

Effectiveness of government entrepreneurial support on start-ups: a supply chain economy perspective

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Efectividad del apoyo gubernamental al emprendimiento en start-ups: una perspectiva desde la economía de cadena de suministro

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Eficácia do apoio governamental ao empreendedorismo em start-ups: uma perspectiva da economia de cadeia de suprimentos

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Abstract

Purpose – This study aims to analyse the heterogeneous effectiveness of government entrepreneurial support on start-ups by differentiating between two industry types, the supply chain (SC) economy, which supplies goods and services to other businesses, and the business-to-consumer economy (B2C), which serves final consumers.

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Design/methodology/approach – The authors examine 1,956 start-ups that received participative loans from the Spanish governmental agency ENISA between 2014 and 2019. Using a difference-in-differences approach with the Callaway and Sant’Anna estimator, the authors estimate the heterogeneous effects on turnover and employment growth across SC and B2C categories and their subcategories (SC Local, SC Traded, B2C Local, B2C Traded).

Findings – SC start-ups experience a significant 29.2% increase in turnover alongside a significant 25.2% decline in employment; B2C start-ups show no significant effects on either outcome. Within subcategories, SC Traded industries drive the positive turnover result (31.9% increase). Event-study analysis confirms that effects emerge at loan receipt and remain positive one year after treatment, with no pre-treatment differences, and survival analysis shows no differential firm exit across sectors.

Practical implications – Public support programmes for start-ups should account for sectoral heterogeneity. Policymakers can use the SC/B2C framework as a tractable criterion to target resources towards the SC economy, where participative loans yield the largest marginal effect. Managers of B2B start-ups can interpret participative loans as an instrument that relaxes binding financial constraints and enables productivity-enhancing investments.

Originality/value – This study moves beyond traditional high-tech vs non-high-tech classifications, offering a novel framework for evaluating public entrepreneurial finance. The findings indicate that start-ups in the SC economy, particularly those serving traded markets, are more responsive to public financial support, offering new evidence for policymakers designing industry-sensitive support programmes.

Keywords Government support, Start-ups, Participative loans, Supply chain economy, Business-to-consumer, Difference-in-differences

Paper type Research paper

Resumen

Objetivo – Este estudio analiza la efectividad heterogénea del apoyo gubernamental a start-ups diferenciando entre dos tipos de industria, la economía de Cadena de Suministro (SC), que provee bienes y servicios a otras empresas, y la economía Business-to-Consumer (B2C), que atiende al consumidor final.

Diseño/metodología/enfoque – Examinamos 1.956 start-ups que recibieron préstamos participativos de la agencia gubernamental española ENISA entre 2014 y 2019. Utilizando un enfoque de Diferencias en Diferencias con el estimador de Callaway y Sant’Anna, estimamos los efectos heterogéneos sobre el crecimiento de facturación y empleo en las categorías SC y B2C y sus subcategorías.

Resultados – Las start-ups SC experimentan un aumento significativo del 29,2% en facturación junto con un descenso significativo del 25,2% en empleo; las start-ups B2C no muestran efectos significativos en ninguno de los dos resultados. Dentro de las subcategorías, las industrias SC Traded impulsan el resultado positivo en facturación (aumento del 31,9%). El análisis de eventos confirma que los efectos se manifiestan en el momento de recepción del préstamo y se mantienen positivos un año después del tratamiento, sin diferencias previas al tratamiento, y el análisis de supervivencia no muestra mortalidad diferencial entre sectores.

Implicaciones prácticas – Los programas públicos de apoyo al emprendimiento deberían considerar la heterogeneidad sectorial. Los responsables de política pública pueden utilizar el marco SC/B2C como criterio operativo para orientar recursos hacia la economía de cadena de suministro, donde los préstamos participativos producen el mayor efecto marginal. Los gestores de start-ups B2B pueden interpretar los préstamos participativos como un instrumento que relaja restricciones financieras vinculantes y habilita inversiones que aumentan la productividad.

Originalidad/valor – Este estudio supera las clasificaciones tradicionales high-tech vs. non-high-tech, ofreciendo un marco novedoso para evaluar la financiación pública emprendedora. Nuestros hallazgos indican que las start-ups de la economía de cadena de suministro, particularmente las orientadas a mercados globales, son más receptivas al apoyo financiero público, ofreciendo una nueva perspectiva para el diseño de programas de apoyo diferenciados por sector.

Palabras clave Apoyo gubernamental, Start-ups, Préstamos participativos, Economía de cadena de suministro, Business-to-consumer, Diferencias en diferencias

Tipo de artículo Trabajo de investigación

Resumo

Objetivo – Este estudo analisa a eficácia heterogênea do apoio governamental a start-ups diferenciando entre dois tipos de indústria, a economia de Cadeia de Suprimentos (SC), que fornece bens e serviços a outras empresas, e a economia Business-to-Consumer (B2C), que atende o consumidor final.

Design/metodologia/abordagem – Examinamos 1.956 start-ups que receberam empréstimos participativos da agência governamental espanhola ENISA entre 2014 e 2019. Utilizando uma abordagem de Diferenças em Diferenças com o estimador de Callaway e Sant’Anna, estimamos os efeitos heterogêneos no crescimento de faturamento e emprego nas categorias SC e B2C e suas subcategorias.

Resultados – As start-ups SC experimentam um aumento significativo de 29,2% no faturamento junto com uma queda significativa de 25,2% no emprego; as start-ups B2C não mostram efeitos significativos em nenhum dos resultados. Dentro das subcategorias, as indústrias SC Traded impulsionam o resultado positivo no faturamento (aumento de 31,9%). A análise de eventos confirma que os efeitos se manifestam no momento do recebimento do empréstimo e permanecem positivos um ano após o tratamento, sem diferenças prévias ao tratamento, e a análise de sobrevivência não mostra mortalidade diferencial entre setores.

Implicações práticas – Os programas públicos de apoio ao empreendedorismo devem considerar a heterogeneidade setorial. Os formuladores de políticas podem utilizar o framework SC/B2C como critério operacional para orientar recursos à economia de cadeia de suprimentos, onde os empréstimos participativos produzem o maior efeito marginal. Os gestores de start-ups B2B podem interpretar os empréstimos participativos como um instrumento que relaxa restrições financeiras vinculantes e viabiliza investimentos que aumentam a produtividade.

Originalidade/valor – Este estudo supera as classificações tradicionais high-tech vs. non-high-tech, oferecendo um framework inovador para avaliar o financiamento público empreendedor. Nossos achados indicam que as start-ups da economia de cadeia de suprimentos, particularmente as orientadas a mercados globais, são mais responsivas ao apoio financeiro público, oferecendo uma nova perspectiva para formuladores de políticas que desenham programas de apoio diferenciados por setor.

Palavras-chave Palavras-chave Apoio governamental, Start-ups, Empréstimos participativos, Economia de cadeia de suprimentos, Business-to-consumer, Diferenças em diferenças

Tipo de papel Trabalho de pesquisa

1. Introduction

In recent years, there has been a notable shift in the consensus regarding the role of government in the economy, towards a more favourable stance on proactive intervention (Mazzucato, 2018). Consequently, governments are increasingly focusing on promoting economic growth and innovation through investments in innovative start-ups. These seed funds help start-ups overcome financing constraints that hinder their ability to start, grow and scale (Audretsch *et al.*, 2020; Bai *et al.*, 2021; Ratinho *et al.*, 2020). However, the limited availability of public resources necessitates allocating investments to sectors with the highest potential returns (Caliendo and Tübbicke, 2020; Hottenrott and Richstein, 2020; Mulier and Samarin, 2021; Pantea and Tkacik, 2025), and the question of which industries yield the highest returns from public support remains unresolved.

Previous research has predominantly examined this heterogeneity through the lens of technological intensity, with generally favourable results for high-tech firms but important limitations in scope and applicability (Ratinho *et al.*, 2020; Audretsch *et al.*, 2020). However, emerging economic processes such as servicification, non-R&D innovation and the reorganisation of global value chains suggest that traditional categorisations may no longer capture the relevant dimensions of heterogeneity (Delgado and Mills, 2020). There is a need for alternative frameworks that better reflect these dynamics and guide public resource allocation.

The aim of this study is to analyse the heterogeneous effectiveness of government entrepreneurial support on start-ups by differentiating between suppliers of goods and

services, the “Supply chain economy” (SC economy), and those focused on the final consumer, the “Business-to-consumer economy” (B2C economy), based on the framework proposed by [Delgado and Mills \(2020\)](#). We therefore ask whether government-supported start-ups from the SC economy exhibit differential growth patterns compared to those from business-to-consumer industries. We analyse a dataset comprising 1,956 start-ups that received participative loans from ENISA (*Empresa Nacional de Innovación*, S.A.), the Spanish public company for entrepreneurial finance, through its start-up funding line between 2014 and 2019. Employing a difference-in-differences (DiD) approach with the [Callaway and Sant’Anna \(2021\)](#) estimator and a not-yet-treated identification strategy, we measure the heterogeneous effects of public support on SC and B2C economy categories and their subcategories (SC Local, SC Traded, B2C Local, B2C Traded) on turnover and employment growth.

Our findings reveal that ENISA’s participative loans have a heterogeneous impact across industry types. SC start-ups experience a significant 29.2% increase in turnover alongside a 25.2% decline in employment, while B2C start-ups show no significant aggregate effects on either outcome. Within subcategories, SC Traded firms drive the positive turnover result with a 31.9% increase. Event-study analysis confirms that these effects emerge at loan receipt and remain positive one year after treatment, with no pre-treatment differences across treatment cohorts. Kaplan–Meier survival analysis provides no evidence of differential firm exit across sectors. These results suggest that government support for the supply chain economy is an effective targeted policy strategy for promoting economic growth and entrepreneurial activity. For academics, our study offers important insights into the heterogeneous effects of government support across the SC/B2C framework, extending the literature beyond the traditional high-tech/non-high-tech dichotomy. Overall, our results indicate that the SC economy framework provides a useful lens for evaluating public entrepreneurial support with direct implications for policy design.

The remainder of this study is organised as follows. Section 2 reviews the previous literature on government start-up support and heterogeneous industry effects. Section 3 presents the research setting and methodology. Section 4 presents the main results. Section 5 discusses the implications of the results. Finally, Section 6 offers the main conclusions, limitations and future lines of research.

2. Literature review

Start-ups face significant financing constraints that can hinder their growth ([Hall, 2002](#); [Berger and Gregory, 1998](#)), and government initiatives have increasingly sought to address these gaps ([Testa et al., 2024](#)). However, the degree and nature of these effects vary across industries, and the literature has predominantly examined this heterogeneity through the lens of technological intensity ([Pantea and Tkacik, 2025](#); [Ratinho et al., 2020](#)). Using high-tech classification, [Bertoni et al. \(2019\)](#) studied ENISA’s participative loans and find that high-tech firms create significantly more employment, although the corresponding sales effect remains ambiguous. Similarly, [Mulier and Samarin \(2021\)](#) documented significant sector heterogeneity in the dynamic effects of Horizon 2020 (the European Union’s framework programme for research and innovation) subsidies, with high-tech firms capturing the largest benefits, and [Vanino et al. \(2019\)](#) found stronger performance effects for firms in R&D-intensive industries. [Hottenrott and Richstein \(2020\)](#) and [Pantea and Tkacik \(2025\)](#) reported positive effects concentrated in technology-intensive sectors. Even where evidence favours high-tech firms, this approach has important limitations. [Ratinho et al. \(2020\)](#) noted that tailoring support to technology-based firms narrows the population of affected start-ups and consequently diminishes the net potential economic impact. More fundamentally, as

[Audretsch et al. \(2020, 24\)](#) argued, equating technological intensity with innovativeness is problematic because “one definition of innovative start-up probably does not fit all contexts”. Although this evidence base draws predominantly from European and North American programmes, similar instruments exist in Latin America, Asia and Africa, and whether sectoral heterogeneity operates comparably in those settings remains largely unexplored.

Indeed, over the past two decades, servicification, non-R&D-based innovation and the reorganisation of global value chains have transformed the way firms create and capture value ([Delgado and Mills, 2020](#)). A firm’s position within the value chain, whether it supplies intermediate goods and services to other businesses or sells directly to final consumers, may therefore be a more relevant dimension than its technological intensity alone. Building on the clusters literature ([Porter, 1998](#); [Porter, 2003](#)), [Delgado and Mills \(2020\)](#) proposed the “supply chain economy” framework, a taxonomy that distinguishes between industries oriented towards providing goods and services to other businesses (the “supply chain” or SC economy) and those focused on the final consumer (the “business-to-consumer” or B2C economy). Within this framework, suppliers play a unique role in fostering innovation. By providing specialised inputs, they enhance the efficiency and effectiveness of the innovation process ([Rosenberg, 1963](#)). Unlike producers of consumer goods, suppliers interact with a diverse range of industries, allowing their innovations to spread across various sectors, such as the impact of semiconductors on multiple technologies ([Bresnahan and Trajtenberg, 1995](#)). Additionally, suppliers located near their customers within industry clusters benefit from intensified collaboration and knowledge exchange, creating spillover effects that further drive innovation and economic growth within these clusters ([Carlino, 1980](#); [Delgado and Porter, 2021](#); [Porter, 1998](#); [Saxenian, 1991](#)).

The [Delgado and Mills \(2020\)](#) framework classified economic sectors by integrating the SC economy categorisation with other categorisations such as traded versus local industries ([Delgado et al., 2014](#); [Porter, 1998](#); [Porter, 2003](#)). Traded industries (e.g. Engineering Services or Breakfast Cereal Manufacturing) have been associated with higher innovation than the local economy (e.g. temporary help services or full-service restaurants) because they can exploit economies of agglomeration. In their analysis of the US economy, [Delgado and Mills \(2020\)](#) revealed that the SC economy constitutes nearly half of the nation’s economic activity. They also highlighted that over the past 25 years, the SC traded economy has outperformed both the B2C traded economy and the local economy in generating STEM jobs and high-wage employment.

[Delgado et al. \(2020\)](#) explored the impact of firm age on industry dynamics within the SC economy, particularly in traded services. They found that established companies predominantly drive the growth of the SC traded economy, while start-ups face significant barriers, such as securing skilled personnel, attracting customers and obtaining financial resources. Despite these challenges, start-ups in the SC economy hold considerable promise for driving growth, innovation and creating high-wage jobs. However, [Delgado et al. \(2020\)](#) documented a concerning trend. New firm entry in SC traded services declined by 20% between 1998 and 2015, and employment in new SC firms dropped by 50% over the same period, while growth concentrated overwhelmingly in mature incumbent firms. These barriers are structurally more severe for SC start-ups than for their B2C counterparts. SC firms supply specialised inputs to other businesses, which requires customising products for each client’s value chain, sustaining longer sales cycles and making capital-intensive investments before generating revenue ([Delgado et al., 2020](#)). In contrast, B2C start-ups sell directly to final consumers with more standardised offerings and shorter paths to market. [Delgado et al. \(2020\)](#) explicitly called for policies that remove barriers to entry and growth

for SC start-ups, arguing that this is essential to promote innovation diffusion across the economy.

Building on this literature, we argue that government financial support should have a heterogeneous impact across the SC and B2C economies. If SC start-ups face more severe financial constraints due to the complexity of business-to-business (B2B) markets, then a capital injection should have a larger marginal effect on these firms by reducing their investment-cash flow sensitivity and enabling them to overcome the barriers that limit their entry and growth (Colombo *et al.*, 2013; Delgado *et al.*, 2020). Moreover, within the SC economy, start-ups in traded industries should exhibit the strongest response, as they combine the highest growth potential (Delgado and Mills, 2020) with the most binding financial barriers (Delgado *et al.*, 2020). Furthermore, the agglomeration externalities documented by Delgado *et al.* (2014) suggest that a financial stimulus in SC traded industries can trigger cumulative spillovers through inter-firm linkages and knowledge exchange within clusters, amplifying the initial effect of the support. Considering this, we pose the following research question (RQ):

RQ. Do government-supported start-ups from the supply chain economy exhibit differential growth patterns compared to those from business-to-consumer industries?

3. Research setting and methodology

3.1 ENISA's participative loans

ENISA is a public company under the Spanish Ministry of Economy, Industry, and Competitiveness, established in 1982 to provide equity financing to high-technology firms. As the Spanish venture capital market matured in the late 1990s, ENISA gradually transitioned from equity to participative loans (PLs). This shift allowed ENISA to complement, rather than compete with, private venture capitalists, providing long-term funding to a broader set of entrepreneurial ventures (Bertoni *et al.*, 2019; Martí and Quas, 2018). ENISA's approval also serves as a certification signal to banks and private investors, reducing information asymmetries and facilitating access to subsequent financing rounds (Martí and Quas, 2018). Because PLs are loan contracts rather than equity shares, they do not require a formal valuation of the firm. Moreover, their predetermined maturity frees ENISA from devoting attention to divestment strategies, unlike traditional venture capital investors.

The allocation of PLs follows a competitive process with specific eligibility requirements. For the start-up funding lines analysed in this study, applicants must meet the following criteria: be SMEs according to EU definitions; be constituted no more than 24 months before the application date; have their main activity and registered office in Spain; and present an innovative business model with competitive advantages. Given the early-stage nature of most applicants, ENISA does not require comprehensive historical financial statements but instead focuses on forward-looking assessments. All applicants must submit a comprehensive business plan through an online platform, including a description of the venture and its business model, the background of the founders, a justification for the requested amount and cash-flow projections. The evaluation process typically lasts two to three months. A critical eligibility requirement is that the founders must contribute equity equivalent to at least 50% of the loan amount requested, serving as proof of their commitment to the business plan. This emphasis on forward-looking assessments is consistent with evidence that public external support promotes early and systematic planning behaviour among entrepreneurs, which in turn relates to higher employment growth in new firms (Contín-Pilart *et al.*, 2020).

After preliminary analysis, ENISA's investment committee accepts or rejects proposals based on both quantitative factors and qualitative factors, including the company's life cycle stage, market attractiveness, competitive landscape and dependencies on customers and suppliers. For loans exceeding €300,000, approval from ENISA's board is also required. The applicants' success rate in obtaining funding is approximately 50% (Bertoni *et al.*, 2019; Martí and Quas, 2018). Several factors explain this acceptance rate. For example, incomplete applications are rejected outright; in some cases, entrepreneurs apply before the company is legally constituted; and the parallel capital increase requirement proves insurmountable for some applicants.

Since ENISA must demonstrate its effectiveness to obtain continued government funding, its approach differs from pure public-spending entities. By the end of 2022, ENISA had recovered approximately 55% of the principal lent between 2005 and 2019, implying a taxpayer cost of roughly 45 cents per euro of loan principal. This is a conservative estimate, as many loans from recent cohorts are still in their repayment period and the figure excludes interest income, profit participation and early cancellation commissions (Pellón, 2023).

In the broader landscape of public entrepreneurial finance, ENISA shares characteristics with other government-backed initiatives worldwide, such as the small business administration (SBA) loan guarantees in the USA, Germany's KfW programmes, France's Bpifrance and the UK's British Business Bank (Bertoni *et al.*, 2023; Audretsch *et al.*, 2020). These programmes address financing gaps faced by start-ups lacking collateral or track records, although their design features vary considerably across countries (Testa *et al.*, 2024). Cross-country evidence shows that government and private investors tend to act as complements rather than substitutes, with public financing crowding in private capital for early-stage ventures (Bai *et al.*, 2021). ENISA's distinctive feature is its use of participative loans, a hybrid instrument between debt and equity that allows flexible repayment terms tied to firm performance while avoiding equity dilution for founders.

3.2 Dataset

ENISA regularly publishes a public register of all approved participative loans, including the loan signing date, amount, recipient firm's name and trademark. For our research, we use all ENISA start-up support funding lines. Using this register and a web scraping protocol, we retrieved the tax identification numbers for all supported firms (Acebo *et al.*, 2024). We then merged this data set with the SABI database (Bureau van Dijk) to obtain annual economic and financial data for the supported start-ups.

To ensure that all firms in our sample are genuinely young ventures, we restrict the analysis to firms that were at most four years old at the time of loan receipt and to treatment cohorts between 2014 and 2019. Three considerations motivate this period selection, the recent evolution of ENISA's support programme (Pellón, 2023), the need for a sufficient post-treatment window to observe growth effects, and the aim of avoiding confounding from the COVID-19 pandemic. Our final sample comprises 2,159 participative loans and 1,956 firms (1,419 SC and 537 B2C).

Comparing these figures to the official data reported by Pellón (2023), our sample represents 95.5% of the total supported start-ups in seed and early-stage funding lines during the 2014–2019 period, providing a highly representative panel data set. The remaining 4.5% corresponds to firms that could not be matched to SABI, typically because they were dissolved before filing financial statements or registered under a different legal entity. Our data collection procedure follows the same approach used in previous evaluations (Bertoni *et al.*, 2019; Martí and Quas, 2018), which matched ENISA-supported firms to the SABI

database to collect financial and economic data. Because we rely on administrative records rather than survey instruments, our data set is not subject to conventional non-response bias.

Table 1 presents the distribution of participative loans and supported start-ups across the SC and B2C economies. The concentration of participative loans in regions such as Catalonia and Madrid reflects the higher density of start-up activity in these areas. The distribution by SC and B2C categories indicates that B2C Local and SC Local receive less support compared to SC Traded, which accounts for the majority of the SC economy firms.

3.3 Variables

Following previous studies such as Berton *et al.* (2023), we measure start-up growth through two dependent variables, turnover and employment. Because start-up samples contain zero-value observations, we apply the transformation $\log(Y + 1)$ to accommodate them. All continuous variables are winsorised to limit the influence of extreme values. Our treatment variable is a dummy variable equal to 1 if a firm received a participative loan in calendar year t . We aggregate information at the firm-year level for companies receiving more than one participative loan in the same calendar year.

Table 1. Distribution of the sample

Category	SC No.	SC (%)	B2C No.	B2C (%)
<i>Panel A: Loans</i>				
By signature year				
2014–2015	512	32.59	198	33.67
2016–2017	526	33.48	178	30.27
2018–2019	533	33.93	212	36.05
By loan amount				
≤ 60K€	603	38.38	240	40.82
60–77K€	229	14.58	92	15.65
77–150K€	491	31.25	179	30.44
> 150K€	248	15.79	77	13.10
Total	1,571		588	
<i>Panel B: Firms</i>				
By age at treatment				
< 1 year	106	7.47	34	6.33
1–4 years	1,313	92.53	503	93.67
By subcategory				
B2C Local			249	46.37
B2C Traded			288	53.63
SC Local	134	9.44		
SC Traded	1,285	90.56		
By region (NUTS-2)				
Andalucía	104	7.33	44	8.19
Cataluña	481	33.90	144	26.82
C. de Madrid	433	30.51	195	36.31
C. Valenciana	102	7.19	42	7.82
Other	299	21.07	112	20.86
Total	1,419	100	537	100

Note(s): Distribution of ENISA participative loans (Panel A) and treated firms (Panel B) by signature year, loan amount, age at treatment, supply chain subcategory and NUTS-2 region

Source(s): Authors' own work

To analyse the differences between the SC economy and the business-to-consumer economy, we adopt the classification developed by [Delgado and Mills \(2020\)](#). According to their framework, firms are considered part of the supply chain economy if less than 35% of their output is directed towards personal consumption expenditure (PCE). Each firm is assigned to one of four subcategories (SC Traded, SC Local, B2C Traded and B2C Local) based on the NAICS industry code recorded in SABI. As control variables, we include pre-treatment log turnover and the logarithm of age. Pre-treatment turnover accounts for baseline differences in firm size and makes the conditional parallel trends assumption more plausible when covariate distributions differ across groups ([Callaway and Sant'Anna, 2021](#)), while age captures differences in firm maturity. Sector-specific heterogeneity is addressed by estimating the model separately for SC and B2C firms (and for each subcategory).

[Table 2](#) presents summary statistics and pairwise correlations for the pooled sample of ENISA-treated firms. The average firm reports sales of €81,400, employs five workers, and is approximately five years old. The average loan amount is €114,000. Pairwise correlations between sales, employment and age are low, suggesting that these variables capture distinct dimensions of firm characteristics.

3.4 Econometric approach

Analysing the heterogeneous impact of public support mechanisms on start-ups poses an identification challenge. As discussed by [Colombo et al. \(2013\)](#), the non-random nature of public financing and its potential endogeneity require appropriate estimation techniques. Previous studies have applied different strategies, such as DiD ([Bertoni et al., 2023](#)) or instrumental variables ([Bertoni et al., 2019](#)).

We use the [Callaway and Sant'Anna \(2021\)](#) DiD estimator with the regression adjustment method of [Sant'Anna and Zhao \(2020\)](#), which addressed three well-documented limitations of conventional two-way fixed effects (TWFE) regressions ([Goodman-Bacon, 2021](#)). Firstly, it does not assume homogeneity in treatment effects, which is particularly relevant in our setting with six staggered cohorts (2014–2019) where effects may differ across cohorts and evolve over time. Secondly, the regression adjustment models the conditional expectation of the outcome given pre-treatment covariates, providing consistent estimates under correct specification of the outcome regression ([Sant'Anna and Zhao, 2020](#)). Thirdly, it decomposes the overall ATT into event-time specific estimates, revealing how treatment effects unfold after loan receipt.

Furthermore, this methodology uses not-yet-treated firms (cohorts that received ENISA loans in later periods) as the comparison group, avoiding the bias that arises when already-treated units serve as controls ([Goodman-Bacon, 2021](#); [Sun and Abraham, 2021](#)). The

Table 2. Summary statistics: ENISA-treated firms

Variable	Obs.	Mean	SD	(1)	(2)	(3)
(1) Turnover (K€)	20,470	81.4	182.9			
(2) Employees	20,470	5.0	19.1	0.084		
(3) Age	20,470	4.9	3.3	−0.097	0.010	
Loan amount (K€)	2,351	114.0	98.2			

Note(s): Summary statistics for 1,956 ENISA-treated firms (all programmes, cohorts 2014–2019). Turnover and loan amounts in thousands of euros (K€). Columns (1)–(3) report pairwise Pearson correlations

Source(s): Authors' own work

regression adjustment includes pre-treatment log turnover and firm age as covariates, allowing for conditional parallel trends (Callaway and Sant'Anna, 2021).

Beyond these desirable statistical properties, several features of our empirical design address concerns regarding structural changes, macroeconomic shocks and identification. Firstly, the Callaway and Sant'Anna (2021) estimator computes a separate $ATT(g, t)$ for each cohort g at each calendar time t , comparing treated firms to not-yet-treated firms observed at the same point in time. Aggregate time shocks are therefore differenced out non-parametrically, which is strictly more flexible than imposing parametric year fixed effects in a pooled TWFE regression. Secondly, we estimate the model separately for SC and B2C firms, which is equivalent to allowing fully independent time dynamics for each sector group and thus more flexible than sector $\times$ year fixed effects in a pooled specification. Thirdly, with treatment cohorts restricted to 2014–2019 and an event window of $[-2, +1]$, the effective identification window runs from approximately 2012 to 2020, leaving major structural disruptions well outside the estimation period.

Our identification strategy relies on the no-anticipation assumption, which is highly plausible in our setting for both institutional and empirical reasons. ENISA's approval process has a success rate of approximately 50%, and the timing of disbursement depends on review committee schedules, so firms cannot predict with certainty whether or when they will receive the loan. Moreover, the treatment is a financial disbursement. Until the participative loan is received, the start-up cannot finance the hiring or investment decisions that would alter turnover or employment. This is reinforced by the fact that our sample consists of young firms (aged four years or less at the time of loan receipt), which typically lack the financial slack for anticipatory adjustments. We provide supporting evidence for this assumption in Section 4.3.

To compare the SC and B2C sectors, we compute the average treatment effect on the treated (ATT) for each sector separately. Following this, we conduct a χ^2 test to evaluate whether the differences in ATTs between sectors are statistically significant. Additionally, we run the same analysis using the subcategories (SC Local, SC Traded, B2C Local and B2C Traded) to determine in which one the impact of participative loans is greater.

4. Results

4.1 Main results

Table 3 presents the estimated ATT of participative loans on turnover and employment, comparing SC and B2C start-ups to their not-yet-treated counterparts. Panel A reports the aggregate effects by economy type. Because the dependent variables are log-transformed, percentage changes are computed as $[\exp(\beta) - 1] \times 100$. SC start-ups experience a significant 29.2% increase in turnover alongside a significant 25.2% decline in employment. In contrast, B2C start-ups show no significant effects on either outcome. A χ^2 test for the difference in ATTs between sectors reveals no significant difference for turnover but a significant gap for employment. This indicates that the employment adjustment following loan receipt differs between the two economy types. In sum, SC start-ups experience significant turnover growth following government support whereas B2C start-ups do not, and the two sectors diverge in their employment adjustment patterns.

Panel B of Table 3 decomposes these effects by subcategory. Within the SC sector, SC Traded firms drive the positive turnover result with a significant 31.9% increase, while SC Local firms show no significant turnover effect. Both SC subcategories exhibit significant employment declines: 32.3% for SC Local and 23.0% for SC Traded. Within the B2C sector, B2C Local firms experience a significant turnover decline of 69.0% with no significant

Table 3. Beneficiaries' growth after receipt of participative loan

ATT	Turnover coefficient	Turnover robust std. error	Employment coefficient	Employment robust std. error
<i>Panel A: ATT by SC and B2C</i>				
SC economy	0.256*	0.149	-0.291***	0.077
B2C Economy	0.005	0.225	-0.023	0.125
ATTSC - ATTB2C	$\chi^2(1) = 0.87$		$\chi^2(1) = 3.35^*$	
<i>Panel B: ATT by SC and B2C subcategories</i>				
B2C Local	-1.170***	0.274	0.099	0.126
B2C Traded	-0.007	0.266	0.039	0.136
SC Local	-0.161	0.518	-0.390***	0.129
SC Traded	0.277*	0.152	-0.261***	0.080
ATTSC Traded - ATTB2C Traded	$\chi^2(1) = 0.86$		$\chi^2(1) = 3.62^*$	
ATTSC Local - ATTB2C Local	$\chi^2(1) = 2.97^*$		$\chi^2(1) = 7.40***$	

Note(s): ATT estimated via Sant'Anna and Zhao's (2020) regression-adjusted difference-in-differences estimator using not-yet-treated ENISA firms as controls. Dependent variables are log-transformed and winsorised at the 1st and 95th percentiles. Controls: log age and pre-treatment log turnover. Panel A reports aggregate estimates for SC (5,276 firm-year observations) and B2C (1,963); Panel B decomposes by subcategory. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source(s): Authors' own work

employment effect, whereas B2C Traded firms show no significant effects on either outcome.

Taken together, these results suggest that participative loans enable SC start-ups, particularly those in traded industries, to grow their turnover while restructuring their workforce. The combination of rising turnover and declining employment is consistent with productivity-enhancing investments that increase output per worker. We explore these mechanisms in Section 5. B2C start-ups, by contrast, show no significant aggregate effects, although the subcategory decomposition reveals a sharp turnover decline among B2C Local firms and no significant effects for B2C Traded industries.

4.2 Survival analysis

An important concern when evaluating the impact of participative loans is whether the growth effects documented above could be driven by differential firm survival across sectors. If SC firms survive at higher rates, the ATT estimates might reflect a composition effect rather than genuine performance improvement. To address this, we complement the DiD analysis with a non-parametric Kaplan–Meier survival analysis.

Table 4 reports survival rates at one, three and five years after loan receipt for SC and B2C firms. Both groups exhibit remarkably similar survival trajectories. SC firms show survival rates of 98.1%, 94.2% and 93.9% at these horizons, while B2C firms show 98.3%, 94.2% and 93.4%, respectively. A log-rank test confirms that these survival functions are not statistically different. This result provides no evidence of differential firm exit across sectors, reducing the concern that the growth effects in Table 3 are driven by selective firm exit.

4.3 Dynamic effects and robustness

Having established that the growth effects are not driven by differential survival, we now examine the temporal dynamics of these effects and validate the parallel trends assumption. Table 5 decomposes the aggregate ATT into event-time coefficients over the $[-2, +1]$

Table 4. Firm survival after receipt of participative loan

Group	Firms (N)	1 year	3 years	5 years
SC economy	1,205	98.1	94.2	93.9
B2C Economy	458	98.3	94.2	93.4
Log-rank test	$\chi^2(1) = 0.02$			

Note(s): Kaplan–Meier survival estimates for ENISA-treated firms (cohorts 2014–2019). Survival rates report the proportion of firms still active at 1, 3 and 5 years after loan receipt. A firm is classified as dead once it records zero employees and turnover in two consecutive periods (excluding the first three years of life). Firms still active at the end of the observation period are right-censored. The log-rank test evaluates the null hypothesis that survival functions are equal across SC and B2C groups

Source(s): Authors’ own work

Table 5. Event-study estimates: turnover and employment

Event time	Turnover coefficient	Turnover std. error	Employment coefficient	Employment std. error
<i>Panel A: SC economy</i>				
–2	–0.166	0.245	–0.043	0.083
–1	–0.091	0.147	0.019	0.050
+0	0.382***	0.095	0.023	0.036
+1	0.569***	0.203	–0.188**	0.091
<i>Panel B: B2C economy</i>				
–2	–0.303	0.342	0.046	0.120
–1	–0.131	0.246	–0.039	0.096
+0	0.483***	0.166	0.105	0.065
+1	0.552*	0.333	0.051	0.148

Note(s): Event-time ATT estimated via Sant’Anna and Zhao’s (2020) regression-adjusted difference-in-differences estimator using not-yet-treated ENISA firms as controls. Dependent variables are log-transformed and winsorised at the 1st and 95th percentiles. Controls: log age and pre-treatment log turnover. Panel A: 5,276 firm-year observations (SC); Panel B: 1,963 (B2C). Event window: [–2, +1]. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Source(s): Authors’ own work

window relative to loan receipt (see Section 3.4). Pre-treatment coefficients ($e = -2$ and $e = -1$) are statistically insignificant across all groups and outcomes, supporting the parallel trends assumption that underlies the identification strategy.

The post-treatment dynamics shed light on how the effects of participative loans unfold over time. For turnover, both SC and B2C start-ups exhibit significant positive effects at the year of treatment, consistent with the capital injection enabling immediate commercial expansion. SC start-ups, however, show a larger coefficient at $e = +1$, suggesting that the revenue effect does not dissipate within the first post-treatment year. The event-study also reveals that B2C start-ups experience significant turnover gains at treatment, with a significant effect persisting at $e = +1$, despite the non-significant aggregate ATT reported in Table 3.

This divergence arises because the aggregate ATT weights all group–time cells differently from the event-study, and the smaller B2C sample yields less precise estimation when aggregated. The event-study thus provides a more nuanced picture: while B2C firms benefit from short-term revenue gains following the capital injection, these effects are less precisely estimated and less sustained than those observed for SC start-ups.

For employment, the two sectors diverge markedly. SC firms show no immediate effect at treatment but experience a significant decline at $e = +1$, suggesting that workforce adjustment materialises gradually rather than immediately upon loan receipt. B2C firms, by contrast, exhibit no significant employment effects at any horizon.

5. Discussion

The significant growth effects observed in SC but not B2C start-ups can be explained by the structurally different financial constraints that these sectors face. Building on the structural differences identified by [Delgado et al. \(2020\)](#), SC start-ups must tailor specialised inputs to each client's value chain, sustain longer B2B sales cycles and make capital-intensive investments in skilled personnel and technology before generating revenue. These requirements imply higher working capital needs and greater investment-cash flow sensitivity than in consumer-facing markets.

[Bertoni et al. \(2019\)](#) identified precisely these conditions as those under which public financial support is most effective. Consistent with this logic, [Colombo et al. \(2013\)](#) shown that public subsidies reduce investment-cash flow sensitivity precisely among the most financially constrained firms, enabling them to undertake growth-oriented investments they could not otherwise pursue. A participative loan therefore has a larger marginal effect on SC start-ups because it directly relaxes the binding constraint, access to long-term capital, that prevents these firms from acquiring new business clients and scaling operations. B2C start-ups, by contrast, sell more standardised offerings directly to final consumers through shorter and less capital-intensive paths to market ([Delgado and Mills, 2020](#)). The same capital injection therefore addresses a less pressing financial need and produces a smaller growth response.

The declining entry rate of SC start-ups documented by [Delgado et al. \(2020\)](#) further suggests that the barriers facing these firms are severe enough to deter entry altogether, reinforcing the argument that government support can be particularly transformative for the SC firms that do enter. ENISA's certification signal ([Martí and Quas, 2018](#)) may be especially valuable for SC start-ups, whose intangible and customised service offerings make it harder for banks to assess creditworthiness, amplifying the loan's indirect effect on subsequent access to private financing. The combination of rising turnover and declining employment in SC firms complements the positive employment effects found by [Bertoni et al. \(2019\)](#) for ENISA loans over 2005–2011, with differences likely driven by the distinct identification strategies, the SC/B2C decomposition that isolates patterns masked in pooled estimates, and the different macroeconomic contexts of the two sample periods.

The subcategory decomposition reveals that SC Traded firms drive the aggregate turnover effect, with a 31.9% increase, the only subcategory to show positive revenue growth at conventional significance levels. SC Traded firms combine the highest growth potential, as the leading segment for STEM employment and innovation ([Delgado and Mills, 2020](#)), with the most binding financial barriers to entry and scaling ([Delgado et al., 2020](#)), making them especially responsive to a capital injection that eases their core financial barrier. Moreover, traded industries benefit from agglomeration externalities such as knowledge spillovers, specialised labour pooling and inter-firm linkages within clusters ([Delgado et al., 2014](#)), which can amplify the initial effect of the loan by enabling start-ups to leverage complementary resources in their regional environment. SC Local firms, by contrast, show the largest employment decline without a corresponding turnover increase, suggesting that firms in geographically bounded SC industries may reduce their workforce without being able to translate the capital injection into revenue growth.

Among B2C subcategories, B2C Local firms exhibit a significant 69.0% turnover decline. Local consumer markets are characterised by limited demand and intense competition from established incumbents (Porter, 1998), which constrains the revenue upside of new investment. For these firms, a capital injection alone may not overcome the demand-side and competitive limitations they face.

6. Conclusion

This study extends the literature on public entrepreneurial finance by examining the heterogeneous effectiveness of government support across industry types, moving beyond the traditional high-tech/non-high-tech dichotomy. Adopting the supply chain/business-to-consumer framework proposed by Delgado and Mills (2020), we analyse 1,956 start-ups that received participative loans from the Spanish governmental agency ENISA between 2014 and 2019, using the Callaway and Sant'Anna (2021) DiD estimator with a not-yet-treated identification strategy.

Our findings reveal that participative loans have a heterogeneous impact across industry types. SC start-ups experience significant turnover growth (29.2%) coupled with employment restructuring (25.2% decline), whereas B2C start-ups show no significant effects. Although formal between-group tests do not reach statistical significance for turnover, the employment adjustment differs across sectors, and the contrasting patterns of individual significance point to meaningful heterogeneity. Within subcategories, SC Traded firms drive the positive turnover result (31.9% increase), consistent with the expectation that firms facing the most binding financial barriers respond significantly to a capital injection (Delgado *et al.*, 2020). Event-study analysis confirms that these effects emerge at loan receipt and persist one year after treatment, with no pre-treatment differences. Survival analysis provides no evidence of differential firm exit.

These results carry direct implications for theory, policy and practice. For theory, the SC/B2C framework captures heterogeneity in start-up responses to public support that traditional classifications miss, answering the call by Audretsch *et al.* (2020) for refined approaches to understanding which firms benefit most from government intervention. The relevant dimension of heterogeneity may not be technological intensity but the structural position of firms within the value chain, extending the growing literature on sector heterogeneity in public support (Mulier and Samarin, 2021; Bertoni *et al.*, 2023). More broadly, just as Mayorga *et al.* (2025) demonstrated that the GEM framework's measurement of entrepreneurship is context-dependent and multidimensional, our results suggest that the classification framework used to evaluate public support also matters. The high-tech/non-high-tech dichotomy, while useful in some settings, fails to capture the relevant heterogeneity in how start-ups respond to public financial intervention.

For policy, our findings support the “missing start-ups” argument of Delgado *et al.* (2020). SC start-ups face binding financial barriers yet show significant response to public support, suggesting that industry-specific programme design can more effectively address declining entry rates than one-size-fits-all allocation. Supporting the SC economy also requires fostering ecosystems, industry clusters and inter-firm networks (Delgado and Porter, 2021). Although these implications derive from a single-country programme with distinctive features, the underlying logic – that the structural position of firms within the value chain conditions their response to public support – should generalise to other instruments. Open evaluation strategies, akin to those used for SBIR grants (Dutta *et al.*, 2022) or public loan guarantees (Bertoni *et al.*, 2023), would strengthen evidence-based policy design. Outcome-based measurement toolkits designed for innovation ecosystems (Sanchez-Dominguez and Almanza-Rueda, 2025) could support such efforts.

For practice, the combination of turnover growth and employment restructuring in SC firms suggests that these start-ups use the capital injection for productivity-enhancing investments rather than simple headcount expansion. This pattern provides managers and venture capitalists with evidence that the SC traded segment offers the highest growth potential from this type of public support. For SC start-up managers specifically, participative loans can bridge the gap between capital-intensive entry requirements and delayed revenue generation that characterises B2B markets. Practitioners designing accelerator or incubation programmes should also consider the SC/B2C distinction when selecting and benchmarking portfolio firms, as growth expectations differ structurally across these categories.

Despite these contributions, this study has several limitations. Firstly, we observe only firms that received ENISA loans, not the full pool of applicants. With an approval rate of approximately 50% (Bertoni *et al.*, 2019), the rejected applicants would constitute a natural counterfactual group that could strengthen causal identification. Our not-yet-treated design mitigates selection bias by comparing firms that all passed ENISA's screening process, but it cannot replicate the inferential power of an approved-versus-rejected comparison (Ratinho *et al.*, 2020). Secondly, the DiD estimator treats all participative loans as a binary event, regardless of their amount. This precludes dose-response analysis and may attenuate the estimated effects. While this binary approach is standard in the policy evaluation literature (Mulier and Samarin, 2021; Bertoni *et al.*, 2023), it cannot identify the optimal loan size or test whether larger amounts produce proportionally larger growth effects.

Thirdly, the SC/B2C classification of Delgado and Mills (2020) assigns each firm to a category based on its NAICS industry code and the share of sectoral output directed to personal consumption expenditure. This deterministic, sector-level taxonomy does not capture the actual business model of individual firms. As Audretsch *et al.* (2020, 24) noted, sector-based definitions “may run the risk of including firms that ultimately turn out not to be innovative (false positives) and excluding firms that eventually become highly innovative (false negatives)”, a caveat that extends to any sector-based categorisation. Moreover, the SC/B2C framework was developed using US economic data, and the extent to which its thresholds map onto the Spanish industry structure remains an open question. Fourth, the not-yet-treated design with six cohorts (2014–2019) restricts our event window to $[-2, +1]$, capturing only one year of post-loan effects. Whether the SC turnover gains persist or dissipate over the medium term remains unknown. Additional robustness checks such as alternative winsorisation thresholds or placebo tests would strengthen confidence in the findings. Fifth, the analysis is confined to a single country and programme, where institutional features such as labour market rigidity and the quasi-equity design of participative loans may shape firm responses, limiting external validity. Finally, our data do not include firm-level information on investment allocation, so we cannot directly observe whether the capital injection is directed towards equipment, R&D or workforce restructuring. The mechanisms behind the turnover–employment divergence remain inferred from aggregate outcomes rather than observed at the firm level.

Several avenues for future research emerge from these limitations. If ENISA's evaluation scores were made available to researchers, a regression discontinuity design at the approval threshold would enable estimation of the causal effect of receiving versus not receiving the loan (Dutta *et al.*, 2022). The broader call for open evaluation strategies in public entrepreneurial finance (Ratinho *et al.*, 2020) reinforces the value of this approach. Extending the DiD framework to accommodate continuous treatment intensity would enable identification of the marginal return per euro of public support, building on the cost-effectiveness estimates of Bertoni *et al.* (2019). ENISA's (Scale-Up) funding line, which

targets more mature firms, offers a natural complement to our analysis. Given that employment growth in SC Traded Services is concentrated in mature firms rather than new entrants (Delgado *et al.*, 2020), the returns to public support may differ substantially across firm stages. Similarly, ENISA's "Women Entrepreneurs" line provides a setting in which to examine whether gender-focused programmes interact with the SC/B2C dimension.

Cross-country comparisons with analogous instruments such as Bpifrance, the British Business Bank, KfW or public loan guarantees (Bertoni *et al.*, 2023) would clarify the external validity of our findings and disentangle the role of programme design from country-specific institutional features. Finally, combining the SC/B2C taxonomy with complementary classifications based on technological or knowledge intensity (Mulier and Samarín, 2021) and incorporating firm-level data on investment, patents and human capital would help identify the specific mechanisms through which participative loans translate into differential growth across industry types.

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