



## The Effect of Different Sources of Funding on Firm Performance: Evidence From Chile

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### Abstract

This study analyses the impact of different funding sources—public and private—on firm’s sales performance, labor productivity, and capital productivity of Chilean firms. We use data from the Chilean Longitudinal Survey of Firms (2013–2019), fixed-effects econometric models were employed for their robust fit and reliability. The findings show that funding through capital and bond issuance positively influences all three performance measures, while supplier credit, non-bank funding, and public funding enhance sales and labor productivity but not capital productivity. Firm characteristics, including age, industrial sector, group affiliation, and export activity, also significantly affect performance, with export activity negatively impacting capital productivity. This research makes a unique contribution by disaggregating funding into distinct categories and addressing a notable gap in Latin American studies, offering detailed insights into the funding-performance relationship in this regional context.

**Keywords:** funding, performance, sales, labor productivity, capital productivity.

**JEL codes:** D24, G21, G32.

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# 1. Introduction

Corporate funding decisions are critical in determining business performance (Kim and Cho, 2020). These decisions typically rely on funding from either public or private sources. In Chile, public funding predominantly takes the form of subsidies awarded through competitive evaluations of firm proposals (Mardones and Zapata, 2018). Private funding, in contrast, encompasses a broader range of sources, including commercial banks, internally generated funds, supplier credit lines, and alternative financing mechanisms.

In this paper, public funding is defined as financial resources provided by the State through specific programs. Private funding, in contrast, encompasses funds from banks, suppliers, firm-owned resources, investors, retail sources, angel investors, bonds, non-banking institutions, and informal channels.

Small businesses, which often face significant funding constraints, struggle to meet their investment needs through internal funds alone (Nguyen, 2020). In response, some countries have introduced government-backed risk capital programs to address this gap. For example, Italy has implemented such programs to support high-potential small firms that are underserved by private banks (Minola et al., 2017).

The persistent challenges in funding and the ongoing interest in understanding its business implications motivate a deeper analysis of how funding sources impact firm performance. This paper addresses a central question: What is the impact of funding sources on the performance of firms in Chile? We assess performance through three indicators: sales, labor productivity, and capital productivity. To answer this question, we propose ten hypotheses, detailed in Section 2.

Although previous research has examined innovation and funding (Busom and Vélez-Ospina, 2021; Kapidani and Luci, 2019), financial decisions and small business growth (Bui et al., 2021; Zada et al., 2021), and external funding and investment performance (Guo et al., 2022; Nguyen, 2020), few studies have explored how diverse funding sources impact Chilean firms specifically. This research addresses this gap by providing detailed insights into the relationship between public and private funding sources and firm performance.

Empirical evidence highlights the use of linear regression models to evaluate performance in contexts such as participatory loans (Bertoni et al., 2019) and fixed effects models to analyze investment effects (Nguyen, 2020). Some studies compare pooled linear regressions with fixed effects models to evaluate financial restrictions and financial ratios (Lin et al., 2020). Recent contributions show that the traditional empirical approach that focuses on the average firm effect has yielded mostly inconclusive results (Santi and Santoleri, 2017). In order to verify this claim and to examine a longer time span, we contrast the results of growth model with level models already mentioned.

We use data from the Chilean Longitudinal Survey Firms (ELE, for its acronym in Spanish), published by Ministry of Economy, Development, and Tourism. This database spans four waves (2013 – 2019) and provides comprehensive insights into funding sources accessible to Chilean firms.

This study addresses an unexplored area in the literature by simultaneously examining three distinct performance dimensions (sales level, labor productivity, and capital productivity) in relation to a detailed disaggregation of funding sources. Existing research typically aggregates funding into broad categories (internal vs. external, public vs. private, formal vs. informal). We distinguish between banking, non-banking institutions, retail, informal sources, own funding, supplier credit, public subsidies, capital investors, bond issuance, and angel investors. This disaggregation enables us to identify which funding mechanisms drive each performance dimension, moving beyond the classifications that have dominated prior literature and revealing nuanced relationships that remain obscured in aggregated analyses. Additionally, we incorporate five firm characteristics as control variables: age, size, industrial sector, economic group membership, and export activity. These factors allow for a more nuanced contribution to the literature.

When comparing our results with previous studies, we observe several parallels (Wu et al., 2022; Wang and Xu, 2022; Kim and Cho, 2020). Specifically, sales revenue and labor productivity are significantly and positively influenced by supplier funding, capital, bond issuance, and non-bank funding. Similarly, capital productivity shows significant positive responses to funding from capital and bond issuance.

The remainder of the article is structured as follows: Section 2 reviews relevant literature, Section 3 describes the data and variables, Section 4 outlines the empirical models and results, Section 5 discusses findings and implications, and Section 6 concludes.

## 2. Literature Review

### 2.1. Literature Review

Numerous studies investigate how funding affects business performance (Bertoni et al., 2019; Hottenrott and Richstein, 2020; Howell, 2019; Herianingrum et al., 2019; Nguyen, 2020). Some focus on sales growth as a performance metric (Santi and Santoleri, 2017; Kim and Cho, 2020), while others examine the role of funding in research, development, and innovation (Huergo and Moreno, 2017; Mardones and Zapata, 2018). Bravo-Ortega et al. (2023) extend this analysis to include labor productivity, emphasizing its connection to managerial and firm characteristics.

Funding sources vary widely. For example, Nguyen (2020) examines the impact of internal, external, formal, and informal funding on Vietnamese small businesses, identifying local institutions and external funding as key determinants of investment. Similarly, Bertoni et al. (2019) find that public funding programs enhance entrepreneurial activities, while Yuan et al. (2021) show that credit card access improves survival probabilities for small Chinese businesses. Angel investors also play a pivotal role in supporting startups, particularly in their early stages (Capizzi et al., 2021; Croce et al., 2018).

The methodologies employed to assess the impact of funding on business outcomes vary in both approach and focus. Jin et al. (2024), using a fixed effects model, it is found that the degree of digital funding of a firm has a positive and significant impact on total factor productivity of Chinese manufacturing companies. Huergo and Moreno (2017) analyzed the likelihood of Spanish firms engaging in research and development activities when supported by low-interest state loans and national or European subsidies. Their findings indicate that European subsidies had a more substantial impact than loans and subsidies from the Spanish government. Similarly, Bertoni et al. (2019) applied a growth model and determined that government participatory loans significantly contributed to increases in sales and employment among Spanish entrepreneurs, with the most pronounced effects observed in small, young high-tech firms. Similarly, government subsidies increase R&D activities among Chinese SMEs (Sun et al., 2023).

Previous studies in the field of finance offer valuable insights that inform our research question and the results obtained. For instance, Kim and Cho (2020) utilize a structural equation model to explore the relationship between financial resources and firm performance. Their findings indicate that internal finance and institutional finance positively impact the performance of Korean small and medium-sized enterprises (SMEs), while other forms of capital exhibit a negative effect. Serrasqueiro et al. (2023) demonstrate that in the absence of internal funding, external debt increases the growth of Portuguese SMEs. Similarly, Nguyen (2020) examines the influence of external private funding (both formal and informal) on the performance of small businesses in Vietnam. Using fixed effects modeling, the study reveals a complex interaction between institutional environments and external funding, highlighting that the impact of external funding on business investment can vary significantly across different institutional settings. These findings underscore the interconnected nature of external funding and the broader institutional context.

Recent studies concerning Latin America have shed light on various aspects of funding, particularly focusing on public funding for micro, small, and medium-sized enterprises (Durango-Gutiérrez et al., 2021). For instance, Fernandez (2017) identifies financial constraints, funding sources, and firm characteristics as the key drivers of innovation across Latin American countries. Meanwhile, Durango-Gutiérrez et al. (2021) analyze factors influencing the likelihood of loan defaults among microenterprises in Bolivia and Colombia. Their findings highlight that variables such as loan amount, frequency of late payments, guarantees provided, and the borrower's gender (male) play significant roles in default probabilities.

In Chile, studies have explored the relationship between public funding and business performance. Research by Martínez et al. (2018) and Navarro (2018) underscores the impact of public funding on various outcomes. Mardones and Zapata (2018) argue for revised and explicit criteria in allocating these funds, emphasizing the need to prioritize small and medium-sized enterprises that face greater financial constraints. Martínez et al. (2018), using data from a public microenterprise program, conclude that public support enhances business practices, employment levels, and labor income. Similarly, Navarro (2018) finds that firms subsidized through Capital Semilla (CORFO) exhibit a higher likelihood of significant sales growth, with a comparable positive impact on business survival rates. Unlike research in developed countries, there remains a significant gap in studies focused on developing nations. A key limitation is the scarcity of data and the relatively early stage of public R&D, innovation, and entrepreneurship programs, which restrict the development of a more robust empirical foundation (Parada and Catalán, 2020). Moreover, most research in these regions centers on public support programs (Akcigit et al., 2024) and their relationship with business activity (for example, innovation and business performance and productivity), leaving aside private funding.

Previous studies (Kim and Cho, 2020) have identified a positive relationship between equity funding and bank funding on firm performance. Moreover, Nguyen (2020) research reports that informal funding has a positive and significant impact on increasing investments in firms. Complementary to the above, the availability of informal financial markets helps reduce the impact of legal barriers on firm growth (Bui et al., 2021).

Given that bank debt is the main source of funding for small and medium-sized enterprises, public policies seek to improve access to credit by focusing on bank loans (Akcigit et al., 2024). Oh and Hwang (2024), using weighting methods to eliminate selection bias, show that public support for R&D in Korean manufacturing firms significantly improves sales and employment.

The literature on business funding and its impact on firm performance provides diverse methodologies and findings across different contexts. Table 1 highlights key studies conducted in Latin America, including Chile, which predominantly focus on public funding and its implications for innovation, business growth, and performance.

Table 1: Summary of business funding and main findings in Latin America and Chile

Authors (year)	Method	Explained variable	Explanatory variables	Country	Main findings
Santi and Santoleri (2017)	Quantile regression	Sales growth.	Innovation in product and process.	Chile	A positive relationship between process innovation and firm growth.
Fernandez (2017)	Logistic regression	Innovation rate.	Funding.	Latin America	Financial limitations, funding sources, and firm characteristics are the main drivers of innovation.
Martínez et al. (2018)	Experimental design	Employment rate.	Public support + public funding.	Chile	Chile Public support improves business practices and employment, among others.
Navarro (2018)	Probabilistic model	Probability of starting, growing, and surviving.	Age of the firm + industrial sector.	Chile	A positive association between projects that received subsidies and starting to sell.
Mardones and Zapata (2018)	Binary choice model	Probability of obtaining funding for innovation activities.	Public funding + expenses + number of workers + industrial sector + others.	Chile	Firms that invest in training their workers in R&D activities are less likely to obtain public funding.
Parada and Catalán (2020)	Fixed effects model and regression equations	Performance (sales, employment, productivity, and Capital).	Public funding + region + industrial sector + others.	Chile	Firms that receive public funding (CORFO) reveal an effect based on experience.
Durango-Gutiérrez et al. (2021)	Logistic regression	Probability of default.	Loan amount + sex + analyst assessment + others.	Bolivia and Colombia	The risk of non-payment for microcredits is greater when the amount lent is greater.

Source: Own elaboration based on references therein.

Expanding the scope, Table 2 presents similar research conducted in Europe, Asia, Africa, and North America. These studies shed light on various funding mechanisms and their outcomes. For instance, Huergo and Moreno (2017) and Bertoni et al. (2019) reveal the significant role of European subsidies and participatory loans in fostering R&D and business growth in Spain. Similarly, Croce et al. (2018) and Hottenrott and Richstein (2020) focus on the effectiveness of angel investors and grants in early-stage investments and R&D funding, respectively. In developing regions, studies like Mawejje and Sebudde (2019) and Nguyen (2020) emphasize the influence of macroeconomic environments and social networks on firm performance.

These tables collectively illustrate the diversity in funding sources, methods, and outcomes across regions, with Latin American research often emphasizing public funding, while studies from other regions explore broader mechanisms such as angel investments, social capital, and targeted monetary policies. This contextual diversity underpins the need for further research into how specific funding sources impact firm performance, particularly in underexplored contexts such as Chile.

Table 2: Summary of business funding and main findings in Europe, Asia, Africa, and North America

Authors (year)	Method	Explained variable	Explanatory variables	Country	Main findings
Huergo and Moreno (2017)	Treatment effect model.	Probability of developing R&D.	Support programs and European subsidies.	Spain	State loans and European subsidies positively affect R&D development.
Croce et al. (2018)	Linear regression model.	Investment amount.	Number of investors and stage of the firm.	USA	The experience of angel investors is positively associated with investments in the early stages of the business.
Bertoni et al. (2019)	Linear regression model.	Growth in employment and sales.	Investment amount, age of the firm and industrial sector.	Spain	Public funding positively affects business growth for business development.
Hottenrott and Richstein (2020)	Experimental design.	Investment in R&D and employment.	Grants and loans.	Germany	Grants are more suitable than loans for increasing R&D investments.
Howell (2019)	Probit model.	Probability of creating a business.	Funding sources and characteristics of the head of household.	China	Han households tend to rely more on formal initial funding.
Herianingrum et al. (2019)	Vector automatic regression (VAR) model.	Long-term business trend.	Funding of the Islamic Bank.	Indonesia	Existence of a long-term relationship between bank funding and business trends.
Kim and Cho (2020)	Structural equation model.	Performance, efficiency, growth.	Internal, external and institutional funding.	Korea	The positive relationship between capital funding and firm performance.
Nguyen (2020)	Fixed effects model.	Investment.	Funding and firm characteristics.		Social networks improve the relationship between informal finance and firm investments.
Lin et al. (2020)	Fixed effects model.	Cash flow sensitivity.	Monetary policy and firm characteristics.	China	A flexible and targeted monetary policy significantly reduces the financial constraints of small businesses.
Yuan et al. (2021)	Probit model.	Survival probability.	Characteristics of the respondent (age, education, among others).	China	Access and use of credit cards improve the probability of survival.
Jin et al. (2024)	Fixed effects model.	Total factor productivity.	Financial ratios and firm characteristics.	China	Digital funding increases total factor productivity.

Source: Own elaboration based on references therein.

## 2.2. Theoretical Framework

The evolution of corporate capital structure is characterized by two fundamental and significant approaches. First, the Pecking Order Theory (POT), whereby firms follow a specific preference order when funding their

operations or undertaking new investments (Myers and Majluf, 1984). Preferably, they initiate investments with internal funds. When internal resources are insufficient, firms resort to debt as their second option, with equity issuance being the least preferred alternative. Second, the Trade-Off Theory (TOT) posits that there exists an optimal debt level that maximizes firm value (Kraus and Litztenberger, 1973). However, economic conditions affect both models. Thus, de Souza et al. (2024) study demonstrates that POT is more prevalent than TOT among Brazilian publicly-traded firms during the COVID-19 pandemic period. Beyond the economic context, a firm's leverage level also affects these theories. Accordingly, TOT performs better for firms with low leverage levels, whereas POT performs better for private firms with high leverage levels (Voutsinas and Werner, 2025).

On the credit supply side, the convergence of Financial Development and Economic Growth Theory (King and Levine, 1993) with Financial Constraints Theory (FCT) (Fazzari et al., 1988) suggests that financial development not only stimulates economic growth but also mitigates the financial constraints firms face. Empirical results show that local financial development and the business environment interact positively in their effects on firm growth (Haschka et al., 2022). However, short- and long-term credit constraints reduce the likelihood of high-growth firms emerging (Nlemvo and Bouslama, 2025). Meanwhile, Ngo and Nguyen (2022) argue that a well-developed financial system alleviates credit constraints for firms.

The rationale for state intervention to stabilize financial markets and promote business performance is grounded in the Theory of Market Failures and Government Intervention (Stiglitz and Weiss, 1981), which argues that financial markets are imperfect due to information asymmetries between lenders and borrowers. In this context, the European Union has increasingly employed market-based approaches and policy outsourcing to the private sector to achieve its objectives of integration, financial stability, and business growth (Mortágua and Solipa, 2022). For instance, Schmidt (2023) demonstrates how public support instruments, through blended finance mechanisms, can enhance the effectiveness of investment social impact.

Agency conflicts grounded in Jensen and Meckling's (1979) Agency Theory, along with information asymmetry challenges posed by Signaling Theory (Ross, 1977), are considered in corporate funding decisions and to some extent impact firm performance. Effects on performance measures vary depending on the funding source and firm characteristics (Bravo-Ortega et al., 2023; Yuan et al., 2021; Fan et al., 2023; Alvarez et al., 2023). Thus, Khémiri and Noubbigh (2020) findings reveal that small firms are more vulnerable to financial risk. Consequently, they must rely on internal funds to maximize their performance.

Consistent with the literature review and theoretical framework, there are arguments supporting why access to financial resources should flow internally or externally, depending on factors and characteristics inherent to the firm and financial markets. Most reviewed studies show a positive relationship between a given funding source and firm performance (e.g., Nguyen, 2020; Kim and Cho, 2020; Oh and Hwang, 2024). For instance, store credit cards, funding from non-bank institutions, internal firm funds, and formal and informal funding have positive and significant effects on sales and total factor productivity (Nguyen, 2020; Yuan et al., 2021). Similarly, Kim and Cho (2020) find that non-bank funding negatively impacts firm performance.

Given the above, the following hypotheses relating funding sources and firm performance are established; understanding firm performance as sales revenue, labor productivity, and capital productivity. Below, we develop our hypotheses through a review of the relevant literature.

Building on findings from Nguyen (2020); Kim and Cho (2020); Serrasqueiro et al. (2023) and Jin et al. (2024), we propose hypotheses **H1** and **H2**.

**H1:** The funding given by retail positively impacts the performance of the firm.

**H2:** Supplier funding positively affects firm performance.

Kim and Cho (2020) find that while some funding sources positively affect performance, others have detrimental effects. Accordingly, we define hypothesis **H3** as follows.

**H3:** Non-bank funding positively affects firm performance.

Hypotheses **H4** and **H5** address internal funding sources. Consistent with this focus, Fernandez (2017) finds that internal funding has a positive effect on firm performance.

**H4:** Capital funding positively impacts firm performance.

**H5:** Investor funding positively impacts firm performance.

Authors such as Croce et al. (2018) and Hottenrott and Richstein (2020) document the positive effects of angel investor funding on firm performance. Drawing on their findings, we define hypothesis **H6** as follows.

**H6:** Funding from angel investors positively impacts firm performance.

Public funding sources have been examined by several researchers (Martínez et al., 2018; Bertoni et al., 2019; Alvarez et al., 2023; Sun et al., 2023), all of whom document positive effects on firm performance. This evidence supports our formulation of hypothesis **H7**.

**H7:** State funding positively impacts firm performance.

Bond funding has received limited attention in the literature. Nevertheless, existing studies demonstrate positive effects on firm performance (Busom et al., 2017; Huergo and Moreno, 2017). This evidence supports the formulation of hypothesis **H8**.

**H8:** Funding that comes from bonds positively impacts the performance of the firm.

According to the Pecking Order Theory (Myers and Majluf, 1984), informal funding represents one of the last resort options for firms for small businesses. Nevertheless, these sources positively impact firm performance (Nguyen, 2020). Based on this evidence, we define hypothesis **H9** as follows.

**H9:** Informal funding positively impacts firm performance.

A substantial body of literature demonstrates the impact of firm characteristics on performance (Navarro, 2018; Bertoni et al., 2019; Lin et al., 2020; Jin et al., 2024). Based on this evidence, we define hypothesis **H10** as follows.

**H10:** Firm characteristics do have a significant effect on business performance.

In summary, this paper makes two significant contributions to the literature by addressing gaps that remain underexplored. First, it integrates the analysis of both private and public funding, examining their respective impacts on business performance. This approach acknowledges the diversity of funding sources available to firms, which vary significantly due to differences in corporate structures, sizes, liquidity levels, and management practices, among other factors. Second, it situates the research in a Latin American context, an area

with limited studies on this topic, providing valuable geographical insight and addressing unique regional dynamics that differ from those explored in the existing literature. The findings of this study hold practical relevance, serving as a reference for shaping public policies and guiding decision-making in the private sector, particularly within the financial industry.

### 3. Data Source and Descriptive Evidence

This study uses data from four waves of the Longitudinal Business Survey (ELE) conducted by Chile's Ministry of Economy in 2013, 2015, 2017, and 2019. The ELE survey includes formal businesses ranging from micro to large enterprises across various industrial sectors. Combining fixed and refreshed samples provides an unbalanced panel of 51,061 unique observation units over the four rounds. Specifically, the number of firms surveyed in 2013, 2015, 2017, and 2019 was 18,280, 21,823, 6,480, and 4,478, respectively. To assess the representativeness of firms comprising each panel round, an attrition analysis was conducted, revealing substantial and non-random attrition in the panel. Of the firms in Round 1 (2015), only 56.59% remained in Round 2 (2017, attrition rate: 43.41%), 26.52% of firms from Round 2 (2017) remained in Round 3 (2019; attrition: 73.48%), and 68.96% of firms from Round 3 (2019) remained in Round 4 (2022; attrition: 31.04%). Balance tests show that attrition is systematically related to funding sources. In summary, the results indicate that the sample is more representative of formal firms with greater financial access and underrepresents small or informal firms. This selection excludes firms that do not report sales revenue.

The survey's two key strengths lie in its comprehensive coverage of businesses of different sizes (Table 3) and its inclusion of all major industrial sectors (Ministerio de Economía, Fomento y Turismo de Chile, 2017): primary, industry, and tertiary (Table 4). We define the primary sector as that which includes agricultural activities, livestock farming, hunting, forestry, fishing, and mining. The industry sector includes metallic and non-metallic manufacturing industries, electricity, gas and water supply and construction. The tertiary sector includes wholesale and retail trade, hotels and restaurants, transportation, storage and communications, financial intermediation, real estate, business and rental activities, Public Administration and Defense, teaching, social and health services, other service activities, advice administration of buildings and condominiums, organizations and extraterritorial bodies. These features allow for a detailed exploration of the relationship between funding sources and firm performance, accounting for diverse firm characteristics.

Table 3: Distribution of firm sizes in each round (%)

Size of the firm	ELE 3 (2013)	ELE 4 (2015)	ELE 5 (2017)	ELE 6 (2019)
Micro	5.44	5.60	20.31	15.60
Small	18.20	30.05	26.72	25.83
Medium	14.94	14.41	14.11	15.61
Large	61.54	50.04	38.94	40.32
Sample size	35.80	42.74	12.69	8.77

Note: (a) One classification for firm sizes is by annual sales (in UF). Thus, Micro = Micro-enterprise (0 - 2,400 UF), Small = Small firm (2,400.01 - 25,000 UF), Medium = Medium-sized firm (25,000.01 - 100,000 UF), Large = Large firm (100,000 UF and more); (b) ELE 3 = Longitudinal Survey of Firms for period 1 (2013), For the rest of the ELE it is the same, referring to each period; (c) One development unit (UF), corresponds to 20,429.09 Chilean pesos for the base year 2008 (Source: Central Bank of Chile).

Table 4: Distribution of firm sizes by industrial sector (%)

Size of the firm	Primary Sector	Industry Sector	Tertiary Sector	Sample size
Micro	4.05	0.79	7.26	12.10 (6178)
Small	6.60	1.99	11.84	20.43 (10432)
Medium	4.63	2.37	9.26	16.26 (8303)
Large	19.65	5.35	26.21	51.21 (26148)
Sample size	34.93	10.51	54.56	100.00 (51061)

Note: (a) Numbers in parentheses are numbers of firms; (b) Primary sector = Agriculture, livestock, hunting, forestry, fishing and mining and quarrying; Industry Sector = Metallic and non-metallic manufacturing industries, electricity, gas and water supply, construction; Tertiary Sector = Wholesale and retail trade, hotels and restaurants, transportation, storage and communications, financial intermediation, real estate, business and rental activities, Public Administration and Defense, teaching, social and health services, other service activities, advice administration of buildings and condominiums, organizations and extraterritorial bodies.

Following Santi and Santoleri (2017), we measured the effect on the growth of Chilean firms using the difference between the logarithms of sales revenue between the last and first periods; thus, a single growth rate is obtained that covers all four periods (Table 5). Therefore, the growth rate is expressed as:

$$\Delta\text{Sales}_{i,t} = \frac{\ln(\text{Sales}_{i,t}) - \ln(\text{Sales}_{i,t-d})}{d}, \quad (1)$$

where,  $\Delta\text{Sales}_{i,t}$  is the growth rate of firm  $i$  at time  $t$ ,  $\text{Sales}_{i,t}$  is the sales revenue of firm  $i$  at time  $t$  and  $\text{Sales}_{i,t-d}$  are the sales revenue of the firm  $i$ ,  $d$  previous years. Sales growth rates are used because of growth in the following period.

Table 5: Data panel structure.

Year	Time	Growth <sub><math>t</math></sub>	Funding <sub><math>t-1</math></sub>
2013	$t = 1$	–	Fund <sub>1</sub>
2015	$t = 1$	$\Delta\text{Sales}_{i,2}$	Fund <sub>2</sub>
2017	$t = 3$	$\Delta\text{Sales}_{i,3}$	Fund <sub>3</sub>
2019	$t = 4$	$\Delta\text{Sales}_{i,4}$	–

Note:  $t_1 = \text{Period 1}$ , which corresponds to the year 2013,  $\text{Growth}_1 = \text{Sales growth between 2013 and 2009}$ ,  $\text{Fund}_1 = \text{Funding in period 1}$ , which corresponds to the year 2013.

### 3.1. Funding Variables

Firms can access various sources of funding, as identified in the ELE 2013, which originally included 12 categories. However, this study narrows the scope to ten funding sources due to changes in subsequent rounds of the survey. Specifically, we include bank funding, non-bank funding, equity, informal sources, public and retail funding, supplier credit, venture capital, angel investments, and bonds. Sources such as, funding from stockbrokers is omitted after 2013, while capital raising and capital funding are combined into a single category in later rounds. Additionally, funding from microfinance institutions appears only in the 2015, 2017, and 2019 rounds. Each funding type, such as lines of credit, consumer credit, leasing, and factoring, is detailed within the survey forms.

Table 6: Variable definitions

Variable	Definition
<b>Dependent variables</b>	<b>Firm performance</b>
Sales	Sales income of the firm, with base year 2013 (in logs)
Labor Productivity	Sales/workers = productivity of sales by workers.
Capital Productivity	Sales/capital stock = Productivity of sales by capital stock.
<b>i) Explanatory variables</b>	
Bank	Funding from bank loans (line of credit, consumer loans, leasing, factoring, among other things)
Retail	Funding from retail (advance in installments)
Supplier	The funding consists of a line of credit granted by suppliers for the early delivery of their merchandise or supplies.
No Bank	Funding comes from financial institutions other than banks, such as finance firms (factoring, credit, leasing, among others)
Capital	The source of funding is with resources that the owners of the firm have. For example, capital increase.
Investors	The source of funding is the capital contribution of investors.
Angel	The source of funding comes from people or entities that have an interest in promoting business initiatives.
State	Funding is with contributions from the State, through different instruments.
Bond	The firm finances its activities with debt issuance.
Informal	The firm finances its activities with the capital contribution made by its friends, and relatives, among others.
<b>ii) Control variables</b>	
Age	Age of the Firm (log)
Micro	The size of the firm corresponds to a micro business.
Small	The size of the firm corresponds to a small business.
Medium	The size of the firm corresponds to a medium-sized firm.
Large	The size of the firm corresponds to a large firm.
Primary	The firm is inserted in the primary sector (Agriculture, livestock, hunting, forestry, fishing and mining and quarrying)
Industry	The firm is inserted in the industrial sector (metallic and non-metallic manufacturing industries, electricity, gas and water supply, and construction)
Tertiary	The firm is inserted in the tertiary sector (wholesale and retail trade, hotels and restaurants, transportation, storage and communications, financial intermediation, real estate, business and rental activities, Public Administration and Defense, teaching, social and health services, other service activities, board of directors of buildings and condominiums, extraterritorial organizations and bodies)
Group	The firm is part of an economic group.
Exportation	The firm develops export activities.
D (2013)	Period 1 corresponding to the year 2013
D (2015)	Period 2 corresponding to the year 2015
D (2017)	Period 3 corresponding to the year 2017
D (2019)	Period 4 corresponding to the year 2019

*Note: The definitions of variables are from the Longitudinal Survey of Chilean Firms (INE).*

The selection of financial variables aligns with previous research. For instance, Martínez et al. (2018) demonstrate that public funding significantly boosts employment and income in the short and medium term. Similarly, Navarro (2018) highlight that state subsidies for participatory projects significantly increase the likelihood of small businesses initiating sales. Other studies emphasize the impact of funding on specific business activities: Fernandez (2017) identifies its role in fostering innovation, while Nguyen (2020) links it to increased investments.

Formal and informal funding sources also play a vital role. Yuan et al. (2021) report that both forms significantly contribute to the growth and survival of small businesses in China. Kim and Cho (2020) expand this by exploring internal, institutional, and non-institutional funding, as well as retail funding, finding significant effects on firm performance. In less conventional domains, Croce et al. (2018) show that angel investors provide critical early-stage funding for North American startups.

Table 6 outlines the explanatory variables for funding as specified in the structure of the Longitudinal Business Survey databases.

Large firms absorb the majority of funding, accounting for 44.3% of total funding across the four size categories (Table 7). Banks (16.9%), own resources (12.5%), and suppliers (10.9%) are the primary sources for large firms. In contrast, microenterprises receive the smallest proportions: 5.2% from banks, 4.6% from their own resources, and 3.0% from suppliers. Overall, the most significant sources of funding are bank loans (38.5%), own resources (28.5%), and supplier credit (23.7%).

Table 7: Distribution of funding and firm size (%)

Type of Funding	Micro	Small	Medium	Large	Total
Banking	5.2	10.1	6.3	16.9	<b>38.5</b>
Retail	0.3	0.2	0.1	0.2	<b>0.8</b>
Suppliers	3.0	5.9	3.9	10.9	<b>23.7</b>
Non-banking	0.8	1.5	1.0	2.9	<b>6.2</b>
Own resources	4.6	7.5	3.9	12.5	<b>28.5</b>
Risk capital	0.0	0.0	0.0	0.1	<b>0.1</b>
Angel investors	0.0	0.0	0.0	0.0	<b>0.0</b>
State	0.1	0.3	0.1	0.3	<b>0.8</b>
Bond	0.0	0.1	0.1	0.3	<b>0.5</b>
Informal	0.2	0.4	0.1	0.2	<b>0.9</b>
<b>Total</b>	<b>14.2</b>	<b>26.0</b>	<b>15.5</b>	<b>44.3</b>	<b>100.0</b>

*Note: (a) One classification for firm sizes is by annual sales (in UF). Thus, Micro = Micro-enterprise (0 - 2,400 UF), Small = Small firm (2,400.01 - 25,000 UF), Medium = Medium-sized firm (25,000.01 - 100,000 UF), Large = Large firm (100,000 UF and more); (b) ELE 3 = Longitudinal Survey of Firms for period 1 (2013), For the rest of the ELE it is the same, referring to each period; (c) One development unit (UF), corresponds to 20,429.09 Chilean pesos for the base year 2008 (Source: Central Bank of Chile). Firms from period 1 (2013), for the rest of the ELE it is the same, referring to each period; (c) One development unit (UF), corresponds to 20,429.09 Chilean pesos for the base year 2008 (Source: Central Bank of Chile).*

### 3.2. Control Variables

We assume that the type of funding alone does not directly influence a firm's growth. To effectively analyze the impact of funding on growth, it is essential to include control variables that may significantly affect this relationship.

One key control variable is the logarithm of the firm's age, which has been shown in previous studies to significantly explain investment patterns in small businesses (Nguyen, 2020; Bertoni et al., 2019; Sauer and Wiesemeyer, 2018; Yuan et al., 2021). Additionally, firm size is an important factor. It is categorized into micro, small, medium, and large enterprises, as this classification has demonstrated a notable effect on firm performance (Mawejje and Sebudde, 2019).

Another critical factor is the industrial sector. Specifically, the tertiary sector, which includes technology, communications, and services, has been highlighted in prior research (Bertoni et al., 2019). In this study, the original 18 industrial sectors are grouped into three categories: primary, industrial, and tertiary (Ministerio de Economía, Fomento y Turismo de Chile, 2014). Membership in a business group (Group) is also considered, as it can enhance strategic decision-making and drive significant sales growth. Similarly, the export vari-

able reflects firms engaged in international markets, where higher sales volumes typically lead to improved performance. Table 8 shows the summary statistics for each variable.

Table 8: Description of variables and basic statistics

Variable	Description	Mean	SD	Min.	Max.
<b>Dependent variables</b>					
Sales	= Sales income of the firm, in pesos of 2013 (in logs).	7.33	7.35	0	26.87
Labor Productivity	= Sales/workers = productivity of sales by workers.	69,456	3,578	0	705,864
Capital Productivity	= Sales/capital stock = Productivity of sales by capital stock.	351,708	79,342	0	179,300
<b>i) Explanatory variables</b>					
Bank (baseline)	= 1 if the firm had bank funding (0/1)	0.28	0.45	0	1
Retail	= 1 if the firm was financed with retail (0/1)	0.00	0.08	0	1
Supplier	= 1 if the firm was financed with suppliers (0/1)	0.19	0.39	0	1
No Bank	= 1 if the firm was financed by non-banking institutions (0/1)	0.05	0.22	0	1
Capital	= 1 if the firm was financed with its resources (0/1)	0.25	0.44	0	1
Investors	= 1 if the firm was financed with venture capital (0/1)	0.00	0.03	0	1
Angel	= 1 if the firm was financed with angel investors (0/1)	0.00	0.02	0	1
State	= 1 if the firm obtained funding from the State (0/1)	0.01	0.07	0	1
Bond	= 1 if the firm issued bonds to finance itself (0/1)	0.00	0.05	0	1
Informal	= 1 if the firms accessed non-formal funding (0/1)	0.01	0.09	0	1
<b>ii) Control variables</b>					
Age	: Age of the firm (log)	1.75	1.42	0	5.26
Micro	= 1 if it is a microenterprise (0/1)	0.05	0.23	0	1
Small	= 1 if it is a small business (0/1)	0.13	0.33	0	1
Medium	= 1 if it is a medium-sized firm (0/1)	0.07	0.26	0	1
Large (baseline)	= 1 if it is a large firm (0/1)	0.23	0.42	0	1
Primary	= 1 if the firm belongs to the primary sector (0/1)	0.12	0.32	0	1
Industry	= 1 if the firm belongs to the industry sector (0/1)	0.05	0.21	0	1
Tertiary (baseline)	= 1 if the firm belongs to the tertiary sector (0/1)	0.29	0.45	0	1
Group	= 1 if the firm is part of an economic group (0/1)	0.15	0.36	0	1
Exportation	= 1 if the firm develops export activities (0/1)	0.06	0.24	0	1
D (2013) (baseline)	= 1 if the observation corresponds to period 1 (0/1)	0.40	0.49	0	1
D (2015)	= 1 if the observation corresponds to period 2 (0/1)	0.25	0.43	0	1
D (2017)	= 1 if the observation corresponds to period 3 (0/1)	0.35	0.40	0	1
D (2019)	= 1 if the observation corresponds to period 4 (0/1)	0.27	0.43	0	1
Sample size	= 51,061				

*Note: Primary sector = Agriculture, livestock, hunting, forestry, fishing and mining and quarrying; Industry Sector = Metallic and non-metallic manufacturing industries, electricity, gas and water supply, construction; Tertiary Sector = Wholesale and retail trade, hotels and restaurants, transportation, storage and communications, financial intermediation, real estate, business and rental activities, Public Administration and Defense, teaching, social and health services, other service activities, advice administration of buildings and condominiums, organizations and extraterritorial bodies.*

## 4. Empirical Model

To analyze the data, this study employs a growth model and three additional regression models, described in subsequent sections. To address potential endogeneity and ensure robustness, the Generalized Method of Moments (GMM) is applied.

### 4.1. Growth model

The growth model assesses the effect of funding on each dependent variable: sales, labor productivity, and capital productivity. Growth rates for sales revenue are calculated using equation (1), while equations (2) and (3) are used to estimate growth rates for labor and capital productivity, respectively:

$$\Delta LP_{i,t} = \frac{\ln(LP_{i,t}) - \ln(LP_{i,t-d})}{d}, \quad (2)$$

$$\Delta KP_{i,t} = \frac{\ln(KP_{i,t}) - \ln(KP_{i,t-d})}{d}, \quad (3)$$

where,  $\Delta LP_{i,t}$ , is the growth rate of labor productivity of firm  $i$  in time  $t$ ,  $LP_{i,t}$  is the labor productivity of firm  $i$  in time  $t$  and  $LP_{i,t-d}$  is the labor productivity of the firm  $i$ ,  $d$  previous years. Similarly,  $\Delta KP_{i,t}$ , is the growth rate of capital productivity of firm  $i$  at time  $t$ ,  $KP_{i,t}$  is the capital productivity of firm  $i$  at time  $t$  and  $KP_{i,t-d}$  is the capital productivity of the firm  $i$ ,  $d$  previous years.

Each growth measure serves as a dependent variable in the following linear regression models:

$$\Delta S_{i,t} = \alpha_1 + \beta_1 \text{Sales}_{i,t-1} + \gamma_1 \mathbf{Fund}_{i,t-1} + \delta_1 \mathbf{X}_{i,t-1} + u_{i,t}, \quad (4)$$

$$\Delta LP_{i,t} = \alpha_2 + \beta_2 LP_{i,t-1} + \gamma_2 \mathbf{Fund}_{i,t-1} + \delta_2 \mathbf{X}_{i,t-1} + v_{i,t}, \quad (5)$$

$$\Delta KP_{i,t} = \alpha_3 + \beta_3 KP_{i,t-1} + \gamma_3 \mathbf{Fund}_{i,t-1} + \delta_3 \mathbf{X}_{i,t-1} + w_{i,t}, \quad (6)$$

Consistent with Santi and Santoleri (2017), we assume that there is a lag in the growth response due to the introduction of innovations, we consider that, in our research, the same occurs with funding and the rest of the explanatory variables. Therefore, funding and other variables are in terms of the previous period  $t - 1$ . Thus,  $\mathbf{Fund}_{i,t-1}$  is a vector of binary variables that indicates whether firm  $i$  in period  $t-1$  received (1) or not (0) a type of funding, within which the ten funding categories already explained in Table 6 are included. For its part,  $\mathbf{X}_{i,t-1}$  represents the vector of control variables of the firm  $i$  during period  $t - 1$ , which includes: the level of employment of the firm, the age of the firm, the size of firms determined according to the level of sales (micro, small, medium, and large), denoted respectively by  $\text{Micro}_{t-1}$ ,  $\text{Small}_{t-1}$ ,  $\text{Medium}_{t-1}$  and  $\text{Large}_{t-1}$ . In addition, the vector  $\mathbf{X}_{i,t-1}$  contains the variables corresponding to the primary, industrial, and tertiary industrial sectors. ( $\text{Primary}_{t-1}$ ,  $\text{Industry}_{t-1}$  and  $\text{Tertiary}_{t-1}$ , respectively). Finally, the variables  $\text{Group}_{t-1}$  and  $\text{Export}_{t-1}$  have been added, which indicates whether the firm is in a business group (1) or not (0) and if the firm exports (1) or not (0), respectively.

### 4.2. Pooled Linear Regression Model

The pooled linear regression model is expressed as follows:

$$\log(\text{Sales}_{i,t}) = \beta_1 + \beta_2 \mathbf{Fund}_{i,t} + \vec{\lambda} \mathbf{X}_{i,t} + \sum_t^T \delta^t \psi(T = t) + u_{i,t}, \quad (7)$$

where  $\text{Sales}_{i,t}$  represents the sales income (in Chilean pesos for the year 2013) of the firm  $i$  in period  $t$ ,  $\psi(T = t)$  is an indicative variable that takes the value 1, if  $T = t$ . The rest of the variables are the same as presented in Equation 1 of the growth model.

Since longitudinal models are linear regression models, they must meet the assumptions of normality. Therefore, we apply the logarithm function to provide the fit of our data towards a normal distribution.

The observable units in each of the four rounds are firms and these are identified by their size (microenterprise, small firm, medium-sized firm, and large firm). In turn, the size of a firm is determined by the annual sales revenue (Ministerio de Economía, Fomento y Turismo de Chile, 2017).

### 4.3. Fixed Effects (FE) Model

A first comparison of results is carried out with a fixed effects model. In the fixed effects model, the slopes (coefficient of each independent variable) are constant and the intercept varies for each observation (firm). The term fixed effects is because, although each intercept may vary for each firm, each intercept is time-invariant. Thus, our empirical model is expressed in the following equation:

$$\log(\text{Sales}_{i,t}) = \alpha_i + \beta_2 \mathbf{Fund}_{i,t} + \vec{\lambda} \mathbf{X}_{i,t} + \varepsilon_{i,t}, \quad (8)$$

where the dependent variable is the performance of the firm, measured by the logarithm of sales revenue.  $\mathbf{Fund}_{i,t}$  is the vector that includes all funding categories (specified in Table 8) and  $\mathbf{X}_{i,t}$  corresponds to the vector that contains the control variables, in this case, the characteristics of the firm and  $\alpha_i$  is the individual effect of each firm and is constant over time.

### 4.4. Random Effects (RE) Model

To compare the results of our research, the random effects model will be used. For this, the following specification is given:

$$\log(\text{Sales}_{i,t}) = \beta_1 + \beta_2 \mathbf{Fund}_{i,t} + \vec{\lambda} \mathbf{X}_{i,t} + a_i + u_{i,t}, \quad (9)$$

where  $a_i$  is the individual-specific error component and  $u_{i,t}$  is the random error combining the time series and the cross-sectional component and the explanatory variables are the same as those specified in the fixed effects model.

The explanatory variables used to measure the effects on labor productivity and capital productivity remain consistent across the three-level models (pooled linear regression, fixed effects, and random effects).

## 5. Empirical Results

The analysis uses widely recommended methodologies for panel data (Nguyen, 2020; Lin et al., 2020; Parada and Catalán, 2020), including the fixed effects model and the Generalized Method of Moments (GMM) technique. The Hausman test confirms the superiority of the fixed effects model ( $p$ -value = 0.000). The results are presented for three performance measures: sales, labor productivity, and capital productivity.

## 5.1. Effect of Funding on Sales

Table 9: Regression models for sales.

Variable	Model 1	Model 2	Model 3	Model 4	GMM
Sales <sub>t-1</sub>	0.022 (0.029)	—	—	—	—
Retail	0.065 (0.341)	0.251*** (0.099)	-0.004 (0.102)	0.122 (0.085)	-0.068 (0.142)
Supplier	0.178** (0.071)	0.9519*** (0.024)	0.404*** (0.021)	0.891*** (0.018)	0.085** (0.043)
No Bank	-0.270** (0.115)	0.712*** (0.041)	0.267*** (0.034)	0.558*** (0.030)	0.106* (0.057)
Capital	-0.013 (0.070)	0.1553*** (0.022)	0.546*** (0.019)	1.065*** (0.016)	-0.033 (0.062)
Investors	-0.791 (1.023)	0.457* (0.269)	-0.053 (0.229)	0.252 (0.206)	-0.152 (0.199)
Angel	0.239*** (0.016)	0.029 (0.847)	0.304 (0.473)	0.764* (0.468)	-0.576 (0.572)
Estate	-0.277 (0.331)	0.200* (0.114)	0.159* (0.097)	0.279*** (0.087)	0.119 (0.131)
Bond	0.320 (0.381)	0.513*** (0.175)	0.472*** (0.111)	0.742*** (0.107)	0.388** (0.187)
Informal	0.594** (0.252)	0.204** (0.088)	0.079 (0.090)	0.248*** (0.075)	-0.008 (0.116)
Age	0.091 (0.062)	0.081*** (0.017)	0.068*** (0.016)	0.142*** (0.008)	0.064 (0.066)
Micro	0.440*** (0.197)	0.228*** (0.037)	-0.395*** (0.037)	0.732*** (0.028)	-0.455*** (0.145)
Small	0.176 (0.141)	-0.209*** (0.0253)	-0.686*** (0.026)	0.113*** (0.021)	-0.348** (0.141)
Medium	-0.079 (0.115)	0.605*** (0.036)	-0.106*** (0.032)	0.764*** (0.027)	-0.197* (0.114)
Primary	-0.049 (0.093)	0.363*** (0.031)	0.123*** (0.026)	0.415*** (0.023)	0.158 (0.110)
Industry	0.145 (0.125)	0.271*** (0.052)	0.186*** (0.040)	0.455*** (0.037)	0.011 (0.066)
Group	-0.075 (0.086)	1.279*** (0.027)	0.2964*** (0.024)	1.099*** (0.020)	0.283 (0.305)
Exportation	0.054 (0.117)	0.719*** (0.040)	0.229*** (0.033)	0.569*** (0.029)	-0.500 (0.486)
D (2015)	—	1.308*** (0.104)	—	—	—
D (2017)	—	2.192*** (0.073)	—	—	—
D (2019)	—	2.206*** (0.065)	—	—	—
Constant	2.764*** (0.467)	-0.267*** (0.098)	2.060*** (0.041)	1.026*** (0.022)	3.569* (2.038)
<i>n</i>	4,478	51,061	51,061	51,061	51,061
<i>R</i> <sup>2</sup> adjusted	0.004	0.708	0.349	0.626	—
AIC	20,166	39,706	31,725	—	—
BIC	20,320	39,875	31,871	—	—
Hausman test, p-value	—	—	0.000	—	—

Model 1 is the growth model, Model 2 is pooled linear regression, Model 3 is a fixed effects model, and Model 4 is a random effects model. GMM is the Generalized Method of Moments.

Note 1: Absence of multicollinearity was verified for model 1 without lag (Mean VIF = 1.11; Max VIF = 1.53).

Note 2: Standard errors are in parenthesis. \*\*\* = sig. at 1%, \*\* = sig. at 5%, and \* = sig. at 10%.

To explore the relationship between various funding sources and performance metrics—specifically sales, labor productivity, and capital productivity—our analysis utilizes pooled linear regression, fixed effects (FE), and random effects (RE) models. However, due to superior results in goodness-of-fit measures ( $R^2$ ) and

information criteria (AIC and BIC), we rely primarily on the fixed effects model and the generalized method of moments (GMM) technique. The regression results for these models are presented in Table 9.

These hypotheses pertain to funding from suppliers, non-banking institutions, capital, public funding, and bond issuance. For all these sources, the results indicate a significant and positive impact on sales performance.

Focusing on sales performance, the analysis validates hypotheses **H2**, **H3**, **H4**, **H7**, and **H8**. These hypotheses pertain to funding from suppliers, non-banking institutions, capital, public funding, and bond issuance. For all these sources, the results indicate a significant and positive impact on sales performance.

The decision to finance through equity and bond issuance yields the highest positive impact on sales performance. These findings align with those of Nguyen (2020), who demonstrates that formal funding sources, such as bank loans and loans from financial institutions, significantly enhance firm performance. Similarly, the positive influence of public funding on sales aligns with Bertoni et al. (2019) and Alvarez et al. (2023), who highlight the critical role of participatory funding in driving entrepreneurial growth. The low impact of public funding on sales is attributable to a problem of inadequate beneficiary selection (Mardones and Zapata, 2018). A similar situation occurs with informal financing. Micro and small enterprises are those that most frequently resort to this funding source, obtaining amounts that partially cover their operational costs. Our results further indicate that credit funding substantially boosts sales levels, corroborating the findings of Fan et al. (2023) and Busom and Vélez-Ospina (2021). Additionally, both internal (equity) and external funding emerge as vital contributors to firm performance, as supported by Kim and Cho (2020) and Alvarez et al. (2023).

Hypothesis 10, which examines the impact of firm characteristics on performance, reveals that all firm characteristics significantly influence sales performance. Notably, firm size has a consistently negative effect across all categories, with microenterprises and small-sized firms experiencing the greatest negative impacts, reducing sales levels by 0.395 and 0.686, respectively.

Conversely, firms within economic groups and those engaging in export activities benefit from positive effects, increasing sales by 0.296 and 0.229, respectively. These trends are consistent with the findings of Nguyen (2020) and Hottenrott and Richstein (2020). The impact of industrial sector affiliation on sales performance is less pronounced but still notable. Firms operating in the primary sector see sales increases of 0.123, while those in industrialized sectors achieve a slightly higher growth rate of 0.186.

## 5.2. *Effect of Funding on Labor Productivity*

Following the approach used to analyze sales performance, we now evaluate firm performance in terms of labor productivity. Using Model 3, the results validate hypotheses **H2**, **H3**, **H4**, **H7**, and **H8**. This confirms that funding from suppliers, non-banking institutions, equity capital, public funding, and bond issuance all have a significant and positive impact on labor productivity, with respective rates of 0.346, 0.244, 0.451, 0.117, and 0.452 (Table 10). It should be emphasized that public funding has a limited impact on labor productivity. This can be attributed to the fact that a significant number of selected firms already have R&D departments and, therefore, would have innovated independently of public funds, evidencing the problem of "picking winners" in CORFO programs (Mardones and Zapata, 2018).

The findings reaffirm that these funding sources substantially enhance labor productivity. Notably, equity capital and bond issuance have the most pronounced effects, each contributing over 45% to labor productivity growth. These results emphasize the critical role of these funding methods in driving efficiency gains. The significant positive impact of public funding and bond issuance on labor productivity is consistent with prior studies, including those by Busom et al. (2017) and Huergo and Moreno (2017), which underscore their

importance in enhancing productivity outcomes.

Table 10: Regression models for labor productivity.

Variable	Model 1	Model 2	Model 3	Model 4	GMM
Labor productivity <sub>t-1</sub>	0.016 (0.053)	—	—	—	—
Retail	0.087 (0.299)	0.181** (0.078)	-0.056 (0.088)	0.053 (0.072)	-0.065 (0.139)
Supplier	0.184*** (0.063)	0.745*** (0.019)	0.346*** (0.018)	0.731*** (0.014)	0.119** (0.046)
No Bank	-0.195* (0.104)	0.555*** (0.032)	0.244*** (0.026)	0.470*** (0.024)	0.129** (0.062)
Capital	-0.028 (0.062)	0.902*** (0.017)	0.451*** (0.019)	0.862*** (0.014)	-0.039 (0.067)
Investors	-0.894 (0.932)	0.354* (0.212)	-0.045 (0.107)	0.204 (0.158)	-0.078 (0.246)
Angel	0.173*** (0.014)	0.023 (0.668)	0.187 (0.303)	0.576 (0.447)	-0.855 (0.581)
Estate	-0.106 (0.298)	0.168* (0.090)	0.117* (0.070)	0.216** (0.072)	0.054 (0.129)
Bond	0.345 (0.334)	0.446*** (0.138)	0.452*** (0.095)	0.653*** (0.094)	0.291* (0.177)
Informal	0.452** (0.219)	0.161** (0.069)	0.006 (0.073)	0.168** (0.061)	-0.051 (0.111)
Age	-0.057 (0.056)	0.057*** (0.013)	0.043** (0.019)	0.125*** (0.006)	0.048 (0.069)
Micro	0.308*** (0.118)	0.575*** (0.029)	0.218*** (0.031)	1.073*** (0.021)	0.209 (0.148)
Small	0.123 (0.102)	-0.047** (0.020)	-0.302*** (0.034)	0.295*** (0.022)	0.066 (0.136)
Medium	-0.035 (0.095)	0.543*** (0.028)	0.079*** (0.025)	0.745*** (0.021)	0.049 (0.111)
Primary	-0.020 (0.082)	0.309*** (0.024)	0.106*** (0.021)	0.352*** (0.019)	0.174 (0.108)
Industry	0.125 (0.109)	0.232*** (0.041)	0.147*** (0.029)	0.382*** (0.028)	-0.037 (0.075)
Group	-0.094 (0.077)	0.957*** (0.021)	0.195*** (0.024)	0.841*** (0.017)	0.311 (0.228)
Exportation	0.043 (0.105)	0.535*** (0.031)	0.156*** (0.031)	0.427*** (0.024)	-0.590 (0.473)
D (2015)	—	0.897*** (0.082)	—	—	—
D (2017)	—	1.677*** (0.058)	—	—	—
D (2019)	—	1.664*** (0.052)	—	—	—
Constant	0.345 (0.505)	-0.142* (0.077)	1.560*** (0.051)	0.694*** (0.020)	2.098 (2.165)
<i>n</i>	4,478	51,061	51,061	51,061	51,061
<i>R</i> <sup>2</sup> adjusted	0.007	0.718	0.507	0.640	—
AIC	19,121	32,775	23,100	—	—
BIC	19,237	32,945	23,237	—	—
Hausman test, <i>p</i> -value	—	—	0.000	—	—

Model 1 is the growth model, Model 2 is pooled linear regression, Model 3 is a fixed effects model, and Model 4 is a random effects model. GMM is the Generalized Method of Moments.

Note 1: Absence of multicollinearity was verified for model 1 without lag (Mean VIF = 1.11; Max VIF = 1.53).

Note 2: Standard errors are in parenthesis. \*\*\* = sig. at 1%, \*\* = sig. at 5%, and \* = sig. at 10%.

The analysis of control variables reveals that most categories have a significant and positive impact on labor productivity, except for the small business category within the size variable. Small businesses negatively

influence labor productivity, with a rate of  $-0.302$ . Conversely, microenterprises exhibit a positive effect, contributing to labor productivity at a rate of  $0.218$ . These results suggest that smaller firm sizes generally yield a stronger positive influence on labor productivity. While the size variable overall shows a positive effect on business performance, the impact is relatively low, as indicated in studies by Lin et al. (2020); Howell (2019); Kim and Cho (2020) and Busom and Vélez-Ospina (2021).

Other factors, such as firm age, industrial sector, membership in an economic group, and engagement in export activities, also positively affect labor productivity. Among these, being part of an industrialized sector, belonging to an economic group, and participating in export activities stand out, with coefficients of  $0.147$ ,  $0.195$ , and  $0.160$ , respectively. For instance, membership in an economic group enhances labor productivity by 20%, while firms involved in international trade achieve a 16% increase in productivity. These findings align with previous studies, such as those by Nguyen (2022) and Bravo-Ortega et al. (2023), which highlight the significant role of these factors in driving labor productivity.

### 5.3. *Effect of Funding on Capital Productivity*

The analysis in Table 11 presents the estimated coefficients illustrating the impact of funding sources on capital productivity using the fixed effects model (Model 3). Hypotheses **H4** and **H8** are confirmed, demonstrating that funding through capital and bond issuance significantly enhances capital productivity, with positive effects of  $0.145$  and  $0.526$ , respectively. Access to own funding increases capital productivity by 15%, while bond issuance achieves a remarkable 53% improvement.

While limited literature directly examines the relationship between funding and capital productivity, some studies explore similar concepts through total factor productivity. Wu et al. (2022) identified a positive correlation between state funding and total factor productivity. Similarly, Wang and Xu (2022) observed that external funding positively influences total factor productivity, particularly in firms that initially resist funding, findings that align with the effects of retail and supplier funding noted in this study. Other research, such as Fernandez (2017) and Kim and Cho (2020), highlights positive outcomes of internal funding on business performance.

The influence of firm characteristics on capital productivity appears less pronounced compared to their effects on sales and labor productivity. For small firms, size negatively impacts capital productivity at a rate of  $-0.123$ . Conversely, firms in industrialized sectors improve capital productivity by  $0.070$ , and those in economic groups achieve a higher positive rate of  $0.1280$ . However, firms engaged in export activities exhibit a slight reduction in capital productivity, with a negative rate of  $-0.034$ .

Examining the coefficients from Model 3 across Tables 9, 10, and 11, private funding sources consistently exhibit a stronger impact on firm performance—spanning sales, labor productivity, and capital productivity—compared to state-provided funding. Moreover, the joint analysis in Table 12 underscores this trend, with positive coefficients affirming that private funding plays a more substantial role in explaining business performance across all three dimensions.

The joint analysis further explores the comparative effects of various funding types on business performance. External funding demonstrates a stronger influence than internal funding on both sales and labor productivity, as shown in the third column of Table 12. Similarly, the fourth column reveals that formal funding outperforms informal funding across all three performance measures—sales, labor productivity, and capital productivity. Lastly, credit-based funding proves significantly more impactful on labor productivity and capital productivity than funding derived from donations, such as contributions from angel investors and public funding programs.

Table 11: Regression models for capital productivity.

Variable	Model 1	Model 2	Model 3	Model 4	GMM
Capital productivity <sub>t-1</sub>	0.005 (0.006)	—	—	—	—
Retail	-0.099 (0.080)	0.052 (0.041)	-0.054 (0.075)	0.006 (0.049)	0.787** (0.372)
Supplier	-0.012 (0.016)	0.137*** (0.010)	0.001 (0.012)	0.144*** (0.008)	0.227* (0.120)
No Bank	0.058** (0.026)	0.092*** (0.017)	-0.011 (0.019)	0.073*** (0.013)	0.026 (0.146)
Capital Investors	0.010 (0.015)	0.260*** (0.009)	0.145*** (0.012)	0.287*** (0.008)	-0.095 (0.170)
Angel	0.408** (0.198)	0.138 (0.112)	0.151 (0.123)	0.163* (0.097)	-0.210 (0.563)
Estate	0.016*** (0.003)	0.314 (0.353)	-0.112 (0.172)	0.173 (0.170)	0.753 (1.070)
Bond	0.014 (0.051)	0.126*** (0.048)	0.116 (0.071)	0.136*** (0.047)	0.102 (0.339)
Informal	-0.032 (0.076)	0.537*** (0.073)	0.526*** (0.080)	0.593*** (0.060)	0.625** (0.142)
Age	0.018 (0.088)	0.083** (0.037)	-0.075 (0.068)	0.064 (0.041)	-0.196 (0.215)
Micro	-0.033** (0.014)	-0.022*** (0.007)	-0.006 (0.011)	0.032*** (0.003)	-0.083 (0.178)
Small	-0.037 (0.027)	0.124*** (0.015)	-0.023 (0.026)	0.312*** (0.015)	-0.089 (0.406)
Medium	-0.024 (0.021)	0.017* (0.011)	-0.123*** (0.019)	0.136*** (0.010)	-0.192 (0.412)
Primary	-0.019 (0.022)	0.210*** (0.015)	0.028 (0.021)	0.287*** (0.012)	0.019 (0.308)
Industry	0.017 (0.020)	0.010 (0.013)	0.018 (0.017)	0.072*** (0.012)	-0.331 (0.242)
Group	-0.010 (0.026)	0.045** (0.022)	0.070*** (0.025)	0.139*** (0.018)	0.175 (0.238)
Exportation	-0.012 (0.019)	0.363*** (0.011)	0.128*** (0.015)	0.362*** (0.009)	-0.536 (0.459)
D (2015)	0.007 (0.025)	0.004 (0.017)	-0.034* (0.019)	0.027** (0.013)	1.364 (0.860)
D (2017)	—	0.028 (0.043)	—	—	—
D (2019)	—	0.402*** (0.030)	—	—	—
Constant	—	0.360*** (0.027)	—	—	—
Constant	0.066 (0.044)	0.180*** (0.041)	0.512*** (0.028)	0.173*** (0.008)	-4.435 (4.432)
<i>n</i>	4,478	51,061	51,061	51,061	51,061
<i>R</i> <sup>2</sup> adjusted	0.005	0.423	0.188	0.348	—
AIC	6,551	14,195	1,437	—	—
BIC	6,660	14,365	1,575	—	—
Hausman test, <i>p</i> -value	—	—	0.000	—	—

Model 1 is the growth model, Model 2 is pooled linear regression, Model 3 is a fixed effects model, and Model 4 is a random effects model. GMM is the Generalized Method of Moments.

Note 1: Absence of multicollinearity was verified for model 1 without lag (Mean VIF = 1.11; Max VIF = 1.53).

Note 2: Standard errors are in parenthesis. \*\*\* = sig. at 1%, \*\* = sig. at 5%, and \* = sig. at 10%.

Table 12: Joint analysis to measure the effect on performance, according to the type of funding

Performance variable	Private funding versus public funding	Internal funding versus external funding	Informal versus formal funding	Grant funding versus credit funding
Sales	1.856*** (0.564)	-1.189** (0.566)	-2.015*** (0.560)	-0.755 (0.143)
Labor Productivity	1.468*** (0.362)	-0.891** (0.362)	-1.690*** (0.360)	-0.689** (0.345)
Capital Productivity	0.456* (0.248)	-0.094 (0.267)	-0.838*** (0.258)	-0.384* (0.219)

Note 1: Each column refers to the types of funding. Differences have been considered according to the order written in each column of the types of funding.

Note 2: Standard errors are in parenthesis. \*\*\*= sig. at 1%, \*\*= sig. at 5%, and \*= sig. at 10%.

#### 5.4. Autocorrelation, Endogeneity and Exogeneity

The assessment of autocorrelation within the models, conducted using the Generalized Method of Moments (GMM) and specifically the Arellano-Bond test, indicates no evidence of first-order (AR (1)) or second-order (AR (2)) autocorrelation. This finding applies consistently across the three performance models. In practical terms, this implies that the performance measures—sales, labor productivity, and capital productivity—are not influenced by their own prior or future values. Consequently, this absence of autocorrelation supports the suitability of employing longitudinal models to analyze the impact of funding on these performance metrics. The detailed results are presented in Table 13.

Table 13: Autocorrelation, endogeneity, and exogeneity tests for the three performance models

	Sales	Labor productivity	Capital productivity
Arellano-Bond AR(1) test	0.464	0.382	0.108
Arellano-Bond AR(2) test	0.508	0.439	0.783
Hansen test (endogeneity)	0.236	0.197	0.942
Hansen test (exogeneity)	0.227	0.141	0.874

The Arellano-Bond test for serial autocorrelation in the residuals in the first differences tests the nullity of no autocorrelation in the first differences in the residuals. The Hansen test (endogeneity), tests the joint validity of the instruments used by testing the null hypothesis of the endogeneity of the instruments. The Hansen test (exogeneity) for instrument validity, tests the null hypothesis that all instruments are exogenous.

Regarding endogeneity, the Hansen test across the three performance models indicates no presence of endogeneity. This result ensures that the selected explanatory variables—funding sources—are appropriate and reliable for the analysis. To further validate this, the Hansen test for exogeneity confirms that the funding variables used in the models for sales, labor productivity, and capital productivity are indeed exogenous.

The GMM estimators provide evidence of causality for the explanatory variables. First, in the context of sales performance, the GMM results confirm that supplier funding, non-bank funding, and bond-based funding directly influence sales outcomes (as shown in Table 9). Second, these same funding sources are also positively associated with labor productivity (Table 10). Finally, the GMM estimators reveal that only bond-based funding has a direct and significant effect on capital productivity (Table 11).

When assessing the effect of funding variables on firm performance, there is a possibility that firms with higher performance may have better access to various funding sources. For instance, banks and suppliers may extend more credit to firms with higher sales revenue, which would imply an endogeneity problem arising

from reverse causality. However, evidence shows that financing is a cause of performance. Bağır and Ünal Seven (2022) confirm that financial constraints decrease firm productivity. Tingbani et al. (2024) show that trade credit causes firm growth. As in our research, both authors use GMM to test their results. We have included the results of the Generalized Method of Moments (GMM) technique in tables 9, 10, and 11. This can be explored in future research.

## 6. Conclusion

This study investigates the impact of various funding sources on the performance of Chilean firms, spanning four survey periods between 2013 and 2019. The analysis encompasses micro, small, medium, and large firms, using a range of funding options including bank loans, retail funding, supplier credit, non-bank funding, capital contributions, investors, angel investors, state funding, bond issuance, and informal funding. Firm performance is assessed through three key variables: sales, labor productivity, and capital productivity, with firm characteristics—such as age, size, and industrial sector—serving as control variables. To quantify the effects of funding on performance, four econometric models were employed.

The findings reveal that firm performance, whether measured by sales, labor productivity, or capital productivity, improves significantly with funding from own resources (capital) and bond issuance. This underscores the importance for firms to leverage internal financial resources or secure long-term debt through bond markets to maintain sustainability. Additionally, sales performance and labor productivity are positively influenced by supplier credit, non-bank funding, and public funding, highlighting the diverse impacts of these funding sources.

While prior studies have examined the relationship between funding and firm performance (e.g. Bertoni et al., 2019; Santi and Santoleri, 2017; Kim and Cho, 2020), this research distinguishes itself by disaggregating funding into specific categories, providing a granular understanding of their individual effects. Unlike prior studies that group funding into broad categories—such as internal versus external, formal versus informal, or public versus private (Kim and Cho, 2020; Nguyen, 2020; Huergo and Moreno, 2017)—this study extends the analysis to demonstrate how private, external, and formal funding play crucial roles in the Chilean context.

An important contribution of this research lies in its focus on labor productivity and capital productivity, performance measures that are seldom explored in the literature (Bravo-Ortega et al., 2023; Giner et al., 2017). These measures are critical to understanding firm efficiency, and identifying the financial determinants behind them offers valuable insights for strategic decision-making in both public and private sectors.

The study acknowledges some limitations. First, the dataset covers only four periods, as the surveys were conducted biannually from 2013 to 2019. Future research can expand this analysis with additional rounds from the Longitudinal Business Survey (ELE) as they become available. Second, the scope of control variables was restricted, excluding managerial characteristics (e.g., gender, education, experience, and leadership) and technological factors. Future studies could investigate how these additional variables influence sales, labor productivity, and capital productivity.

This research provides relevant information for public policy decision-making and corporate strategy design. For public policymakers, the findings highlight the need to develop differentiated funding programs that consider the heterogeneity of businesses, specifically in relation to economic sector and firm size. In particular, governments should consider establishing targeted funding programs that reduce barriers to formal funding for micro and small businesses, which often face greater difficulties in accessing bank credit. Furthermore, evidence on the differential impacts of funding sources suggests that public policies should create targeted support instruments for businesses.

For private firms, this research highlights the importance of strategic funding decisions as determinants of medium- and long-term business performance. Therefore, business leaders should evaluate not only the cost of capital but also the strategic implications of different funding sources on productive performance, growth, and financial stability. Micro and small businesses should also consider diversifying their sources of funding to reduce their dependence on single sources such as informal funding or short-term debt, as these can limit growth opportunities. Finally, medium-sized and large firms should explore capital market alternatives such as bond issuance and equity placement, as this research shows a low share of these sources of funding.

For future studies, we recommend delving deeper into the relationship between funding and performance by analyzing labor and capital productivity across firms of different sizes. This approach could yield more targeted insights into how various funding sources impact micro, small, medium, and large enterprises, enabling tailored strategies for financial and operational improvement. This decomposition would reveal whether certain sources of funding primarily improve labor productivity or capital productivity. Such performance measures would allow policymakers to design public support programs that address specific productivity constraints. Furthermore, future research should investigate non-random attrition in the results. We leave this for future exploration.

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