
g2022	t_2021_2022	-31.10977	160.1186	-0.19	0.846	-344.9365	282.717
g2022	t_2021_2023	43.17637	147.2189	0.29	0.769	-245.3673	331.72

FACULDADE DE **ECONOMIA**