

ECONOMICS – WORKING PAPERS 2024/08

# Do financing conditions pose a threat to the performance and transformation of SMEs?

December 2024



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**EIB Working Paper 2024/08**

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## ABSTRACT

The availability of internal and external financing sources significantly influences firms' investments and growth. Even profitable firms with ample financing in normal times can be adversely affected by demand and supply shocks such as the COVID-19 pandemic, the energy crisis, or the recent tightening of financing conditions. This paper examines the impact of funding difficulties on firms' investment, performance and growth during normal period and periods of external shocks, using a regression adjustment treatment effect approach. We distinguish between structural barriers to external financing and cyclical deteriorations in financing conditions, while controlling for other major investment barriers. The analysis uses survey data collected from the 1<sup>st</sup> to 8<sup>th</sup> vintage of the European Investment Survey (EIBIS). Empirical evidence shows that micro and small firms, as well as leading innovators, are particularly vulnerable to deteriorating funding conditions. Results indicate that firms lagging in digitalisation and green investments face more of a structural rather than a cyclical financing issue. Consequently, policy support should be oriented towards these structural financing impediments to ensure a fair and faster transformation.

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## KEYWORDS

SMEs, investment gap, external funding, internal funding, financing constraints, uncertainty, investment barriers, firm performance, growth, digital and green transition.

**JEL codes:** C83, D22; G32

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# 1 Introduction and research background

The growth of SMEs is significantly more dependent on access to finance compared to large firms. For firms to grow, they need to invest and this often requires financial resources beyond their internal sources, such as annual cash flow and savings from previous year's profit (Hagel, 2002, and Murray and Vidhan, 2008). SMEs, however, are less likely to secure the additional external financing they need, irrespective of the potential of their investment projects. Their fundings are often limited to their internal funds and financial support from friends and family (Ardic et. al, 2013). According to the EIB Investment Survey (EIB, 2024a), internal financing accounted for 69% of SME's total investments in 2023, higher than the 63% of large firms, while 54% of SMEs relied exclusively on internal sources, compared to 43% of large firms. This dependency on internal financing can exacerbate their situation during periods of external shocks, such as the sudden decline in sales due to the COVID-19 lockdowns, recent increases in production costs driven by high energy prices, and the tightening of external financing conditions through interest rate hikes or stricter lending criteria. In this paper we examine both internal and external financing conditions, their interaction and specific firm characteristics for the period 2016-2023, covering both normal and crisis period. We contribute to the literature that explores the distinction between external and internal financing, as well as their interactions and complementarities. While some firms are constrained to use only internal sources, others may choose not to use external financing, and still others may use both for different purposes. Rajan and Zingales (1998) show the differences in external financial dependence across industries and derive a causal effect of financial development on real growth. Eppinger and Neugebauer (2022) develop a country-industry-specific index of external financing dependence for seven European countries, showing that the financial crisis had a disproportionately negative impact on firm performance in financially dependent industries. Bougheas (2004) investigates the internal versus external financing of R&D activities and finds that the high ratio of intangible assets and the high-risk nature of these investments often preclude firms to raise debt, leading them to rely more on internal financing. In similar matter, innovative firms face in general difficulties in accessing external financing (Lee et al., 2015; Cincera et al., 2016; Santos and Cincera, 2022) due to the higher levels of uncertainty and risk associated with their projects, as well as their lack of tangible assets to use as collateral for loans (Hall and Lerner, 2010). Santos et al. (2024) demonstrate the importance of external financing for promoting innovation and provide evidence that diversification through different type of external financing is also crucial.

Our paper closely aligns with the existing literature that investigates the role of financing frictions during both normal time and periods of economic downturns. However, we uniquely analyse these two trends simultaneously. Moreover, this paper provides deeper insights into the effects of internal and external funding conditions and the characteristics of firms that might either ameliorate (such as liquidity buffers) or amplify (such as uncertainty) these conditions as investment barriers. To examine the investment behaviour of firms in relation to their funding difficulties, we cross-check alternative variables like long-term accumulated investment gaps, drops in investment projects, planned investment reductions, and changes in the investment rate. The literature shows that financing constraints can have amplified effects on business decisions during cycles: Aghion et al. (2012) find that R&D investment plummets during recessions for credit-constrained firms and does not increase proportionally during upturns. Musso and Schiavo (2008) find that in the presence of asymmetric information and financing constraints, even small shocks may amplify business-cycle fluctuations. In this paper, we present evidence that a subset of SMEs and leading innovators, which are financially viable firms with strong growth potential, might face stronger financing difficulties, and therefore require special policy attention. This is not only due to their structurally higher external finance constraints but also because of the relatively stronger impact of cyclical deteriorations in their financing conditions. Missed investment opportunities due to limited financing are particularly detrimental for firms, especially during periods of structural shifts towards digitalisation and greening. These missed investment opportunities can have long-term implications for growth, productivity and competitiveness, affecting not only individual firms but also the broader economy. For instance, the transition to a greener economy coincides with a similar push for digital solutions at the firm level, and these trends are mutually reinforcing. Survey-based analyses on European companies show that digital firms were more resilient during the COVID-19 pandemic and were less likely to reduce employment (Coad et. al, 2023). While deepening digitalisation proved to be a successful strategy for many firms that already had certain level of digital maturity, non-digital firms faced increasing competitive disadvantages. Furthermore, empirical evidence shows that the poor degree of digitalization among SMEs and the digitalisation gap between digital and non-digital firms widened amid external shocks (Teruel et al., 2022). Consequently, we focus particularly on the financing conditions of viable firms that are lagging in the green and digital transformation. Without the

adequate financing for these investments, the divide might increase further. Along this line, this paper presents an empirical investigation on how financing difficulties, both internal and external, affect firms' investment decisions. We show that there is a greater risk of missed investment opportunities for small-sized and innovative firms. This is caused by their relatively higher vulnerability in periods of cyclical deterioration, that goes beyond the structurally high gap of investments. Regarding the green and digital transformation, we find evidence that those lagging in adopting digital and green solutions are facing structurally more difficulties of accessing external financing. However, we do not find significant difference in terms of financing deterioration during crises or monetary policy tightening period between transforming and non-transforming firms.

After evidencing the strong financing-investments relationship, we investigate the longer-term impact on profitability and growth of the firms. There are several studies in the literature tackling the impact of finance constraints on investment and firm's performance. Butler and Cornaggia (2011) and García-Posada (2019) show that firms operating in environment with lower finance constraints were able to invest more and increase production. Fernandes and Ferreira (2017) and Duygan-Bump et al. (2015) investigate the negative effect of finance constraints through the lower growth of employment, while Ferrando and Ruggieri (2018) find that lower financing constraints improve labour productivity. Interestingly, financing constraints can particularly limit investments in specific activities, such as related to innovation and hence hindering efforts to catch up to the technological frontier (Gorodnichenko, 2013).

In this paper, we provide answers to our research question of how much is the loss in the profitability/growth of firms that experienced external funding difficulties, with or without investment gaps. We show evidence that the presence of external finance difficulties considerably affects profitability and asset growth on average two years after. Remarkably, while the direct channel is through the lower investments, even firms with no investment gaps are affected on the long term by the external funding conditions, resulting in lower performance and growth. This alternative channel might work through additional services provided by providing the financing, such as technical assistance, financial consultancy, networking capacity, visibility, monitoring or simply through the flexibility to rely on such financing options in case of need (optimising strategy and timing of investment) (Dai et al., 2021, Bertoni et al., 2023).

From a policy perspective, our analysis points to the importance of firm-level policy support both in normal times and in periods of crisis and transitions, not only for the short-term survival and stabilization during the crisis period but also for longer-term targets of sustainable economic growth in normal period. Recently, it has been shown that firms that benefitted from the COVID-19 policy support tend to be more optimistic regarding their investment plans, especially for those in digital technologies (Harasztosi et al, 2022). While firms with low liquidity are more likely to receive policy support, most of firms benefitting from support were in good financial health before COVID-19, thereby limiting the risk of zombification. Further firm-level evidence for five EU countries (Croatia, Finland, the Netherlands, Slovakia and Slovenia) suggests that after wage support and direct subsidies, there was no immediate increase in 'zombies' (financially fragile and highly indebted firms) (Bighelli et al., 2021). An assessment of bank lending in Austria indicates that increased lending has contributed to the stabilization of the economy by providing liquidity to firms in needs at no additional risks (Kaniowski et al., 2021). In this paper, we differentiate between viable firms with external financing difficulties and those with potential long-term financial weakness (zombification), which by good reason should limit any new financing.

The paper proceeds as follows. The next two sections describe the data and the empirical methodology. Section 4 outlines the empirical results, while Section 5 concludes and presents some policy recommendations.

## 2 Data

For our analysis we rely on the pooled 1<sup>st</sup>-8<sup>th</sup> vintages of the European Investment Bank Investment Survey (EIBIS), the EIBIS 2023, combined with Moody's ORBIS database. The EIBIS database contains information on more than 12000 non-financial firms across various sectors in the EU collected annually for the period 2016-2023. EIBIS is an EU-wide survey that gathers qualitative and quantitative information on investment activities by non-financial corporations, both SMEs (5-250 employees) and larger corporates (250+ employees), their financing requirements and the difficulties they face when running their business. Using stratified sampling, EIBIS aims to be representative across all 27 Member States of the EU, within countries, four firm size classes (micro, small, medium, and large) and four sector groupings (manufacturing, services, construction, and



infrastructure).<sup>3</sup> For each firm, the survey replies are linked to information derived from the annual financial statements obtained from the Moody's ORBIS database (sample size and descriptive statistics of the variables of interest are presented in Table 1).

More importantly for our analysis, the survey contains information about potential change in internal and external financing conditions, difficulties in obtaining any external financing, long-term investment barriers, type of investments (ranging from fixed tangible assets to intangible assets and innovation type like new to the firm, new to the company or new to the global markets), realised investments, accumulated investment gaps compared to their needs/opportunities and investment plans for the near future. The investment gap variable captures the relative value of investment compared to the needs, while the future investment plans are compared to the past investment levels. Consequently, these alternative investment variables may exhibit different dynamics. As an example, a highly performing young innovative firm with strong investment projects may have an above-average investment rate and be less likely to drop future investment during financial tightening as most or all of its projects are financed through internal sources due to good profitability. However, this internal financing may not be sufficient to scale-up to the desired level, leading to higher investment gaps. Additionally, by linking the financial statements of firms from the Orbis database, we can examine the long-term performance and growth dynamics of the firms.

Our main variables of interest are the encompassing indicators of external and internal financing difficulties. For external funding difficulties, we distinguish between cyclical and structural funding difficulties. Structural barriers of firms' access to finance are given by the level of the development of the financial sectors and firm-specific characteristics, like the transparency, credibility, level of tangible assets, profitability etc. To capture these supply-side elements of the financing, we focus on viable firms that need a loan but they either were discouraged or rejected (fully constrained) or received less than they needed (quantity constrained) or it was too expensive (price constrained). To make sure that difficulties in accessing the financing are not related to the financial viability of the firm, we exclude firms that are reporting losses or zero profit for three consecutive years.

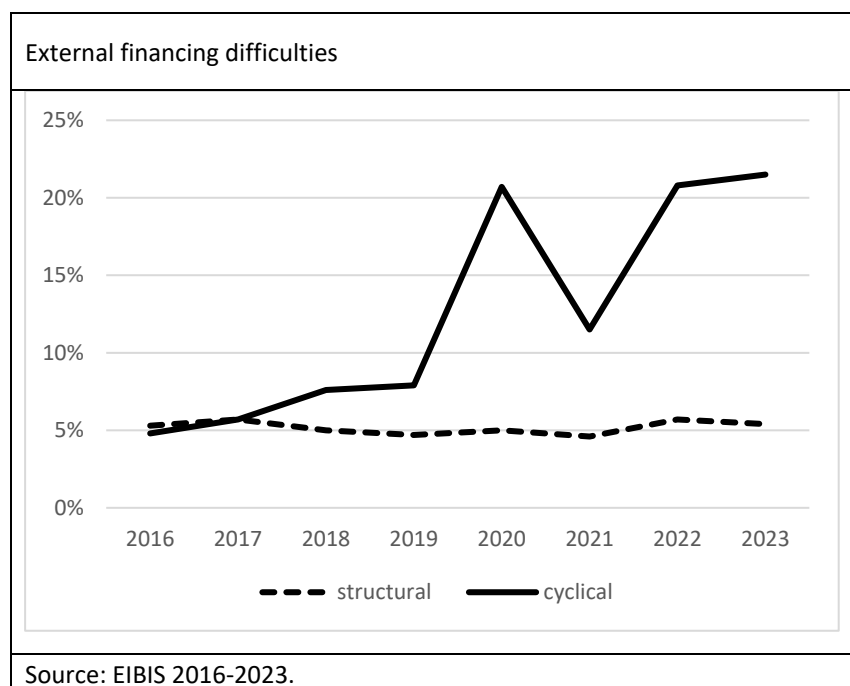
<sup>4</sup> To eliminate the time-varying cyclical component of this variable, we average the firm-level variable across years. We separately capture the financial tightening cycles, regardless of the development level and characteristics of the financial system and firms. For this, we consider the perception of firms regarding the changes in their external financing conditions. To eliminate the internal (like successfulness/viability of the business strategy) versus external drivers, we exclude from this category firms that register losses for three consecutive years (financially weak firms regardless of the cycle). The encompassing "*External funding difficulties*" indicator combines these two sources of structural and cyclical financing challenges. Figure 1 presents the two, structural and cyclical external funding difficulties variables for the 2015-2022 financial years, covered by the 2016-2023 EIBIS waves.

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<sup>3</sup> EIBIS has been shown to be a reliable data source with no systematic sampling bias (Brutscher et al., 2020).

<sup>4</sup> As a robustness check, we use an alternative definition of our main internal and external funding difficulties, by considering as viable firms those firms with cash flow (profit+ depreciation) above 0.2% of Total Assets. The changes in the final results are minor, with no significant change in the sign and magnitude of the coefficients. Results of the robustness check are available upon request.

**Figure1: External funding difficulties: by structural and cyclical component.**



Our second main variable, the “*Internal funding difficulties*” is defined as viable firms reporting a deterioration in their internal finance conditions. To exclude the impact of firms with long-term financial weakness (*zombie firms*), which are less likely to invest, we consider only those firms that have not registered losses for three consecutive years.<sup>5</sup>

Furthermore, our analysis relies on several variables from EIBIS 2016-2023 and Orbis 2015-2022 as described in Table A1 in the appendix. We distinguish four different dependent variables:

1. Investment gap;
2. Drop in realised investment;
3. Drop in planned investment;
4. Net investment rate.

The first three variables are derived from the survey responses and are constructed as dummies. Each is equal to 1 if firms: (1) are declaring that investment over the last 3 years was too little to ensure the success of their business going forward (*investment gap*); (2) reported less investment than in the previous year (*realised investment drop*); (3) total investment spent in the current or next year is expected to be less than in previous year (*planned investment drop*). The last variable is the *net investment rate* which is defined as the difference of fixed assets between two subsequent years, over lagged fixed assets.

Table A1 in Appendix includes also definitions for several control variables, such as size classes, sectors, a set of financial ratios (including leverage, profitability, cash holdings) and various dummy variables related to obstacles to investment activities. We also control for digital and green investments. Table 1 displays various characteristics of the firms in our dataset. Around 14% of firms report experiencing some form of external funding difficulties. Of these, around 12% attribute the difficulties to cyclical conditions and around 5% to structural issues, with some overlap likely between these two variables. The percentage of firms indicating internal funding difficulties is slightly lower (12%). An investment gap is reported by 15% of firms. Furthermore, there is a 6 percentage point difference between the drop in realised investment (21%) and the drop in planned investment (27%).

<sup>5</sup> The number of financially weak firms is relatively small of around 2% of the total sample and there is no significant change in the results when we do not exclude them from our main sample of firms having financial difficulties.

**Table 1: Descriptive statistics of the main variables.**

	N	Mean	Stand.Dev.	p10	p90
External funding difficulties (overall)	92,660	0.15	0.35	0	1
External funding difficulties – structural component	92,660	0.05	0.22	0	0
External funding difficulties – cyclical component	92,660	0.13	0.33	0	1
Internal funding difficulties	87,871	0.12	0.32	0	1
Investment gap	92,660	0.15	0.36	0	1
Planned investment drop	91,307	0.27	0.44	0	1
Realized investment drop	89,445	0.21	0.41	0	1
Net investment rate	68,574	0.10	0.56	-0.19	0.37
SMEs	92,660	0.52	0.50	0	1
Leading innovator	68,579	0.08	0.28	0	0
Digital	58,117	0.65	0.48	0	1
Green	46,156	0.71	0.46	0	1
Cash flow to Total Assets	50,239	0.09	0.11	0.00	0.20
Capital ratio	67,358	0.42	0.23	0.12	0.75
Cash holding to Total Assets	68,351	0.12	0.15	0.00	0.33
Financial leverage	58,158	0.20	0.22	0.00	0.49
Return on Assets (in %)	62,793	4.15	10.40	-3.39	13.92
Firm growth	70,128	0.07	0.29	-0.12	0.26
Financially weak firms (zombie) -no profit for 3 years	92,978	.018	.134	0	0
Financially weak firms (zombie) -close to zero or no profit for 3 years	92,978	.020	.141	0	0

### 3 Econometric framework

Our empirical analysis is twofold. First, we focus on a specification that examines the impact of internal and external funding difficulties on (past and planned) investment decisions of firms based on a probit model.

In detail, we apply a regression adjustment treatment effect where the treatment refers to the external/internal funding difficulties while the outcome variable is the investment of the firm. The estimated potential outcome with or without the funding difficulties is based on the linear probit (in case of binary variables) or linear regression model (in case of continuous variable):

The baseline equation of the treatment effect is:

$$Prob(Inv.)_{i,t} = \alpha_1 + \beta_1 Ext/Int Fin. Dif._{i,t-1} + \beta_2 Firms charact._{i,t-1} + \beta_3 Inv. barriers_{i,t-1} + \beta_3 Size_{it} + \beta_3 Sector_{it} + \beta_3 CountryG_{it} \quad (1)$$

where the dependent variable *Inv.* refers to different investment variables described above. We estimate the average treatment effect of external/internal funding deterioration and the potential outcomes of investments without funding difficulties.

In our probit model, we control for several firm characteristics, beyond size classes and sector, including profitability, equity share, financial leverage, cash holdings and innovativeness. We also consider the main barriers on investment that firms encounter, such as economic uncertainty, lack of availability of skilled staff, changes in market demand for products and access to digital infrastructure. To investigate the between external funding issues and internal funding difficulties, as well as potential internal financing buffer, like cash holdings of firms, we split the sample accordingly.

In the second step, we assess the ex-post effects of external funding difficulties on future firm performance (measured by Return on assets, ROA) and growth (measured by the change in total assets). Both variables of

interest are defined as the average of the two years following the initial observation to determine the extent to which external funding difficulties impact firms. Additionally, we divide the sample into two groups and perform separate estimations for firms with declared investment issues (such as accumulated investment gap or a drop in planned investments) and those without such issues.

Our research question is straightforward: what is the loss in the performance/growth for firms experiencing external funding difficulties but did not report investment problems? We also examine the second group of firms that faced external financing difficulties but did not report investment issues, potentially indicating sufficient internal sources/buffer or alternative funding sources such as loans, equity from existing shareholders, subsidies, or grants.

Beyond the direct impact of funds availability, we consider possible indirect effects of external financing, particularly loans from financial institutions. These effects might include technical assistance, financial consultancy, networking capacity, visibility, or simply the availability of such financing options when needed. Such indirect effects could also influence firms' performance and growth (Dai et al., 2021, Bertoni et al., 2023).

The baseline equation of the treatment effect is:

$$Prob(Perform/Growth.)_{i,t+2} = \alpha_1 + \beta_1 Ext Fin. Dif._{it-1} + \beta_2 Firms charact._{it-1} + \beta_3 Inv. barriers_{it-1} + \beta_3 Size_{it} + \beta_3 Sector_{it} + \beta_3 CountryG_{it} \quad (2)$$

Our objective is to measure again the ATET (average treatment effect on the treated) group for firms that reported external funding difficulties). Specifically, we aim to measure the average difference in outcomes that would occur if all firms in the treated group received the treatment, compared to if none of these firms received the treatment. For this calculation we use a propensity score matching estimator with the K-nearest-neighbour algorithm (Rosenbaum and Rubin, 1983; Rosenbaum and Rubin, 1984; Li, 2013). This estimator computes the ATET by selecting a number of comparison units, whose propensity scores are nearest to the treated unit being analysed (Li 2012). In our case, the treatment variable is the presence of external funding difficulties, while the outcome variable is the performance and growth variables, measured as the difference in the parameter under investigation up to two years after the event. The resulting propensity score represents the conditional probability of a firm signalling external funding difficulties, based on the observed firms' characteristics. In the probit analysis, the dependent variable is the binary variables (*Ext Fin Dif.*<sub>.i,t</sub>) and the explanatory variables (lagged by one year) are those previously described. What makes a variable relevant and appropriate is the extent to which it affects the probability of being subject to treatment. In addition, the set of explanatory variables chosen must satisfy the balancing property, ensuring that after matching, the distributions of the covariates and the propensity scores between the treated and the control groups are similar.

We then employ the k-nearest neighbour matching algorithm to identify k=3 matched (control) observations from the sample of firms that did not report external funding difficulties (untreated firms) for each treatment observation. The control observations are the untreated observations closest to the treated observations in terms of their propensity scores. The average treatment on the sample is estimated with the three matches equally weighted, using the nearest neighbour matching and controlling for heteroscedasticity (Abadie et al., 2001).

The distance is measured in terms of the propensity score. Finally, the ATET takes the following form:

$$ATET = \frac{1}{N_1} \sum_{i \in \{T=1\}} (Y_{1,i} - \sum_{j \in \{C_i\}} h_{i,j} Y_{0,j}) \quad (3)$$

where  $N_1$  is the number of treated units,  $\{T=1\}$  is the treated group,  $\{C_i\}$  is the matched group for unit  $i$  (which includes only untreated units) and  $h_{i,j}$  is a weight assigned to the untreated firm  $j$  when it is matched with firm  $i$ .

## 4 Empirical Results

### 4.1 External Funding Difficulties and Investments

The first step is to investigate how much external and internal financing difficulties are affecting investment decision of firms and to quantify how much they are related to missed investment opportunities. Table 2 reports

the results of the average treatment effect among firms with external funding difficulties on their different investment decisions.

**Table 2: Treatment effect of external funding difficulties on Investments**

	(1)	(2)	(3)	(4)
	Investment Gap	Realized Drop in Inv.	Planned Drop in Inv.	Net Inv.
<b>ATET</b>				
Firms with external funding difficulties relative to those without	0.067***	0.024*	0.073***	-0.074*
	(7.01)	(2.44)	(10.75)	(-1.79)
<b>Potential Output mean</b>				
Firms with no external funding difficulties	0.167***	0.223***	0.336***	0.217***
	(45.77)	(56.22)	(102.96)	(8.83)
<b>N</b>	15,449	15,449	37,808	12,858
<b>z statistics in parentheses</b>				
<b>=** p&lt;0.10</b>	<b>** p&lt;0.05</b>	<b>*** p&lt;0.01"</b>		

Note: z value in parenthesis, where higher than 2.5 shows significance at 95%. ATET refers to average treatment effect on the treated group.

The results show that external funding difficulties increase the likelihood of investment gap by 6.7 percentage points, the probability of dropping investment during the last financial year rises by 2.4 percentage points, while the probability of a drop on investment plans in the current or next year increases by 7.3 percentage points. Moreover, the net investment rate is expected to drop by 7.4 percentage point from the average mean net investment rate of 21.7% in the absence of external financing deterioration.

The average treatment effect is presented on an annual basis for the two variables with the highest effects: investment gap and planned investment drop. A positive and significant impact is confirmed across years (see in appendix Figure A3).

To further illustrate this point, we estimate the annual expected probability of firms having an accumulated investment gap and those with a planned drop of investment based on equation (1), conditional on external funding difficulties (Figure A4). The difference in investment between firms with and without external funding difficulties is significant in all years, both during normal and crises period. Notably, some of our investment variables are more sensitive to cyclical downturns, such as the planned investment drop, while others, like the accumulated investment gap -which, by definition, covers a longer period of the previous three years- is less volatile across years. Additionally, the relatively lower values of the gap during crises reflect a drop in investment needs compared to availability, rather than necessarily indicating higher investments.

## 4.2 Internal Funding Difficulties and Investments

We perform a similar exercise focusing on the impact of internal funding difficulties on investment decisions (Table 3). Also in this case, the average treatment effect on the treated (ATET) for firms experiencing internal funding deterioration is significantly higher than the estimated potential outcome mean (POmean) if no firms faced such difficulties.

The results show that internal funding difficulties increase the likelihood of investment gap by 7.4 percentage points. Additionally, the probability of dropping investment during the last financial year rises by 8.9 percentage points, while the probability of investment plans to drop in the current or next year is above by 18.3 percentage

points. Moreover, the net investment rate is expected to decrease by 15.6 percentage point from an average mean net investment rate of 25.3% in the absence of external financing deterioration.

Next, we present the average treatment effect of internal funding difficulties on the investment gap and planned investment drop on an annual basis (Figure A4). The positive and significant impact is reconfirmed on the annual basis. Furthermore, the expected probability of an investment gap and planned investment drop is estimated based on equation (1), conditional on internal funding difficulties and plotted through the years 2016-2024 (Figure A6). There is a significant difference in investments between firms with and without internal funding difficulties, also on the annual basis, during normal and crisis period.

**Table 3: Treatment effect of internal funding difficulties**

	(1)	(2)	(3)	(4)
	Investment Gap	Realized Drop in Inv.	Planned Drop in Inv.	Net Inv.
<b>ATET</b>				
Firms with internal funding difficulties relative to those without	0.074***	0.089***	0.183***	-0.156***
	(7.72)	(8.64)	(25.56)	(-3.95)
<b>Potential Output mean</b>				
Firms with no internal funding difficulties	0.168***	0.211***	0.338***	0.253***
	-51.86	(60.52)	(100.940)	(7.25)
<b>N</b>	19,312	19,328	48,081	16,024
<b>z statistics in parentheses</b>				
<b>=** p&lt;0.10</b>	<b>** p&lt;0.05</b>	<b>*** p&lt;0.01"</b>		

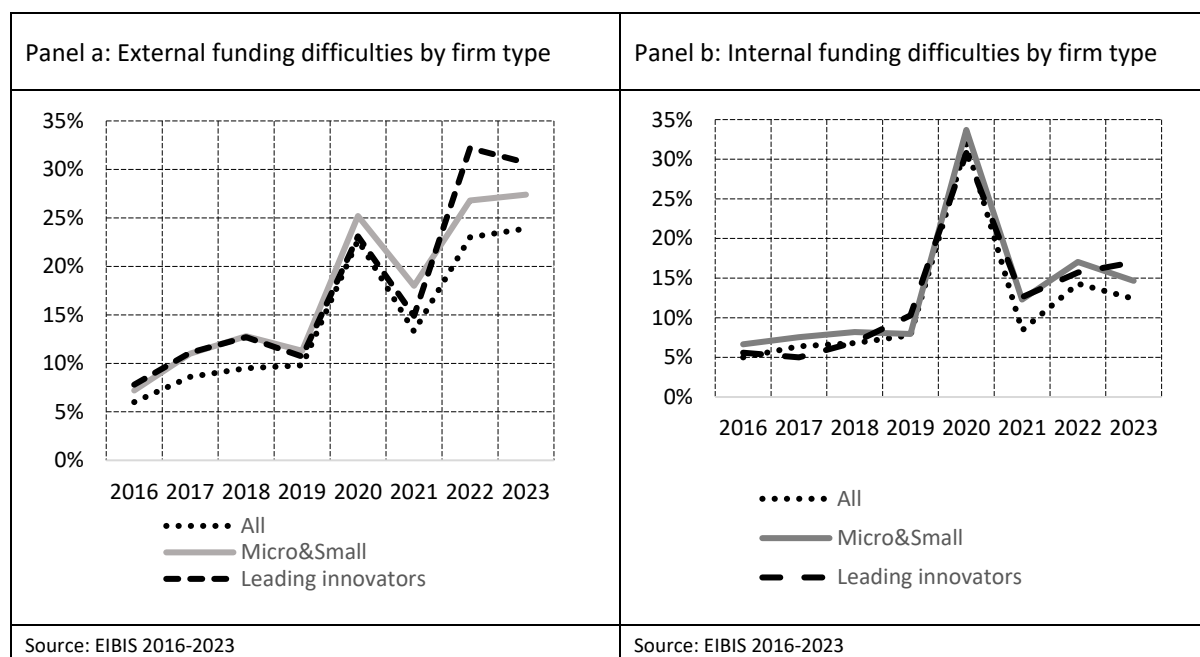
Note: z value in parenthesis, where higher than 2.5 shows significance at 95%. ATET refers to average treatment effect on the treated group.

### 4.3 External and Internal Funding Difficulties by Firm Type

Figure 2 displays the percentages of firms reporting external and internal funding difficulties over time (panel a and b, respectively). For external funding difficulties, micro and small firms, as well as highly innovative firms, report above-average difficulties in most years. Notably, the years 2020 and 2022 stand out with significantly higher level of external funding difficulties. The sharp increase between 2021 and 2002, from around 10% to 25%, reflects the pass-through to financing conditions of the tightening cycle of monetary policy in most countries. The pass-through affects firms in a different way depending on the assessment of banks of their risk profile (Beyer et al., 2024). Consequently, financing becomes even more costly or potentially unavailable for certain firms, such as those with less transparent financial statements (traditionally SMEs) and those lacking tangible assets to serve as collateral (highly innovative firms that rely more on research and development, which are intangible investments) (Durante et al., 2022)

In panel b, we report the percentages of firms reporting internal funding difficulties, which peaked during the COVID-19 pandemic. The sudden halt in sales due to the lockdowns across countries had an immediate impact on profitability and cash flow generation. On average, internal funding conditions improved in the subsequent year, but slightly deteriorating again during the energy price increase/start of tightening cycle in 2022.

**Figure 2. External and Internal funding difficulties by categories of firms**

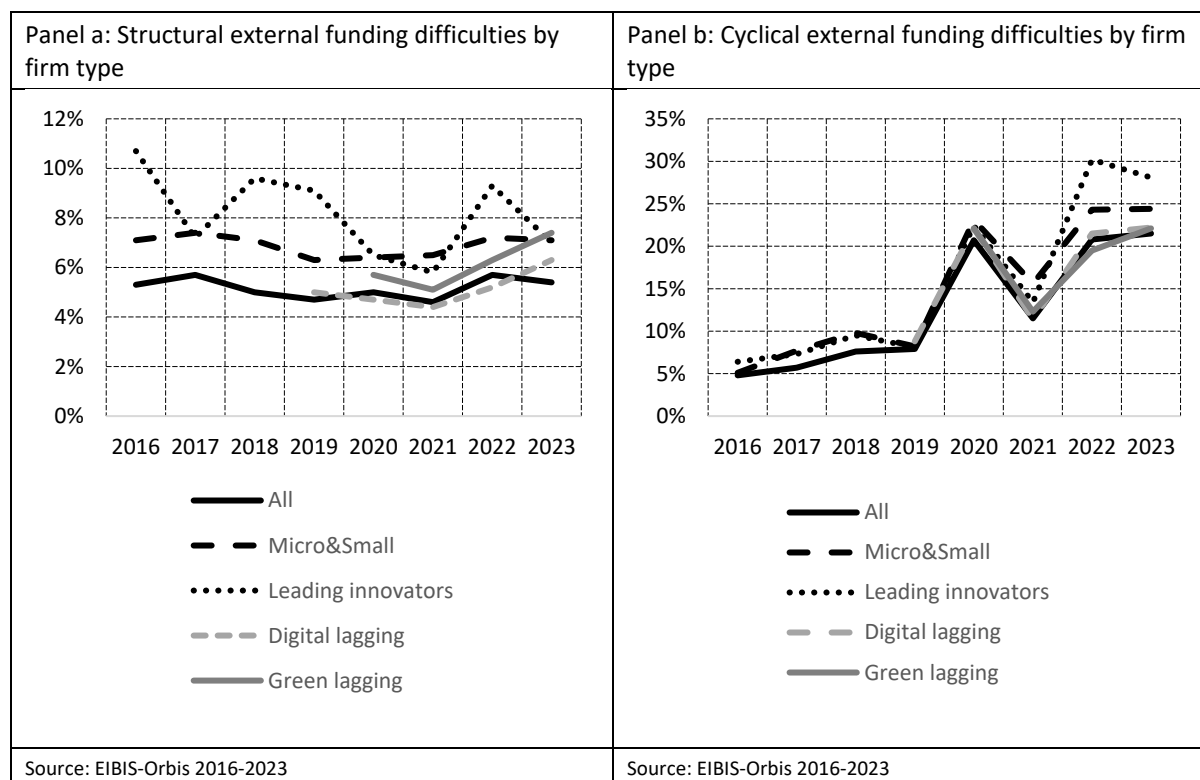


Note: for further details in differences see Table A2 in Appendix.

## 4.4 Structural and Cyclical External Funding Difficulties by Firm's Type

Figure 3 presents further details regarding the type of external funding difficulties, differentiating among structural (panel a) and cyclical elements (panel b) and including two subcategories of firms: firms with no digital solution (digital lagging) and firms with no green investments or planned investments in green solutions. According to Panel a, micro and small firms, leading innovators, and green lagging firms face structurally higher difficulties in accessing external loans. In contrast, firms lagging in digitalization show an upward trend and above average levels in 2023. The relatively higher volatility observed among leading innovators may be driven by the smaller sample size (around 8% of the whole sample, whereas the other subsamples are all above 50% of the whole sample). Panel b shows the relatively worse situation of micro and small, as well as leading innovators, which might be explained by the intrinsic higher risk profile. Also, during economic slowdown and crisis period, not only the equity risk premium but also the premium of corporate debt over the risk free rate is increasing. Andersson et al. (2021) show that during crises, tightened financial conditions impair loan provision and widens borrowing spreads by country and by borrower size. For digital and green lagging firms (traditional firms with no digital and green investments), there is a cyclical worsening, but their situation is not worse than that of the average firm.

**Figure 3. Structural and Cyclical External funding difficulties by categories of firms (for further details in differences see Table A2 in Appendix)**



## 4.5 Conditional Impact of External Funding Difficulties on Investments

To further understand the impact of external funding conditions on firms' investment decision, we examine the conditional effect of deteriorating external financing conditions on firms with and without internal funding difficulties, as well as on firms with low and high cash holding. As expected, we find that both the investment gap and the reduction in planned investment are higher for firms with low cash holdings firms and for those experiencing internal financing challenges. Moreover, the results from the conditional treatment effects show that the negative impact of worsening external financing conditions on investments is intensified for firms with internal funding difficulties and low cash holdings.



**Table 4: Conditional impact of external funding difficulties on Investment gap**

	(1)	(2)	(3)	(4)
	With Internal Funding Difficulties	Without Internal Funding Difficulties	Low cash	High cash
<b>ATET</b>				
<b>Impact of lagged external funding difficulties</b>	0.053**	0.044***	0.082***	0.046***
	(2.41)	(4.00)	(5.55)	(3.15)
<b>PO mean</b>				
<b>Investment gap with no external funding difficulties</b>	0.227***	0.155***	0.188***	0.144***
	(15.67)	(40.97)	(32.72)	(24.94)
<b>N</b>	1,715	13,269	6,825	5,722

Note: z value in parenthesis, where higher than 2.5 shows significance at 95%. ATET refers to average treatment effect on the treated group.

**Table 5: Conditional impact of external funding difficulties on Planned investment drop**

	(1)	(2)	(3)	(4)
	With Internal Funding Difficulties	Without Internal Funding Difficulties	Low cash	High cash
<b>ATET</b>				
<b>Impact of external funding difficulties</b>	0.055***	0.036***	0.106***	0.085***
	(3.48)	(4.46)	(7.01)	(8.92)
<b>PO mean</b>				
<b>Drop in planned inv. with no external funding difficulties</b>	0.495***	0.292***	0.330***	0.307***
	(45.07)	(99.35)	(45.77)	(72.50)
<b>N</b>	4,268	32,221	13,936	17,851

Note: z value in parenthesis, where higher than 2.5 shows significance at 95%. ATET refers to average treatment effect on the treated group.

The results from the treatment effects are confirmed by the predicted probabilities of investment gaps and planned investment reductions, which are estimated by simultaneously considering the impact of internal and external funding difficulties, while controlling for firm characteristics and major investment barriers (in Table 6). As expected, a worsening of internal funding negatively affects a firms' investment capacity, similar to the impact of uncertainty as a main investment barrier. The impact of external funding remains significant across all investment variable considered.

Regarding firm characteristics, we find that firms with higher financial leverage are more likely to reduce their future investments. This trend can be explained by two factors: first, these firms may have already completed significant investment plan with past financing (reflecting the cyclicity of big investments); second, financially indebted firms may exhibit greater volatility in their investment activities. Conversely, firms that do not rely on

external financing (financial leverage) are less likely to invest, and, therefore, do not need to adjust (decrease) their investment plans.<sup>6</sup>

Moreover, cash savings and profitability serve as crucial sources of investment. Leading innovators are less likely to decrease their planned investments, indicating that these firms are high-growth, promising firms with robust investment projects. However, they are more likely to be bounded below their potential due to limitation of external financing (see results of Subsections 4.3 and 4.4). The lower probability of investment drop among these firms can be also explained by the nature of R&D investments, which are typically planned over multiple years.

When comparing different size classes, larger firms have a significantly smaller accumulated investment gap compared to micro firms. Additionally, larger firms are less likely to reduce their future investments than micro and small firms. Significant barriers to investment include uncertainty, lack of demand, and a shortage of skilled staff, all resulting in higher investment gaps. However, firms facing a shortage of skilled staff tend to be more resilient in their investment plans., We argue that high-growth firms, which invest relatively more than the average firm, are more often constrained by the unavailability of qualified workers at the pace required to scale their operations (EIB, 2024b).

**Table 6: Determinants of investment - impact of external/internal funding difficulties on investments, marginal effects.**

VARIABLES	(1) Investment gap	(2) Planned investment drop
External funding difficulties (lag)	0.041*** (0.008)	0.032*** (0.008)
Internal funding difficulties (lag)	0.058*** (0.009)	0.148*** (0.009)
Cash holdings (lag)	-0.064*** (0.023)	-0.063*** (0.020)
Profitability (lag)	-0.309*** (0.031)	-0.017 (0.022)
Financial leverage (lag)	-0.003 (0.016)	0.100*** (0.014)
Leading innovators	-0.020 (0.013)	-0.034*** (0.011)
Small	-0.019* (0.011)	-0.044*** (0.009)
Medium	-0.043*** (0.011)	-0.072*** (0.009)
Large	-0.052*** (0.011)	-0.110*** (0.010)
Construction	-0.026*** (0.009)	-0.025*** (0.008)

<sup>6</sup> Alternatively, we checked the impact of profitable firms with financial leverage and in this case, we found significantly lower investment gap while the probability of investment plan drop is confirmed. Estimation results are available upon request.

Services	-0.027*** (0.008)	-0.012 (0.008)
Infrastructure	0.003 (0.008)	-0.044*** (0.007)
South Europe	-0.084*** (0.007)	-0.018*** (0.007)
West and North Europe	-0.058*** (0.008)	0.017*** (0.006)
Year 2020	-0.010 (0.009)	0.178*** (0.008)
Obstacle - Uncertainty (lag)	0.032*** (0.009)	0.052*** (0.007)
Obstacle - Lack of demand	0.012* (0.007)	0.028*** (0.006)
Obstacle -Lack of skilled staff	0.020** (0.008)	-0.021*** (0.007)
Obstacle - Digital infrastructure	0.007 (0.007)	-0.009 (0.006)
Observations	15,000	30,967

Note: Standard errors in parentheses, where \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

In an additional exercise we split the external funding difficulties in structural and cyclical components. To recall, firms that show structural difficulties to get external finance are considered viable firms that need a loan but were either discouraged, did not receive it or received less than they needed. Firms signalling cyclical difficulties are those that, regardless of their current external financing possibilities, perceive external financing conditions to be worsening.

In the econometric analysis reported in Table 8, the investment gap is likely to increase due to both structural and cyclical components, with a greater impact from the former (column 1). The estimated drop in planned investment, reported in the column 2, is instead driven by the cyclical component, while the negative coefficient of the structural component tends to mitigate the overall impact. This can be explained by the fact that firms facing structural difficulties in accessing external financing tend to rely more heavily, or exclusively, on internal financing, so they are generally less indebted and thus less impacted by any tightening of the financing conditions.

**Table 8: Determinants of investment gap and reduction in planned investment: Impact of financing difficulties**

VARIABLES	(1) Investment gap	(2) Planned investment drop
Structural external financing difficulties	0.090*** (0.010)	-0.042*** (0.010)
Cyclical external financing difficulties	0.035*** (0.009)	0.047*** (0.009)
Internal funding deterioration (lag)	0.058*** (0.009)	0.146*** (0.009)

Cash holdings (lag)	-0.066*** (0.023)	-0.060*** (0.020)
Profitability (lag)	-0.297*** (0.031)	-0.022 (0.022)
Financial leverage (lag)	-0.017 (0.017)	0.111*** (0.014)
Leading innovators	-0.022* (0.013)	-0.033*** (0.011)
Small	-0.017 (0.011)	-0.044*** (0.009)
Medium	-0.040*** (0.011)	-0.073*** (0.009)
Large	-0.048*** (0.011)	-0.111*** (0.010)
Construction	-0.027*** (0.009)	-0.025*** (0.008)
Services	-0.026*** (0.008)	-0.012 (0.008)
Infrastructure	0.002 (0.008)	-0.043*** (0.007)
South Europe	-0.082*** (0.007)	-0.020*** (0.007)
West and North Europe	-0.053*** (0.008)	0.014** (0.006)
Year 2020	-0.009 (0.009)	0.176*** (0.008)
Obstacle - Uncertainty (lag)	0.031*** (0.009)	0.052*** (0.007)
Obstacle - Lack of demand	0.011 (0.007)	0.028*** (0.006)
Obstacle -Lack of skilled staff	0.021*** (0.008)	-0.021*** (0.007)
Obstacle - Digital infrastructure	0.008 (0.007)	-0.009 (0.006)
Observations	14,992	30,944

Note: Standard errors in parentheses, where \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## 4.6 Impact of External Funding Difficulties on Profitability and Growth

In this section we present the results on the ex-post effect of the presence of external funding difficulties on firm performance and growth. The propensity score is run using the specification described in section 3. Table 9 show the distribution of the sample across firms with external funding difficulties and investment gaps (panel a) and drops in planned investment (panel b).

**Table 9: Sample distribution of firms with external financing difficulties and investment issues**

**Panel a: Investment gap**

	No investment gap	Investment gap	Total
No external funding difficulties	68%	14%	82%
External funding difficulties	13%	4%	18%
Total	81%	19%	100%

**Panel b: Planned investment drop**

	No Planned Investment drop	Planned Investment drop	Total
No external funding difficulties	60%	22%	82%
External funding difficulties	11%	6%	18%
Total	71%	29%	100%

We estimate the propensity score, representing the conditional probability of a firm signalling external funding difficulties based on the observed characteristics of firms and various subsamples of firms facing or not investment difficulties (investment gap or planned investment drop). The selected explanatory variables must satisfy the balancing property, ensuring that, after the matching, the distributions of covariates and the propensity score are similar between the treated and the control groups. Figure 4 confirms that the propensity score distribution after the matching is similar for the treated and control groups.

**Figure 4: Propensity score distribution before and after the matching**

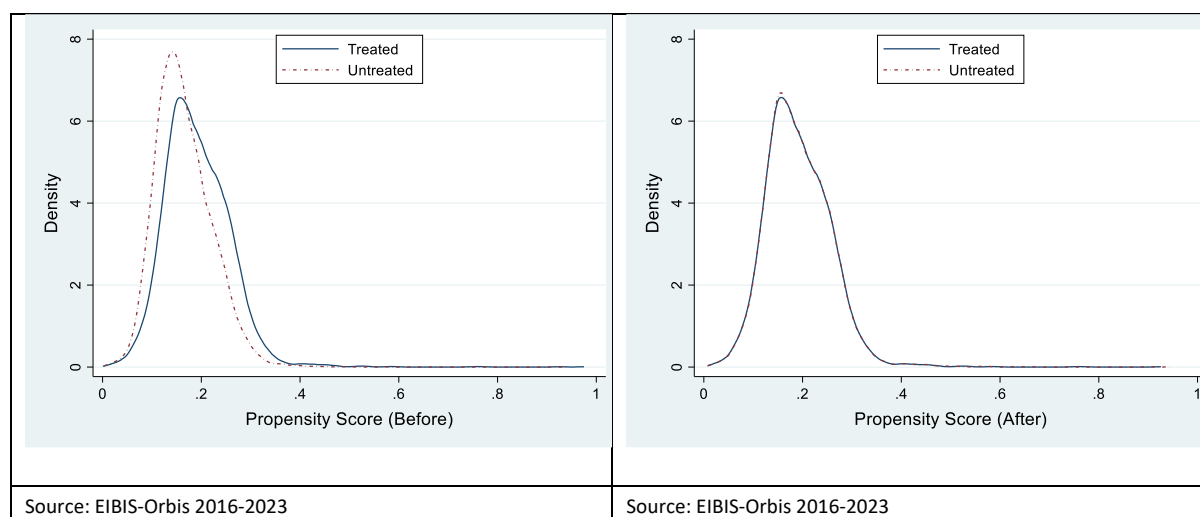


Table 10 displays our main findings on the ex post impact of access to external finance on firms' growth based on the propensity score analysis. Column 1 of Table 10 reveals that external funding difficulties have a negative and statistically significant impact on the subsequent profitability and growth. Firms that faced difficulties to get external financing are less profitable (-1.26 percentage points) and grow relatively less (1.1%) than firms that did not face this kind of problems. In column 5, we observe that the loss in profitability is even greater among firms reporting past investment gaps (-1.74 percentage points). In contrast, distinguishing between firms with and without planned investment drops does not provide additional insight into future performance, likely due to the often pessimistic nature of firms' reporting on investment.

In terms of future asset growth, column 3 shows that firms indicating no past investment gap, despite financial problems, experience a smaller loss (column 3). This suggests that these firms, having already expanded

according to their business needs in the previous years, might pause further plans to invest when external finance is not easily available.

Overall, the results indicate that beyond the direct impact of fund availability on investments, external financing difficulties significantly negatively affect performance and growth. However, the coefficient for this second group is not significant due to the small sample size (4% and 6% of total sample, respectively).

**Table 10. Differential growth rates of firms with funding gap versus firms with no funding gap by investment decisions - propensity score results**

	(1) All	(2) No investment gap	(3) With investment gap	(4) No planned investment drop	(5) With planned investment drop
Profitability (Return on Assets)	<b>-1.26</b> <b>(6.14)</b>	<b>-1.23</b> <b>(5.1)</b>	<b>-1.74</b> <b>(3.53)</b>	<b>-1.214</b> <b>(4.4)</b>	<b>-1.206</b> <b>(3.52)</b>
Firms' Growth (change in Total assets)	<b>-0.011</b> <b>(2.56)</b>	<b>-0.02</b> <b>(2.83)</b>	-0.01 (1.28)	<b>-0.02</b> <b>(2.3)</b>	-0.01 (1.52)

Note: T- statistics in parentheses. For more details see Table A3 in Appendix.

## 5 Conclusion and Policy Implications

In this paper we provide novel evidence of the negative impact of internal and external funding conditions on firms' investments, profitability and growth. We document that micro and small firms, as well as leading innovators, are more likely to face both internal and external funding difficulties, especially during periods of economic downturn.

Our findings show that external funding difficulties have a long-term impact on future firm performance and growth. Specifically, firms that previously struggled to secure external finance face greater challenges in generating additional financial flows for their total asset investments over the subsequent two years. These losses are even higher when the same firms have signalled some investment gaps in the past.

We argue that policy support should focus on firms that are particularly vulnerable to tightening and deteriorating funding conditions, especially when internal and external funding conditions are deteriorating simultaneously – a situation recently faced by many micro and small firms. Viable firms, even those with high growth potential and leading innovators, might be forced to stagnate by cancelling their investments due to lack or unaffordable funding. This is in line with previous findings that firms experiencing the strongest drop in turnover and receiving financial support during the Covid-19 crisis were financially healthy before the crisis (Harasztosi et al., 2022). An environment with easier access to diversified and alternative financing sources would better meet the needs of small and innovative firms, particularly those with high growth potential (Santos et al., 2024).

In the current period of structural shifts towards digitalisation and greening, financing conditions play a crucial role in transforming European firms. Our results indicate that the financing issues faced by firms lagging in digitalisation and green investments are more structural than cyclical. Consequently, policy support should be oriented towards the structural impediments that hinder firms from transforming. Targeted policy support of these specific investments is needed to close the digitalisation and greening gap among EU firms, thereby accelerating a green and fair transition.

## Reference

- Abadie, A., D. Drukker, L. J. Herr, and G. W. Imbens (2001). "Implementing matching estimators for average treatment effects in Stata", *Stata Journal*, 1(1), 1-18.
- Aghion, P., N. Berman, L. Eymard, P. Askenazy, and G. Clette (2012). "Credit constraints and the cyclical investment: Evidence from France", *Journal of the European Economic Association*, 10(5): 1001-102.
- Andersson, M., L. Maurin, and D. Rusinova (2021). "Market finance as a spare tyre? Corporate investment and access to bank credit in Europe", ECB Working Paper No. 2606.
- Ardic Alper, O.P., M. Hommes, P. Stein, and W. Benno (2013). "Closing the credit gap for formal and informal micro, small, and medium enterprises", Washington, D.C.: International Finance Corporation.
- Bertoni, F., M. G. Colombo, and A. Quas (2023). "The long-term effects of loan guarantees on SME performance", *Journal of Corporate Finance*, 80, 102408.
- Beyer, R., R. Chen, F. Misch, C. Li, E. O. Ozturk, and L. Ratnovski (2024). "Monetary policy pass-through to interest rates: Stylized facts from 30 European countries", IMF Working Paper No. 24/9.
- Bougheas, S. (2004). "Internal vs External Financing of R&D", *Small Business Economics*, 22, 11–17.
- Bighelli, T., T. Lalinsky, and CompNet Data Providers (2021). "COVID-19 government support and productivity: Micro-based cross-country evidence", CompNet Policy Brief No. 14.
- Brutscher, P.-B., A. Coali, J. Delanote, and P. Harasztosi (2020). "EIB Group Survey on Investment and Investment Finance: A technical note on data quality", EIB Working Paper No. 2020/08.
- Butler, A. W., and J. H. Cornaggia (2011). "Does access to external finance improve productivity? Evidence from a natural experiment", *Journal of Financial Economics*, 99(1), 184-20.
- Cincera, M., and A.M. Santos (2015). "Innovation and access to finance: A review of the literature", Université libre de Bruxelles iCite Working Paper No. 2015-014.
- Cincera, M., J. Ravet, and R. Veugelers (2016). "The sensitivity of R&D investments to cash flows: Comparing young and old EU and US leading innovators", *Economics of Innovation and New Technology*, 25(3), 304–320.
- Coad, A., P. Bauer, C. Domnick, P. Harasztosi, R. Pál, and M. Teruel (2023). "From rapid decline to high growth: Where in the distribution did COVID hit hardest?", *Journal of Small Business and Enterprise Development*, 30(6), 1178-1209.
- Dai, R., D. Mookherjee, Y. Quan, and X. Zhang (2021). "Industrial clusters, networks and resilience to the Covid-19 shock in China", *Journal of Economic Behavior & Organization*, 183, 433–455.
- Durante, E., A. Ferrando, and P. Vermeulen (2022). "Monetary policy, investment and firm heterogeneity", *European Economic Review*, 148, 104251.
- Duygan-Bump, B., A. Levkov, and J. Montoriol-Garriga (2015). "Financing constraints and unemployment: evidence from the great recession", *Journal of Monetary Economics*, 75, 89–10.
- EIB (2023). "Investment Report 2022/2023: Resilience and renewal in Europe", Luxembourg: European Investment Bank.
- EIB (2024a). "EIB Investment Survey 2023: European Union overview", Luxembourg: European Investment Bank, Luxembourg.
- EIB (2024b). "Investment Report 2023/2024: Transforming for competitiveness", Luxembourg: European Investment Bank, Luxembourg.
- Fernandes, A. P., and P. Ferreira (2017). "Financing constraints and fixed-term employment: Evidence from the 2008-9 financial crisis", *European Economic Review*, 92, 215–23.
- Eppinger, P. S., and K. Neugebauer (2022). "External financial dependence and firms' crisis performance across Europe", *Empirical Economics*, 62, 887–904.

- Ferrando, A., R. Pál, and E. Durante (2019). "Financing and obstacles for high growth enterprises: the European case", EIB Working Paper No. 2019/03.
- Ferrando, A., and A. Ruggieri (2018). "Financial constraints and productivity: Evidence from Euro Area companies", *International Journal of Finance & Economics*, 23(3), 257-28.
- Fouejjieu, A., A. Ndoye, and T. Sydorenko (2020). "Unlocking access to finance for SMEs: A cross-country analysis", IMF Working Paper No. 2020/055.
- García-Posada Gómez, M. (2019). "Credit constraints, firm investment and growth: evidence from survey data", *Journal of Banking and Finance*, 99, 121-14.
- Gorodnichenko, Y., and M. Schnitzer (2013). "Financial constraints and innovation: Why poor countries don't catch up." *Journal of the European Economic Association*, 11(5), 1115–52.
- Hall, B., and J. Lerner (2010). "The financing of R&D and innovation". In: Hall, B.H., Rosenberg, N. (Eds.), *Handbook of the Economics of Innovation*, Vol. 1., Amsterdam: North-Holland, Elsevier, 609–639.
- Harasztosi, P., L. Maurin, R. Pál, D. Revoltella, and W. van der Wielen (2022). "Firm-level policy support during the crisis: So far, so good", *International Economics*, 171, 30-48.
- Hagel, J. (2002). "Leveraged growth: Expanding sales without sacrificing profits", *Harvard Business Review*, Financial Analysis, October 2002.
- Kaniowski, S., A. Pekanov, and T. Url (2021). "Ex-post-Analyse der Wirkungen des COVID-19-Maßnahmenpaketes auf die Unternehmensliquidität," Österreichisches Institut für Wirtschaftsforschung (WIFO).
- Lee, N., H. Sameen, and M. Cowling (2015). "Access to finance for innovative SMEs since the financial crisis". *Research Policy*, 44(2), 370–380.
- Li, M. (2013). "Using the propensity score method to estimate causal effects: A review and practical guide". *Organizational Research Methods*, 16(2), 188-226.
- Musso, P., and S. Schiavo (2008). "The impact of financial constraints on firm survival and growth". *Journal of Evolutionary Economics*, 18, 135–14.
- Murray, Z. F., and K. G. Vidhan (2009). "Trade-Off and Pecking Order Theories of Debt", In: Espen Eckbo, B. (Ed.), *Handbook of Empirical Corporate Finance*, Vol. 2, Amsterdam: North-Holland, Elsevier, 135-202.
- Rosenbaum, P. R., and D. B. Rubin (1983). "The central role of the propensity score in observational studies for causal effects", *Biometrika*, 70(1), 41-55.
- Rosenbaum, P. R., and D. B. Rubin (1984). "Reducing bias in observational studies using subclassification on the propensity score", *Journal of the American Statistical Association*, 79(387), 516-524.
- Rajan, R. G., and L. Zingales (1998). "Financial dependence and growth", *American Economic Review*, 88(3), 559–86.
- Santos, A. M., M. Cincera, and G. Cerulli (2024). "Sources of financing: Which ones are more effective in innovation–growth linkage?", *Economic Systems*, 48(2), 101177.
- Teruel, M., S. Amaral-Garcia, P. Bauer, A. Coad, C. Domnick, P. Harasztosi, and R. Pál (2023). "Productivity and HGEs: Resilience and recovery from the COVID-19 pandemic", *Industry and Innovation*, 30(7), 895-918.



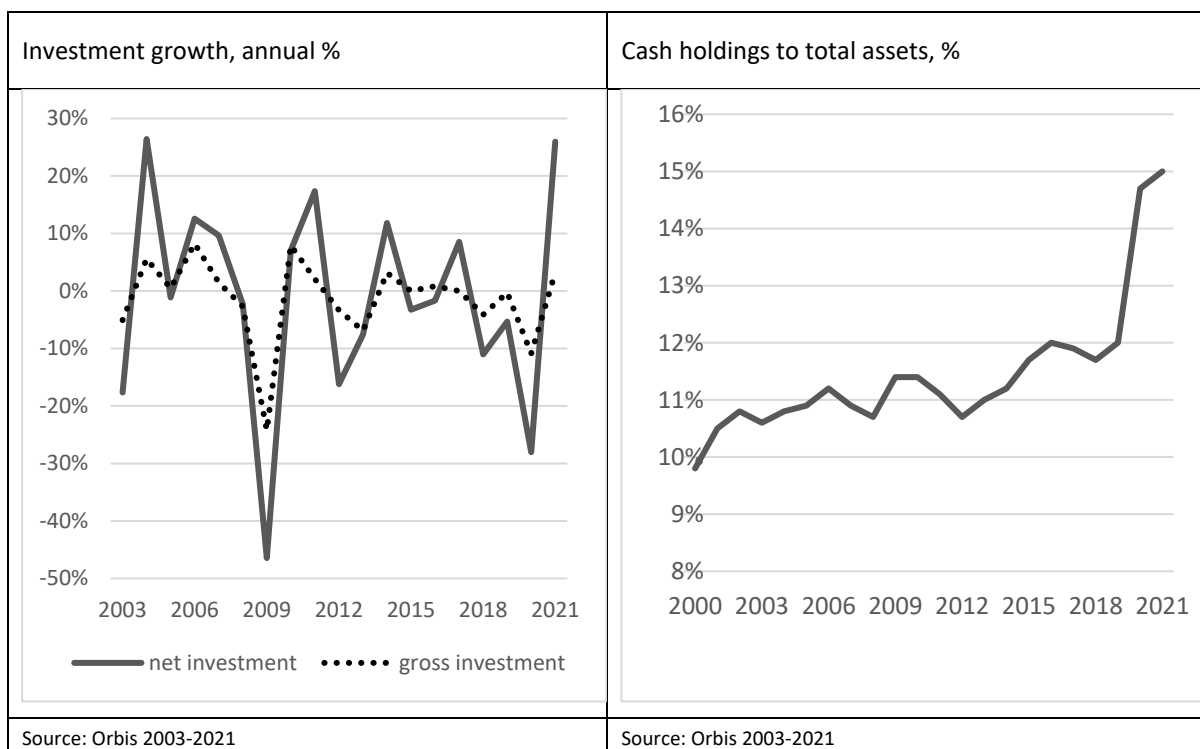
# Annex

**Table A1: Descriptions and definitions of the main variables.**

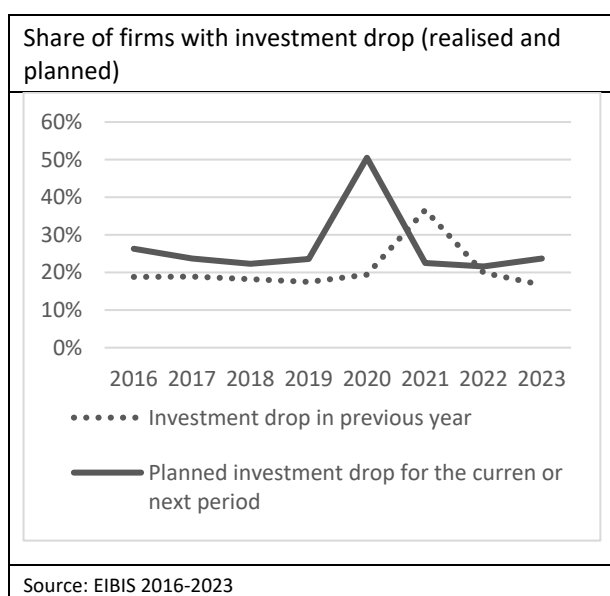
Variable	Description
<b>Main dependent variables</b>	
<b>Investment gap</b>	Firms declaring that investment over the last 3 years was too little to ensure the success of their business going forward
<b>Realised investment drop</b>	Firms with less investment than in the previous year
<b>Planned investment drop</b>	Firms for which total investment expected for the current or next year is expected to be less than in the previous year
<b>Net investment rate</b>	Difference of fixed assets between two subsequent years, over previous fixed assets
<b>Main variables</b>	
External funding difficulties	Firms with either structural or cyclical funding difficulties
structural	Those viable firms that need a loan but they either were discouraged, did not receive it or received less than they needed. Not registering losses for three consecutive years
cyclical	Firms expecting their external financing conditions to deteriorate. Not registering losses for three consecutive years
Internal Funding difficulties	Firms declaring that their internal finance conditions have deteriorated. Not registering losses for three consecutive years.
<b>Main control variables</b>	
<b>Firm size</b>	4 size classes, micro (23% of observations), small (34% of obs), medium (29% of obs) and large (15% of obs).
<b>Sector</b>	Broad sector groups (dummy variables): Manufacturing (28% of observations); Construction (22% of obs); Services (26% of obs); and Infrastructure (23% of obs).
<b>Country group</b>	Countries are clustered into three groups: "Center and East"; "South"; and "North-West". "Center and East": BG, CZ, HR, HU, LT, LV, PL, RO, SI, SK., "South": CY, ES, FR, GR, IT, MT, PT, "North-West": AT, BE, DE, DK, EE, FI, IE, LU, NL, SE.
<b>Profitability</b>	Cash flow (profit plus depreciation) over average of total assets (current and preceding year)
<b>Financial Leverage</b>	Sum of loans and long-term debt over total assets
<b>Cash holdings</b>	Amount of cash and cash equivalents over total assets
<b>Cash flow</b>	Net income minus changes in working capital over total assets
<b>ROA</b>	ROA is calculated by dividing a firm's net income by the average of its total assets, multiplied by 100.
<b>Firms' growth</b>	Difference of total assets between two subsequent years, over previous total assets
<b>Labour productivity</b>	Labor productivity is calculated by dividing the total output by the total number of employees.
<b>Firm growth</b>	Difference between total assets at time t and
<b>Obstacle - Uncertainty</b>	To what extent is uncertainty about the future an obstacle to investment activities
<b>Obstacle - Lack of demand</b>	To what extent is demand for product and services an obstacle to investment activities
<b>Obstacle - Lack of skilled staff</b>	To what extent is availability of staff with the right skills an obstacle to investment activities

<b>Obstacle – Digital infrastructure</b>	To what extent is access to digital infrastructure an obstacle to investment activities
<b>Leading innovators</b>	Firms with (substantial) R&D and products new to the country or the global market
<b>Digital</b>	Firm implemented digital technology in parts of business or organised entire business around it
<b>Green</b>	Already invested or plan to invest to tackle impact of weather events or carbon emission

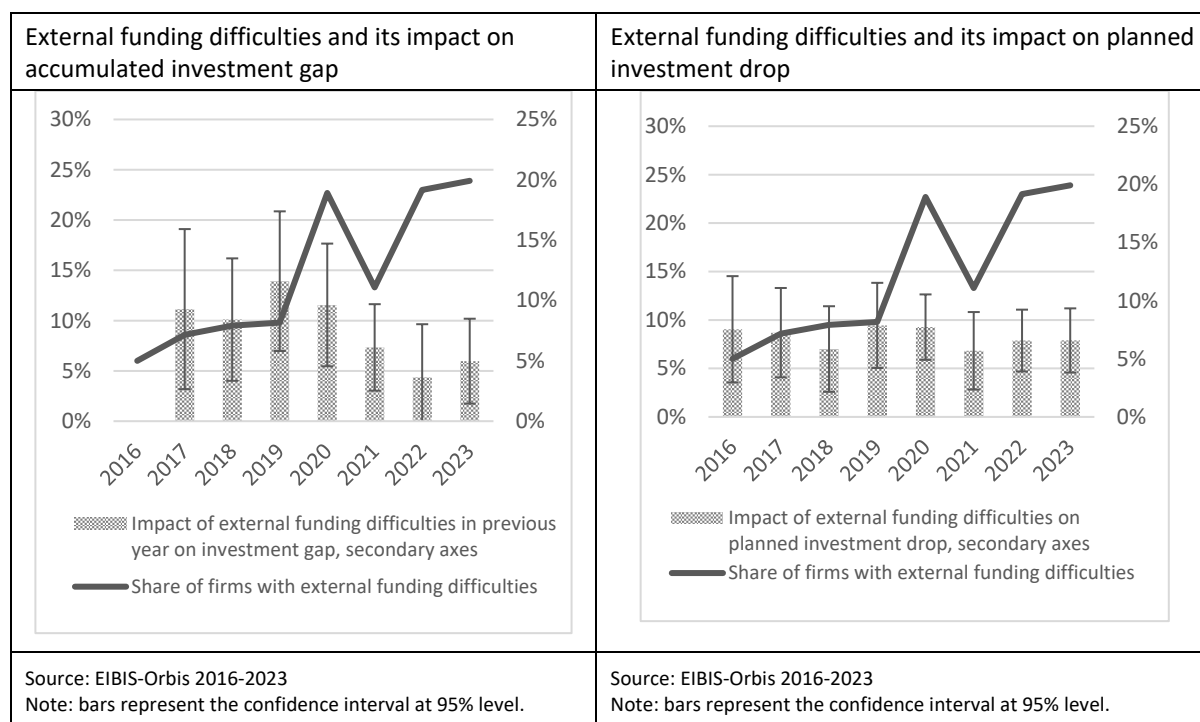
**Figure A1. Investment trends and cash holdings: balance sheet data**



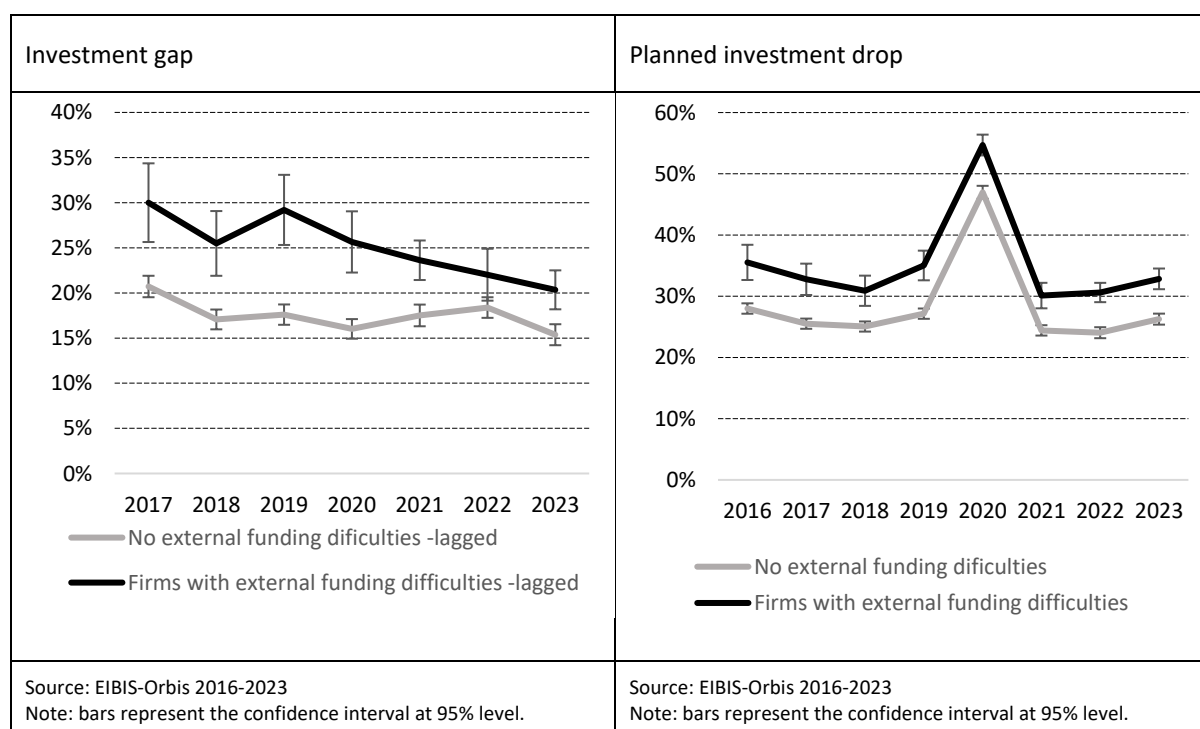
**Figure A2. Investment trends based on survey response**



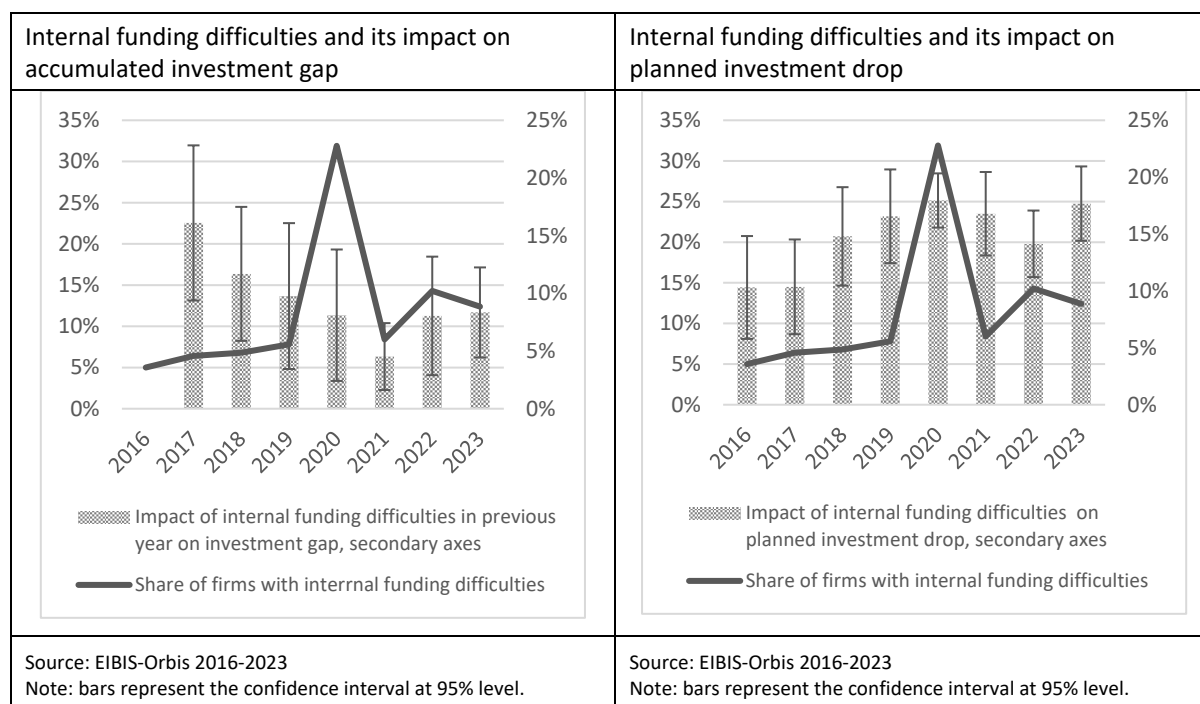
**Figure A3. External funding difficulties and its impact on investments**



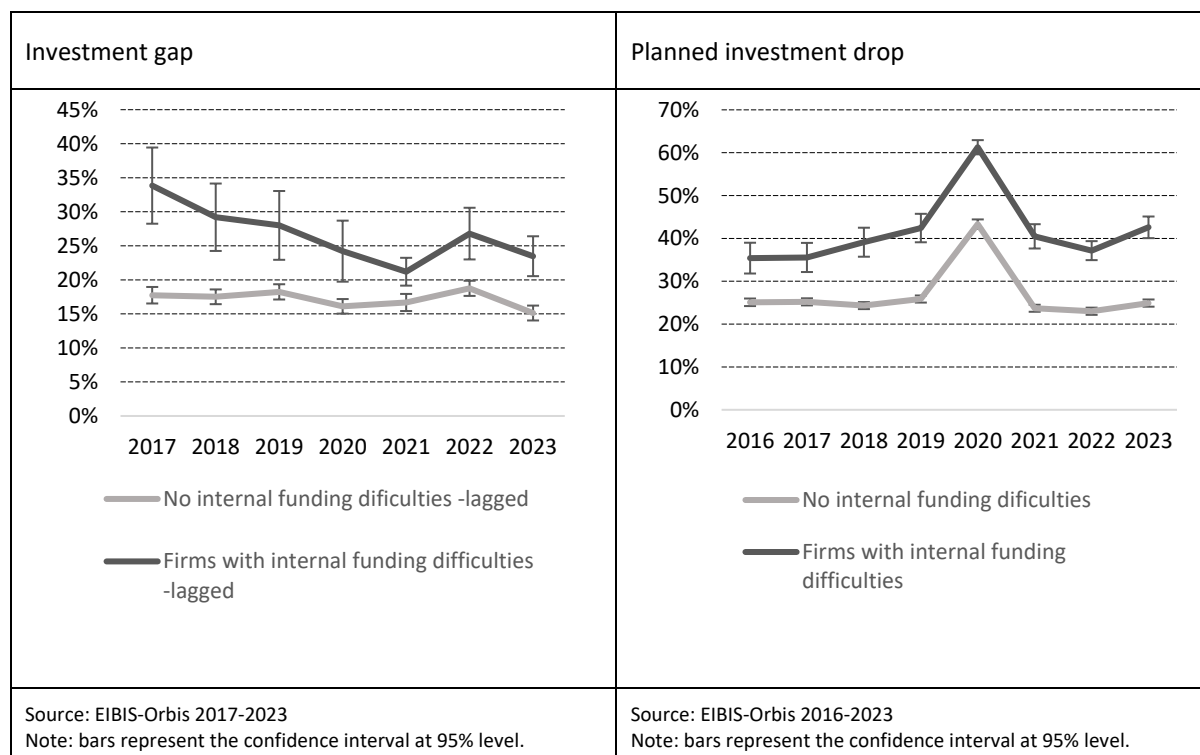
**Figure A4. Expected probability of investment gap and planned investment drop with and without external funding difficulties -annually**



**Figure A5. Internal funding difficulties and its impact on investments -annually**



**Figure A6. Expected probability of investment gap and planned investment drop with and without internal funding difficulties -annually**



**Table A2. Difference in externa funding difficulties among different firm groups**

**t-test external funding difficulties, by firm size**

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
Large	14,298	<b>0.133</b>	0.003	0.340	0.127 0.139
Sme	81,088	<b>0.182</b>	0.001	0.386	0.180 0.185
Combined	95,386	0.175	0.001	0.380	0.173 0.177
Diff		-0.049	0.003		-0.056 -0.043
diff = mean(large) - mean(SMEs)					t= -14.3412
H0: diff = 0					Degrees of freedom= 95384
Ha: diff < 0			Ha: diff != 0		Ha: diff > 0
Pr(T < t) = 0.0000			Pr( T  >  t ) = 0.0000		Pr(T > t) = 1.0000

**t-test structural external funding difficulties, by firm size**

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
Large	14,298	<b>0.133</b>	0.003	0.340	0.127 0.139
Sme	81,088	<b>0.182</b>	0.001	0.386	0.180 0.185
Combined	95,386	0.175	0.001	0.380	0.173 0.177
Diff		-0.049	0.003		-0.056 -0.043
diff = mean(large) - mean(SMEs)					t= -14.1677
H0: diff = 0					Degrees of freedom= 95384
Ha: diff < 0			Ha: diff != 0		Ha: diff > 0
Pr(T < t) = 0.0000			Pr( T  >  t ) = 0.0000		Pr(T > t) = 1.0000

**t-test cyclical external funding difficulties, by firm size**

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
Large	14,298	0.112	0.003	0.315	0.106 0.117
Sme	81,088	0.148	0.001	0.355	0.145 0.150
Combined	95,386	0.142	0.001	0.349	0.140 0.145
Diff		-0.036	0.003		-0.042 -0.030
diff = mean(large) - mean(SMEs)					t= -11.4161
H0: diff = 0					Degrees of freedom= 95384
Ha: diff < 0			Ha: diff != 0		Ha: diff > 0
Pr(T < t) = 0.0000			Pr( T  >  t ) = 0.0000		Pr(T > t) = 1.0000

### t-test external funding difficulties by leading innovativeness

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
Not Leading Innovators	64,987	<b>0.176</b>	0.001	0.381	0.173 0.179
Leading innovators	4,742	<b>0.206</b>	0.006	0.405	0.195 0.218
Combined	69,729	0.178	0.001	0.383	0.176 0.181
Diff		-0.030	0.006		-0.041 -0.019
diff = mean (Not Leading Innov.) - mean(Leading Innov.)					t= -5.1987
H0: diff = 0					Degrees of freedom= 69727
Ha: diff < 0					Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0000					Pr(T > t) = 1.0000
					Pr( T  >  t ) = 0.0000

### t-test structural external funding difficulties by leading innovativeness

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
Not Leading Innovators	64,987	0.083	0.001	0.276	0.081 0.085
Leading innovators	4,745	0.108	0.005	0.311	0.099 0.117
Combined	69,732	0.085	0.001	0.278	0.083 0.087
Diff		-0.025	0.004		-0.033 -0.017
diff = mean (Not Leading Innov.) - mean(Leading Innov.)					t= -6.0112
H0: diff = 0					Degrees of freedom= 69730
Ha: diff < 0					Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0000					Pr(T > t) = 1.0000
					Pr( T  >  t ) = 0.0000

### t-test cyclical external funding difficulties by leading innovativeness

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
Not Leading Innovators	64,987	0.143	0.001	0.350	0.140 0.146
Leading innovators	4,745	0.170	0.005	0.376	0.160 0.181
Combined	69,732	0.145	0.001	0.352	0.142 0.147
Diff		-0.027	0.005		-0.038 -0.017
diff = mean (Not Leading Innov.) - mean(Leading Innov.)					t= -5.1565
H0: diff = 0					Degrees of freedom= 69730
Ha: diff < 0					Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0000					Pr(T > t) = 1.0000
					Pr( T  >  t ) = 0.0000

**t-test structural external funding difficulties by green investors**

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
No green inv	20,127	0.090	0.002	0.286	0.086 0.094
Green inv	27,322	0.077	0.002	0.267	0.074 0.080
Combined	47,449	0.083	0.001	0.275	0.080 0.085
Diff		0.013	0.003		0.008 0.018
diff = mean (No Green inv) - mean(Green inv)					t= - 5.1032
H0: diff = 0					Degrees of freedom= 47447
Ha: diff < 0					Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 1.0000					Pr(T > t) = 0.0000
					Pr( T  >  t ) = 0.0000

**t-test cyclical external funding difficulties by green investors**

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
No green inv		0.205	0.003	0.403	0.199 0.210
Green inv		0.212	0.002	0.408	0.207 0.217
Combined		0.209	0.002	0.406	0.205 0.212
Diff		-0.007	0.004		-0.015 0.000
diff = mean (No Green inv) - mean(Green inv)					t= -1.8837
H0: diff = 0					Degrees of freedom= 47447
Ha: diff < 0					Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0298					Pr(T > t) = 0.9702
					Pr( T  >  t ) = 0.0596

### t-test structural external funding difficulties by digitalisation

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
Non digital	26,821	0.085	0.002	0.279	0.082 0.089
Digital	32,921	0.076	0.001	0.266	0.074 0.079
Combined	59,742	0.080	0.001	0.272	0.078 0.083
Diff		0.009	0.002		0.004 0.013
diff = mean (Non digital) – mean (Digital)					t= 3.9545
H0: diff = 0					Degrees of freedom= 59740
Ha: diff < 0			Ha: diff != 0		Ha: diff > 0
Pr(T < t) = 1.0000			Pr( T  >  t ) = 0.0001		Pr(T > t) = 0.0000

### t-test cyclical external funding difficulties by digitalisation

Group	Obs	Mean	Std. err.	Std. dev.	[95% conf. interval]
Non digital		0.182	0.002	0.386	0.178 0.187
Digital		0.186	0.002	0.389	0.182 0.190
Combined		0.184	0.002	0.388	0.181 0.187
Diff					-0.004
diff = mean (Non digital) – mean (Digital)					t= -1.2123
H0: diff = 0					Degrees of freedom= 59740
Ha: diff < 0			Ha: diff != 0		Ha: diff > 0
Pr(T < t) = 0.1127			Pr( T  >  t ) = 0.2254		Pr(T > t) = 0.8873

**Table A3: Impact of external financing difficulties on performance and growth**

Impact of external financing difficulties on performance (average ROA for the next 2 years)

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Average ROA</b>	Unmatched	2.669	4.968	-2.299	0.169	-13.63
	ATT	2.672	3.927	-1.255	0.204	-6.14

Impact of external financing difficulties on performance (average ROA for the next 2 years)

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Firms' growth</b>	Unmatched	0.051	0.070	-0.020	0.004	-5.26
	ATT	0.050	0.062	-0.011	0.004	-2.56

Impact of external financing difficulties on performance (average ROA for the next 2 years) when there is no investment gap

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Average ROA</b>	Unmatched	3.799516	5.134291	-1.33478	0.206745	6.46
	ATT	3.799516	5.030291	-1.23077	0.241451	5.1



Impact of external financing difficulties on performance (average ROA for the next 2 years) when there is an investment gap

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Average</b>						
<b>ROA</b>	Unmatched	1.473463	2.942958	-1.4695	0.41623	3.53
	ATT	1.475632	3.219615	-1.74398	0.493656	3.53

Impact of external financing difficulties on performance (average ROA for the next 2 years) when there is no planned investment drop

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Average</b>						
<b>ROA</b>	Unmatched	3.814995	5.117169	-1.30217	0.240583	5.41
	ATT	3.814995	5.028994	-1.214	0.275744	4.4

Impact of external financing difficulties on performance (average ROA for the next 2 years) when there is a planned investment drop

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Average</b>						
<b>ROA</b>	Unmatched	2.584484	4.042739	-1.45825	0.297214	4.91
	ATT	2.584484	3.790406	-1.20592	0.342256	3.52

Impact of external financing difficulties on Firms growth (average total assets growth for the next 2 years) when there is no investment gap

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Firms' growth</b>	Unmatched	0.053683	0.07256	-0.01888	0.004695	4.02
	ATT	0.053706	0.070255	-0.01655	0.005838	2.83

Impact of external financing difficulties on Firms growth (average total assets growth for the next 2 years) when there is an investment gap

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Firms' growth</b>	Unmatched	0.03581	0.053853	-0.01804	0.008507	2.12
	ATT	0.036033	0.049824	-0.01379	0.010766	1.28

Impact of external financing difficulties on Firms growth (average total assets growth for the next 2 years) when there is no planned investment drop

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Firms' growth</b>	Unmatched	0.065641	0.081411	-0.01577	0.005717	2.76
	ATT	0.065641	0.082377	-0.01674	0.007264	2.3

Impact of external financing difficulties on Firms growth (average total assets growth for the next 2 years) when there is a planned investment drop

Variable	Sample	Treated	Controls	Difference	S.E.	T stat
<b>Firms' growth</b>	Unmatched	0.02887	0.043262	-0.01439	0.005641	2.55
	ATT	0.02887	0.03956	-0.01069	0.007054	1.52



# Do financing conditions pose a threat to the performance and transformation of SMEs?

December 2024

