



European SMEs' growth: the role of market-based finance and public financial support

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Abstract The study investigates the role of market-based finance and public financial support in aiding scaling up by European SMEs. First, we analyse the impact of public loan guarantee schemes on firms' access to market-based instruments. Second, we study whether firms' access to market-based finance and the use of public grants boost a firm's (ex post) growth. The analysis is based on a unique and original dataset of about 31,000 Eurozone firms in the 2009–2020 period. The study finds that firms' access to market-based finance is (i) driven positively by the previous use of public financial support schemes and (ii) has a positive

effect on subsequent growth. In particular, SMEs display relatively higher growth in fixed assets, while for large firms, growth is mainly driven by current assets. Moreover, SME issuers using public grants achieve significantly stronger growth than comparable firms.

Plain English Summary Improving access to market-based finance and public financial support schemes facilitates the scaling up of European SMEs. Public grants enable SMEs to access market-based finance and their subsequent growth. We analyse about 31,000 Eurozone non-financial firms in the period 2009–2020, for which we have information on firms' market-based finance access and their use of public grants. We demonstrate that the joint role of market-based finance and public financial support helps European SMEs scale up. The firms' access to market-based finance is driven positively by the previous use of public financial support schemes and considerably affects subsequent firms' growth. Deepening our analysis, grants-backed SMEs and more informationally opaque firms achieve significantly more robust growth when they issue new equity and bonds than comparable non-grants-backed firms. In sum, our research findings suggest that policymakers should consider all these aspects when establishing their public support policies since adequate access to external market-based finance for SMEs' investments is a crucial factor for the prosperity of SMEs and economic growth.

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1 Introduction

Sustaining business growth is one of the economic policy priorities of the European Union (EU). Few firms scale up in Europe, and, compared to the USA, there is a scale-up gap in the EU (Quas et al., 2022) with negative implications for aggregate productivity (OECD, 2014). Start-ups, young ventures, and small/medium-sized enterprises (SMEs) face many challenges in their scaling-up process, among which financing is one of the most critical (European Central Bank, 2014). Indeed, the financial constraints that SMEs and start-ups routinely face impinge on their survival and ability to grow. Compared to large firms, they encounter more obstacles in gaining access to finance and have less diversified funding sources (Berger & Udell, 2006; Jaffee & Russell, 1976; Stiglitz & Weiss, 1981). Even if SMEs still have limited access to market-based finance (European Central Bank, 2022), existing evidence confirms that it is crucial to become less reliant on bank lending, especially during credit crunches, intensified in bank risk-aversion periods (Berger & Udell, 2006) or following adverse shocks, such as the COVID-19 pandemic (Juergensen et al., 2020).

Policymakers and governments have engaged in several actions to alleviate the financial constraints faced by SMEs and to sustain their growth. First, they have focused on diversifying SMEs' funding sources through access to market-based finance. They have done so by implementing and developing the Capital Markets Union (CMU) action plan, intended to facilitate SME fundraising and financing start-ups and non-listed companies (European Commission, 2016). Second, especially during crises, policymakers intensified public-support measures in favour of SMEs; one of the most widespread is the credit guarantee scheme,¹ which offers direct support to access bank loans.

During the recent financial crises and the COVID-19 pandemic, there was an exponential growth in the global use of credit guarantee schemes (CGSs) as counter-cyclical policy tools (Altavilla et al., 2022; Cirera et al., 2021; Gourinchas et al., 2021). These measures certainly provide a benefit to SMEs, but they have also stimulated reflection on the possible disincentive effect they might have on the diversification of funding sources so crucial for smaller firms (OECD, 2018). However, this effect has most likely been offset during periods of loose monetary policy and quantitative easing, which has contributed to the increase of bond financing in the euro area (De Santis & Zaghini, 2021; Grosse-Rueschkamp et al., 2019).

This study assesses the effectiveness of access to market-based finance and the use of public financial support in fostering firm growth. Existing studies analyse these two aspects separately. Most studies confirm a positive relationship between a firm's access to market-based finance and its growth (Calomiris et al., 2021; Didier et al., 2021; Kim & Weisbach, 2008). Another strand of the literature analyses the role of public financial support and its implications for firm growth (Bertoni et al., 2018, 2019; Bonfim et al., 2023; Bradshaw, 2002; Caselli et al., 2019; Uesugi et al., 2010). Our study helps bridge these topics, filling a gap in the research on SMEs' access to finance by analysing the joint role of market-based finance and public financial support in aiding the scaling up of European SMEs. Specifically, our study seeks to answer two main research questions: Does the use of public grants influence SMEs' access to market-based finance? Do SME issuers that have also used public grants grow faster than issuers that have not?

Unlike existing studies dealing with capital market financing and firm growth for public, listed firms (Calomiris et al., 2021; Didier et al., 2021; Kim & Weisbach, 2008), we adopt a wider definition of market-based finance that goes beyond merely issuing securities (equity and bonds) on public markets. As our focus is SMEs and unlisted firms, we include the going-public option (i.e., the access to a public—bond or equity—markets) and the private placement channel, which is a significant avenue through which unlisted firms can raise new equity or issue corporate bonds without accessing a public market. In the EU markets, the private placement channel is regularly used for financing

¹ Other forms of support include direct lending, co-funding, interest rate subsidies, and R&D grants.

growth, thanks to the re-engagement of venture capital and private equity funds (Goncalves Raposo & Lehmann, 2019).²

We assemble a comprehensive dataset of around 65,000 observations from 2009 to 2020 for 31,026 non-financial firms. The dataset combines firm-level survey data for the 11 largest Eurozone countries from the European Central Bank/European Commission Survey on the Access to Finance of Enterprises (SAFE) with information on balance sheets and profit and loss accounts derived from the Bureau van Dijk ORBIS (hereafter ORBIS) dataset. In particular, we collect data from the responses of survey participants to questions concerning their access to market-based funding and the use of public grants. We believe that, despite being survey based, the SAFE dataset is suitable for building a significant sample of EU SMEs that have used market-based funding sources and public financial support schemes; the dataset covers a very large portion (around 88% in our matched database) of unlisted EU-based SMEs and listed firms. Moreover, there is no readily available firm-level database on the actual use of public grants by SMEs for several European countries. To the best of our knowledge, this is the first paper that addresses this issue using SAFE data. The SAFE dataset has been extensively used, primarily to assess SMEs' bank financing and credit constraints (e.g., Ferrando & Griesshaber, 2011; Holton et al., 2014; Lawless et al., 2015) and funding diversification (Bongini et al., 2021; Lawless et al., 2015; Moritz et al., 2016). More recently, the survey has been employed in the study of credit rationing and borrower discouragement among Eurozone SMEs (Anastasiou et al., 2022; Ferrando & Mulier, 2022; Kallandranis et al., 2023).

² For example, Invest Europe (2022) shows that the total equity amount invested by private equity and venture capital firms in European companies in 2021—€138bn—far exceeds levels recorded in any year and represents an increase of 51% from 2020's total of €91 bn; 8,895 companies received investment, 13% above the average for the previous 5 years. See also European Investment Fund (2022). Meanwhile, the private placement channel of the bond market has grown rapidly in Europe. A recent study by PricewaterhouseCoopers (2022) records 3,146 transactions with private equity participation in 2021, with a total deal value of €217.4 billion. The 5-year comparison shows this has almost doubled, both in terms of transaction volume and value: in 2016, a total of 1,863 deals took place with a total value of €99 billion.

From a methodological point of view, we employ propensity score matching estimators to assess the impact of using market-based instruments on firm growth, considering the role of public grants.

Among our main findings, we observe that (i) EU-based SMEs that have used public grants have a significantly higher likelihood of accessing market-based finance; (ii) SMEs' access to market-based finance has a positive and robust ex post effect on the growth of total assets and tangible fixed assets 1 and 2 years subsequent to obtaining such funding compared to a matched control group of similar firms that have not issued securities; and (iii) among issuing firms, SMEs that have used public grants show significantly stronger ex post growth than issuers that have not used public grants.

The results of our study contribute, first, to the literature on capital market financing and firm growth with an original focus on unlisted, largely SME, firms. At the macro level, the beneficial relationship between capital market development and country growth rates has been long-established (Demirguc-Kunt & Maksimovic, 1998; Rajan and Zingales, 1998; Levine, 2002; Beck & Levine, 2004; Bekaert et al., 2005). However, this evidence does not necessarily imply that firms use the proceeds raised in these markets to expand their production capabilities and grow. Indeed, they may use capital market funds to achieve alternative business and financial strategies by, for example, renovating and substituting the assets in place (even working capital needs), renegotiating the outstanding corporate financial structure, restructuring or renewing the existing debt, and building up cash and financial assets reserves.

For these reasons, studies using firm-level data, such as this one, can provide additional insights into the relationship between firms issuing securities and changes in their productive capabilities and growth rates. The existing literature on this topic is less developed, and it is limited—to the best of our knowledge—to large and listed firms (Calomiris et al., 2021; Didier et al., 2021; Kim & Weisbach, 2008) with the notable exception of the recent study by Darmouni and Papoutsis (2022).

Our second contribution is to offer insights into the role of public financial support in influencing firms' funding diversification. We contribute, in particular, to the literature on the so-called "behavioural additionality" of public grants (Buisseret et al., 1995;

Feldman & Kelley, 2006; and Takalo & Tanayama, 2010)—that is, the change in SME behaviour, or the behaviour of others stakeholders towards SMEs, after receiving public financial support. In our research setting, we leverage existing studies that demonstrate the financial additionality of public support (Abraham & Schmukler, 2017; Boocock & Shariff, 2005; Levitsky, 1997) by testing whether public grants can be treated as “beneficial” shocks that relax the financial constraints on firms and that may, in turn, influence the association between capital raising and growth. Our empirical findings go in that direction: using public grants increases access to market-based finance instruments and helps SMEs achieve their growth potential faster than issuing firms without public grants. Thus, our results also contribute to the literature on the “economic additionality” of public grants (Bertoni et al., 2018, 2019; Bonfim et al., 2023; Bradshaw, 2002; Caselli et al., 2019; Uesugi et al., 2010).

As a final contribution, we also show that public grants appear to be an effective policy tool beyond times of crisis. Therefore, their use should not be limited to use as a counter-cyclical policy tool to help SMEs achieve financial sustainability and survive crises. When governments allocate financial resources to offer public grants, they support SMEs’ access to bank credit and market-based finance, promoting their growth. Our evidence contributes to the certification theory of public financial support (Hottenrott et al., 2018; Kleer, 2010; Lerner, 1999; Meuleman & DeMaeseeneire, 2012). According to this theory, in addition to the impact on direct cash injections, public grants can have secondary effects, functioning as a quality certification channel that informs capital markets investors about a small firm’s otherwise hard-to-observe prospects. Indeed, if public grants ease access to market-based finance and firm growth even during non-crisis periods, the certification hypothesis holds thanks to a permanent reduction of informational asymmetries that is not limited to scenarios of increased uncertainty, such as those triggered by financial crises and/or downturns in the economic cycle.

In sum, our findings suggest that policymakers should consider all these aspects when establishing their public-support policies since adequate access to external market-based finance for SME investment is a key factor for the prosperity of SMEs and economic growth.

The remainder of the article is organised as follows. In Sect. 2, we review the main literature and

introduce our research hypotheses. In Sect. 3, we describe our dataset and methodology. In Sects. 4 and 5, we discuss our results and conclude in Sect. 6.

2 Literature review and testable hypotheses

There is widespread consensus among scholars and policymakers that enhancing SMEs’ access to finance is important to economic growth. SMEs have a crucial role in improving social cohesion, reducing poverty, and fostering regional and local development (Amini, 2004; Beck et al., 2005; Peterson, 1977; Vecchi et al., 2014). However, their capacity to contribute to economic and social development can be hampered by the difficulties they face in accessing finance (Abraham & Schmukler, 2017; Cressy, 2002; Stiglitz & Weiss, 1981) and their limited capacity to diversify their funding. In particular, the empirical literature shows that SMEs rarely have direct access to European capital markets (Bongini et al., 2021; Lawless et al., 2015; Moritz et al., 2016).

For this reason, one strand of the literature focuses on the factors suitable to improve SME access to market-based funding, considering the effect of firm-specific (Bongini et al., 2021; Chemmanur & Fulghieri, 1999; Leland & Pyle, 1977; Pagano et al., 1998; Ritter, 1987) and country-level characteristics (Beck et al., 2008; de Jong et al., 2008; Kayo & Kimura, 2011; Lawless et al., 2015; Moritz et al., 2016; Psillaki & Daskalakis, 2009). These studies also distinguish among the determinants of a firm’s access to public markets (Ritter, 1987; Chemmanur & Fulghieri, 1994; Mikkelsen et al., 1997; Pagano & Roell, 1998; Pagano et al., 1998; Chemmanur & Fulghieri, 1999; Denis & Mihov, 2003; Hale & Santos, 2008; Mizen et al., 2009; Ritter et al., 2013; Gao et al., 2013; Badoer & James, 2016; Ewens & Farre-Mensa, 2020) and private placements (Black & Gilson, 1998; Bonini & Alkan, 2012; Carey et al., 1993; Cumming & Johan, 2007; Cumming et al., 2006; Diamond, 1991; Fenn et al., 1997; Grilli et al., 2018; Groh et al., 2010).

The EC CMU action plan and other public initiatives aim to sustain SME growth. At the firm level, the diversification of funding sources away from bank lending could significantly facilitate SMEs’ capacity to achieve their growth targets. For example, it can produce a positive spillover effect on bank lending conditions. Pagano et al. (1998) and Hale and Santos (2008) identify the benefit in terms of lower bank

interest rates for firms that have started issuing bonds and equity shares through initial public offerings. In addition, they show that the reduction in the cost of lending also encompasses banks not previously involved in a firm–bank relationship.

In more detail, two strands of the literature frame our research setting and are set out in Table 1. In the first row of Table 1 (cluster A) are studies that deal with the relationship between capital market financing and firm growth, albeit mainly in the context of large listed firms. In a second strand, studies consider the economic and financial impact of public financial support schemes on the ex post performance of grants-backed firms (cluster B, Table 1). The effects of public financial support are usually studied by looking at the SME's improved ability to access bank loan funding since such firms frequently face significant obstacles. Our study helps to build a bridge between these two domains of literature, filling a gap in research into SMEs' access to finance by analysing the joint role of market-based finance and public financial support in helping European SMEs scale up (cluster C).

Regarding the first strand of the literature, most studies confirm a positive relationship between firms' access to market-based finance and growth. This outcome is documented by Didier et al. (2021) in a multi-country set of public equity and bonds markets and by Calomiris et al. (2021) in emerging markets, with equity issuance having a positive impact on investment; Kim and Weisbach (2008) focus on the use of proceeds of public equity offerings in 38 countries. These studies have in common that they centre on large, listed firms. By contrast, only a few studies focus on smaller-sized and unlisted firms; for these firms, a positive relationship between capital market financing and growth has been established, but only for certain specific and limited segments of the public capital market. For instance, Colombelli (2010) and Revest and Sapio (2013) show that SME access to the UK AIM second-tier equity market translated into higher growth in terms of assets and employment; they also detect a negative effect on productivity. Overall, there is still little evidence of the relationship between market-based financing and growth for small firms. In particular, there is a definite gap in the contribution of private placements in market-based funding, vital for private, unlisted firms. The recent study by Darmouni and Papoutsi (2022) fills in part this gap by highlighting two stylised facts in the recent rise of

bond financing in the euro area that interests us. These are, first, the shift in the composition of bond issuers, with the entry of many smaller and riskier issuers. Second, new issues do more than replace bank loans, allowing these firms to invest and grow.

We turn now to the strand of literature that examines the role of public financial support and its implications for firm growth. Among government public-support measures, credit guarantee schemes (CGSs)³ are the most widespread. These have been implemented in almost every country (Pombo et al., 2015) and were reinforced recently to counteract the economic impact of the COVID-19 pandemic (OECD, 2020). Due to their extensive use, a vast literature concentrates on three main aspects: (i) *financial additionality*, that is, the increased availability of credit for targeted firms and enhanced financial conditions (Abraham & Schumaker, 2017; Boocock & Shariff, 2005; Cowling, 2010; Levitsky, 1997; Riding et al., 2007); (ii) *economic additionality*, namely the impact of public guarantees on employment, sales, and profit growth rates (Bertoni et al., 2018, 2019; Bonfim et al., 2023; Bradshaw, 2002; Caselli et al., 2019; Lelarge et al., 2010; Schmidt & van Elkan, 2010; Uesugi et al., 2010); and (iii) *financial sustainability*, namely the ability of the programmes to cover the funding costs and mitigate the borrowers' risk of default (Beck et al., 2008; Green, 2003; Saito & Tsuruta, 2018; Schich et al., 2017).

Another dimension of public financial support schemes in the literature that is relevant to our study is so-called *behavioural additionality* (Buisseret et al., 1995): government support may change SMEs' behaviour or affect other stakeholders' behaviour towards SMEs. In this sense, government-support policies (granting patents, awarding subsidies, grants, and so on) can act as a signal to other investors (Narayanan et al., 2000). For example, Feldman and Kelley (2006) and Takalo and Tanayama (2010) confirm that public R&D subsidies provide a positive signal to market-based investors, increasing funding from sources other than bank lending. Other scholars emphasise the networking effect; that is, these subsidies connect entrepreneurs and government officers in charge of business assistance in addition to establishing networks with financial

³ CGSs are mechanisms by which a third party (i.e., the public guarantor) pledges to repay some or all of the loan amount to the lender if the borrower defaults (Gozzi and Schumaker, 2016).

Table 1 Previous literature and research gaps

<i>Cluster</i>	<i>Main literature strands</i>	<i>Relevant papers</i>	<i>Approaches/theories applied</i>
A	Relationship between access to market-based finance and firms' growth	Didier et al. (2021); Calomiris et al. (2021); Kim and Weisbach (2008) Colombelli (2010); Revest and Sapio (2013); Darmouni and Papoutsi (2022)	The use of proceeds for corporate investments and growth in case of listed and large firms. Positive relationship between capital market financing (public bonds and equity issuances) and firms' growth The use of proceeds for corporate investments and growth in case of SMEs and unlisted firms. Positive relationship between access to public equity (Colombelli and Revest & Sapio) or public bonds (Darmouni & Papoutsi) and firms' growth
B	Relationship between public financial support and firms' growth	Levitsky (1997); Boocock and Shariff (2005); Riding et al. (2007); Cowling (2010); Abraham and Schmukler (2017) Bradshaw (2002); Lelarge et al. (2010); Schmidt and van Elkan (2010); Uesugi et al. (2010); Bertoni et al. (2018); Caselli et al. (2019); Bertoni et al. (2019); Bonfim et al. (2023) Buisseret et al. (1995); Narayanan et al. (2000); Feldman and Kelley (2006) and Takalo and Tanayama (2010); Kader et al. (2009) Lerner (1999); Kleer (2010); Meuleman and DeMaeseneire (2012); Hottenrott et al. (2018); Zhang and White (2016)	Financial additionality: the use of public support instruments (in particular CGSS) increases availability of credit for targeted firms and enhances financial conditions Economic additionality: the use of public support instruments (in particular CGSS) has a positive effect on employment, sales, and profit growth rates Behavioral additionality: the use of public support instruments changes the behaviour of the firms and the behaviour of other stakeholders towards SMEs Certification hypothesis: public grants carry out secondary effects informing capital markets investors about a SME hard-to-observe prospects reducing information asymmetries
C	Joint role of public financial support and access to market based finance on firms' growth	Research Gaps Can the use of public financial support have positive spillovers effects on SMEs access to market-based finance and, therefore, on subsequent growth?	Informational asymmetries for less visible, untried SMEs with limited track record (Berger & Udell, 1998, 2006); certification hypothesis that facilitate access to additional financing (Hottenrott et al., 2018); spillovers and externalities between different forms of entrepreneurial finance (Cumming et al., 2018)

Table 1 summarises the research background and the literature gaps the paper addresses. Cluster A refers to previous studies that deal with the relationship between capital market financing and firms' growth. Cluster B refers to a second literature field that discusses the economic and financial impact of public financial support schemes on the ex-post growth performances of grants-backed firms. Cluster C positions the paper's contribution in filling the literature gaps by analysing the joint role of market-based finance and public financial support in helping European SMEs scale up by assessing the growth performance of firms that have accessed market-based finance after using public financial support

institutions and other business associations (Kader et al., 2009). From this perspective, public financial support can improve SMEs' ability to access market-based funding, easing their financial constraints.

Some studies go beyond *behavioural additionality* and deepen the analysis of the relationship between public grants and access to finance by small firms, considering, in particular, the *certification hypothesis* of public financial support schemes (Hottenrott et al., 2018; Kleer, 2010; Lerner, 1999; Meuleman & DeMaeseneire, 2012). According to this theory, public grants can have secondary effects beyond their direct cash injections effect since they serve as a certification instrument that informs capital markets investors about a small firm's otherwise hard-to-observe prospects. Indeed, external market-based finance may be difficult to obtain due to the high uncertainty and opacity linked to the liability of newness for small and young firms (Zhang & White, 2016). Grants awarded through a careful and selective process can reduce informational asymmetries and uncertainty for private investors (Kleer, 2010). Because of this intense selection process, public grants function as quality certificates, thereby facilitating access to additional financing (Hottenrott et al., 2018).

In this context, it is in the interest of the funding agency to avoid a negative reputation by selecting potentially successful new ventures or small firms, thereby ensuring high-quality standards and the credibility of the whole process. In other words, in the presence of uncertainty, receiving a grant might be an indicator of the unobservable applicant's quality. Along this line of reasoning, Meuleman and DeMaeseneire (2012) show that obtaining an R&D grant has a positive certification effect that facilitates SMEs' subsequent access to financing; receiving a grant increases the likelihood of raising long-term debt. For external equity finance, Meuleman and DeMaeseneire (2012) find a positive effect on start-up SMEs. Hottenrott et al. (2018) also show that the effect of grant certification is stronger in more information-opaque sectors, confirming the role played by informational asymmetries in this context.

Other scholars discuss the role of externalities across different forms of entrepreneurial finance in mitigating financing and/or scale-up gaps (Cumming et al., 2018). These externalities include spillovers from one form of finance to another. Among the determinants of spillovers, an important one involves signalling. Effective signals through external certification, such

as a government grant, mitigate the information asymmetries faced by subsequent investors. In turn, these signals enable better matching of quality firms with investors. For these reasons, Cumming et al. (2018) warn researchers and policymakers of the potential biases from studying different components of entrepreneurial finance in isolation to avoid missing these meaningful spillovers. They also point out the relative scarcity of studies that focus on spillovers between public grants and access to market-based finance, i.e., private equity, private debt and IPOs.⁴

In this study, we consider the relationship between the use of public grants and firms' market-based finance access and how firms' capital market funding affects ensuing growth. Since we are dealing with an intertemporal issue, we need to develop testable hypotheses in our empirical setting to identify these potential key relationships. The argument on which we ground our investigation is the following.

First, public grants may represent a supply-side factor in the capital market that can drive the positive association between market-based finance and growth by relaxing constraints on firm financing. The certification theory of public financial support reminds us of the non-obvious intertemporal feature of public grants. Receiving grants may assist firms seeking access to finance to reduce the uncertainty borne by capital market investors considering firm financing in the presence of informational asymmetries. Public intervention could alleviate underinvestment by SMEs, but they normally need additional funding to sustain their activities over the longer term. Moreover, government grants may raise the applicant project's return above a reasonable hurdle rate for other financiers, making their potential new securities offerings more appealing (Feldman & Kelley, 2006). Still, since one of the main effects of receiving public grants is to improve a firm's solvency, there should be a positive relationship between the financial support received and the likelihood of attracting external market-based funding.

In sum, as the public financial support we deal with in our study is intended to facilitate SMEs' bank loan financing, we are keen to answer the relevant question of whether public financial support also incentivises SMEs' access to market-based finance as a result of the above-mentioned behavioural additionality/certification hypothesis. Second, we want to

⁴ See Table 1 in Cumming et al. (2018).

confirm whether the eventually positive relationship between a public grant and access to market-based finance directly translates into strong ex post growth, reinforcing the previously discussed finding of the economic additionality of public financial support.

Accordingly, we formulate and test the following hypotheses:

- **H.1:** Firms that have obtained public financial support are more likely to access market-based finance.

Based on the empirical findings of H.1, we state our second hypothesis as follows:

- **H.2:** Access to market-based finance is positively associated with the ex post growth of issuers (H2.1). The issuing firms that have used public grants obtain higher subsequent growth than issuers that have not (H2.2).

In this second hypothesis, we compare the growth of issuing firms that have used grants with the growth reported by issuing firms that have not used grants by applying a propensity score matching model. If our results confirm our H2.2, we can shed light on the role of public grants as an effective instrument to foster the SMEs growth capacity even through market-based finance. Accordingly, we could disclose that the grants' function is not limited to the conventional perceived emergency tool to counter the adverse effects of financial crises and economic downturns on the financial sustainability of small firms.

We summarise our research design in Fig. 1, which shows the relationships between the constructs of our model that link the public financial-support schemes to the ex post growth of SMEs through their access to market-based finance.

3 Data and method

3.1 Data and descriptive statistics

The dataset is obtained from the ECB/EC SAFE survey, which is run every 6 months to assess the latest developments in the financing conditions of Eurozone

firms. In one round, the survey covers the major Eurozone countries and in the second, all Eurozone and some neighbouring countries. In this study, we restrict the sample to 11 Eurozone countries that are present in all survey rounds.⁵ Our initial dataset consists of 31,026 firms for waves 1 to 22 of the survey, corresponding to the period January 2009–March 2020. The survey collects firm-level data on SMEs' financing needs, their diversification of financing sources, and their past experience with access to finance. The SAFE also provides other information on SME perceptions of economic and financial conditions and details various structural characteristics, including size, age, ownership type, and activity sector. The survey covers micro, small, medium-sized, and large firms⁶ and provides evidence across branches of economic activity and Eurozone countries.⁷

The survey dataset is matched with the ORBIS database to link firms' answers with their financial statements. For each firm, we consider its ex ante and ex post accounting information relative to the date of its survey participation. We eliminate observations that are inputting mistakes (e.g., negative total assets) and winsorise all variables at the top and bottom 1% of their distributions within each country and obtain a final dataset with 65,000 observations from 31,000 firms.⁸ As we are interested in measuring ex post SME growth, our matched database covers firms' accounting information 2 years after each wave of the SAFE survey, meaning that the second part of our analysis should stop at wave 22.

⁶ Surveyed firms are exclusively non-financial corporations. Size is based on number of employees: micro firms are defined as those with fewer than 10 employees, small firms as those with 10–49 employees, medium-sized firms as those with 50–249 employees, and large firms as those with 250 or more employees.

⁷ More information about SAFE survey is available at: https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/index.en.html. Detailed information on the SAFE weighting methodology for the survey sample selection is available at: <https://www.ecb.europa.eu/stats/pdf/surveys/sme/ecb.safemi.en.pdf>

⁸ Concerning the panel structure of our dataset, we emphasize that the original Eurozone sample includes a rotating panel of Eurozone firms, meaning that firms can be included in more than one wave, although not always in consecutive waves. In the final sample, less than 25% of the firms are present for two or more consecutive years. This greatly limits the panel dimension of the data (Bongini et al., 2021).

⁵ Austria, Belgium, Germany, Spain, Italy, Finland, France, Netherlands, Portugal, Greece, and Ireland.

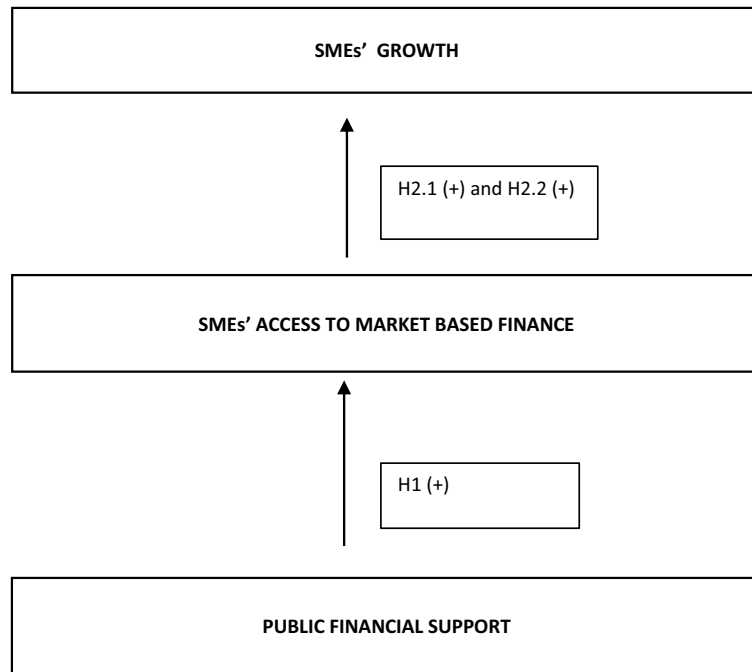


Fig. 1 Research model structure. Figure 1 illustrates our research model structure from a logical and timeline point of view. Our H1, in the bottom side of the figure, is our testable hypothesis investigating whether firms that have obtained public financial support are more likely to access market-based finance. Based on the empirical findings of H1, we state our second hypothesis whether access to market-based finance is positively associated with the ex-post growth of issuers (H2.1); and whether the issuing firms that have used public

grants obtain higher subsequent growth than issuers that have not (H2.2). The theoretical motivation of the two hypotheses is based on the certification theory of public financial support, according to which grants may serve as a certification of the recipient quality that may reduce informational asymmetries easing firms' market-based access and their subsequent growth. For testing H1 we implement a probit regression analysis; for the second hypothesis, we apply a propensity score matching model

Table 2 provides some descriptive statistics on the firm characteristics and financial ratios for our main sample. Firms are, on average, 26 years old, 3% are listed, and more than 88% are SMEs. We also consider a firm's external funding needs through a measure of the financing gap: this is the difference between a firm's investments and its internal funds measured as the sum of the change in fixed assets and in working capital for the previous year minus cash flows, divided by total assets, to scale for firm size (Ferrando & Ruggieri, 2018). On average, the financial gap is negative and for more than half the sample, cash flows are greater than the change in fixed assets and working capital. Firms in the sample show a rather moderate financial leverage ratio of 0.21, with some ability to generate cash flows to pay off their current obligations. The average cash to total assets and cash to current liabilities ratios stand at 0.11 and

0.51, respectively. For completeness, we report the asset coverage ratio; the average for the sample is around 4, showing some leeway by the average firm in our sample in terms of solvency, and the current ratio, which also looks relatively sound at 2.34. As regards economic performance, operating profitability is about 8% (measured by ROA), and sales growth rate is around 9%.

We collect three relevant variables from the SAFE survey that are not otherwise available in traditional databases. The first variable is access to market-based finance. Firms are asked in the survey whether they have used market-based instruments (either new equity or debt securities) in the previous 6 months. These instruments include the option of going public (access to a public bond or equity markets) and the private placement channel, through which firms can raise new equity or issue bonds through transactions

Table 2 Descriptive statistics

<i>Firms' characteristics</i>	Observation	Mean	Std. dev	p5	p25	Median	p75	p95
Age	64,581	26.020	18.840	5.000	13.000	22.000	34.000	59.000
Listed	64,581	0.037	0.190	0.000	0.000	0.000	0.000	1.000
SMEs	64,581	0.882	0.322	0.000	1.000	1.000	1.000	1.000
Financing gap	64,581	-0.061	0.194	-0.345	-0.142	-0.058	0.020	0.223
Financial leverage	64,581	0.213	0.215	0.000	0.018	0.157	0.345	0.624
Cash/TA	64,581	0.114	0.147	0.001	0.013	0.055	0.157	0.434
Cash/current liabilities	64,581	0.512	1.368	0.001	0.030	0.133	0.463	1.900
Current ratio	64,581	2.340	4.481	0.466	1.040	1.425	2.174	5.563
Asset coverage	64,581	3.977	9.324	0.284	0.926	1.468	3.000	14.417
Sales growth	64,581	0.089	0.999	-0.325	-0.075	0.019	0.118	0.479
Profitability	64,581	0.086	0.118	-0.079	0.033	0.076	0.134	0.281
<i>Survey variables</i>								
Access to MBF	64,581	0.041	0.199	0.000	0.000	0.000	0.000	1.000
Grants	64,581	0.150	0.367	0.000	0.000	0.000	0.000	1.000
Financial support sentiment	64,581	0.066	0.248	0.000	0.000	0.000	0.000	1.000

Source: Matched database SAFE-Orbis. All firms (large and SMEs) in our Eurozone country sample. See Appendix Table 13 for a description of the variables. SMEs are defined as firms with fewer than 250 employees. SAFE period analysed: 2009–2020. All firms' accounting data are lagged (i.e., $t - 1$) relative to SAFE survey variables

between the firm seeking funds and any private investors. This variable captures the effective ability (not simply willingness) of firms to access market-based finance. We construct a dichotomous variable, *Access to MBF*, that takes the value of one if firms report having used market-based instruments in the previous 6 months and zero otherwise. We avoid multiple new securities offerings from the same firm by dropping SAFE firms after the first report of using capital market funding; around 4% of firms accessed market-based finance.

The second variable concerns the use of public grants or subsidised loans. The variable *Grants* is calculated based on responses to the following SAFE question (Q4b): “Q4b. Have you drawn on such types of credit in the past six months? Grants or subsidised bank loan (involving support from public sources in the form of guarantees or reduced interest rate loan)”. Around 15% of the firms in our sample declared having used these forms of public financial support. Finally, we create a dummy variable, *Public Support Sentiment*, to reflect responses to the following question (Q11b): “Q11b. Would you say that the access to public financial support, including guarantees, have

improved, remained unchanged or deteriorated over the past six months?”. The dummy variable takes the value of 1 if a firm declares its access to public financial support has improved in the preceding 6 months; 6.6% of respondents identified an improvement.

Table 3 reports firm characteristics by size. As expected, SMEs are younger and less frequently listed than large firms. They are more indebted than large firms, but they show higher liquidity, measured by cash holdings and cash in relation to current liabilities. Moreover, we can see that SMEs are less profitable and have a lower current ratio than large firms, even if they show a higher asset coverage ratio. The financing gap is not statistically different for SMEs and large companies.

Table 4 shows the differences between firms that used market-based financial instruments and firms that did not. We observe that firms that issue market-based finance instruments are, on average, older than others and experience a greater financial gap and higher financial leverage than non-issuer firms. They are also economically and financially weaker than other firms in terms of profitability and liquidity. Nevertheless, they access grants and subsidised loans more frequently than firms that have not used market-based finance.

Table 3 Descriptive statistics by size: SMEs and large firms

<i>Firms' characteristics</i>	SMEs		Large		Difference
	Mean	Std. dev	Mean	Std. dev	
Age	24.710	17.129	35.870	26.600	-11.157***
Listed	0.027	0.163	0.114	0.318	-0.087***
Financing gap	-0.061	0.198	-0.061	0.162	0.000
Financial leverage	0.216	0.217	0.191	0.196	0.025***
Cash/TA	0.119	0.150	0.078	0.113	0.040***
Cash/current liabilities	0.525	1.354	0.417	1.461	0.108***
Current ratio	2.327	4.331	2.403	5.478	-0.076*
Asset coverage	4.149	9.539	2.688	7.403	1.461***
Sales growth	0.090	1.018	0.084	0.845	0.006
Profitability	0.085	0.120	0.089	0.103	-0.003***
<i>Survey variables</i>					
Access to MBF	0.038	0.191	0.067	0.250	-0.029***
Grants	0.147	0.354	0.174	0.379	-0.028***
Financial support sentiment	0.065	0.246	0.075	0.263	-0.010***

Source: Matched database SAFE-Orbis. SMEs and large firms subsample in our Eurozone country sample. See Appendix Table 13 for a description of the variables. SMEs are defined as firms with fewer than 250 employees. SAFE period analysed: 2009–2020. All firms' accounting data are lagged (i.e., $t-1$) relative to SAFE survey variables. Stars denote usual statistical intervals, namely, *** p value < 0.01; ** p value < 0.05; * p value < 0.1

Table 4 Descriptive statistics by access to market-based finance: issuers versus non-issuers

<i>Firms' characteristics</i>	Issuers		Non-issuers		Diff
	Mean	Std. dev	Mean	Std. dev	
Age	26.066	20.814	26.019	18.751	0.047
Listed	0.092	0.20	0.035	0.184	0.057***
SMEs	0.809	0.393	0.886	0.318	-0.076***
Financing gap	-0.050	0.200	-0.062	0.193	0.012***
Financial leverage	0.243	0.220	0.216	0.215	0.027***
Cash/TA	0.097	0.134	0.115	0.147	-0.018***
Cash/current liabilities	0.409	1.235	0.570	1.373	-0.161***
Current ratio	2.123	4.327	2.345	4.487	-0.222***
Asset coverage	3.551	8.656	3.995	9.352	-0.444***
Sales growth	0.089	1.094	0.089	0.995	0.000
Profitability	0.070	0.120	0.086	0.118	-0.016***
<i>Survey variables</i>					
Grants	0.241	0.428	0.146	0.353	0.095***
Financial support sentiment	0.062	0.241	0.066	0.248	-0.004

Source: Matched database SAFE-Orbis. All firms (large and SMEs) in our Eurozone country sample. See Appendix Table 13 for a description of the variables. SMEs are defined as firms with fewer than 250 employees. SAFE period analysed: 2009–2020. All firms' accounting data are lagged (i.e., $t-1$) relative to SAFE survey variables. Stars denote usual statistical intervals, namely, *** p value < 0.01; ** p value < 0.05; * p value < 0.1

3.2 Methodology

We employ a two-phase methodology that involves a probit regression and a subsequent propensity score matching model. In the first phase, we explore the potential relationship between the use of public grants and access to market-based finance, given other firm characteristics. In the second phase, we apply a propensity score matching estimator. In this way, we quantify (i) the ex post increase in growth (i.e., the differential growth) of firms that have issued new bonds or new equity, as compared to the control group of non-issuing firms and (ii) the ex post growth of public grant-backed issuing firms compared to issuers that have not used public grants. This procedure allows us to test the following counterfactual: what would have happened to the issuing firms if (i) they had not accessed market-based finance and (ii) they had accessed the market without using public grants.

3.2.1 First phase: probit regression model

We estimate the probability that firm i uses market-based instruments at time t using the following model:

$$\begin{aligned} \text{Prob}(\text{Access to MBF}_{i,t} = 1) = F(\alpha + \beta_1(\text{FinRatios})_{i,t-1} + \beta_2(\text{FirmChar})_{i,t-1} \\ + \beta_3(\text{Grants})_{i,t-1} + \beta_4\text{Wave} \\ + \beta_5\text{Country}_i + \beta_6\text{Sector}_i + \varepsilon_{i,t}), \end{aligned} \quad (1)$$

where *Access to MBF* _{i,t} is measured as the response (to the SAFE survey Q4)⁹ of firm i at time t , indicating the use of market-based instruments in the previous 6 months; the value α is a constant term, $\text{FinRatios}_{i,t-1}$ is the vector of firm-specific financial ratios (namely financing gap, financial leverage, profitability, and current ratio), and $\text{FirmChar}_{i,t-1}$ is a vector of other firm-specific controls. We define the firm characteristics relevant to increasing the probability of issuing market-based finance instruments, relying

on the findings of Bongini et al. (2021). We do not use all the determinants of this previous study due to a strong correlation between some of them (for example, past fixed asset growth) and our financing gap variable. For this reason, we focus on sales growth, age, a size dummy (SMEs or not), and listed status. Next, we include a dummy variable to control for the firm's use of public grants; *Grants* takes the value of one if the firm reported using grants in the past 6 months and zero otherwise. In an additional specification, we include an alternative dummy for the role of public support. This dummy (*Public-support sentiment*) aims to capture firm sentiment regarding the perceived improvement in access to public financial support. This variable allows us to identify how a change in the firms' sentiment regarding access to public financial support may influence the relationship between capital raising and firm growth. If we observe a positive effect of this variable on the likelihood of firms accessing market-based finance, we could conclude that public policies to support credit markets may have a positive impact on capital market funding, particularly by SMEs, by easing the financial constraints they normally face.

We use a pooled probit model with robust standard errors, and all our regressions include country, time, and sector dummies to capture unobserved heterogeneity and time effects in our data (Table 5). $F(\cdot)$ is a cumulative distribution function, namely, the standard normal distribution function Φ . Finally, all variables are lagged to mitigate endogeneity issues, except *Grants*. For this variable, we opt to use a lagged and a simultaneous variable in different models, since we observe a significant drop in the number of observations when using the lagged grants; only around 25% of the firms respond to two consecutive waves of the SAFE survey.¹⁰ Finally, we describe the variables in Appendix Table 13 and present the correlation matrix in Appendix Table 14.

⁹ The SAFE questions are the following (Q4h and Q4g): "Have you issued any debt securities in the past six months?" and "Have you issued equity in the past six months?" (ECB 2023).

¹⁰ For public-support sentiment, we use a simultaneous variable since we believe that a lagged variable, which in our SAFE survey context would mean a firm' sentiment shaped between 6 and 12 months before the event under consideration, would have a quite modest impact on our dependent variable.

Table 5 Probit estimation results

Dependent variable: equals 1 if firms report (on SAFE questionnaire) to have used market-based instruments (new equity or debt securities) in the previous six months and 0 otherwise

Panel A: Regression coefficients

Specification	1	2	3	4
Dependent variable	Access to MBF	Access to MBF	Access to MBF	Access to MBF
Financing gap	0.055 (0.054)	0.04 (0.055)	0.129 (0.105)	0.055 (0.054)
Financial leverage	0.304*** (0.043)	0.277*** (0.044)	0.215** (0.089)	0.303*** (0.043)
Sales growth	0.008 (0.007)	0.008 (0.007)	0.014 (0.014)	0.008 (0.007)
Listed	0.306*** (0.040)	0.301*** (0.040)	0.373*** (0.085)	0.305*** (0.040)
SMEs	-0.292*** (0.027)	-0.280*** (0.028)	-0.217*** (0.052)	-0.292*** (0.027)
Age	-0.0004 (0.0005)	-0.0005 (0.0005)	-0.0009 (0.001)	0.0004 (0.0005)
ROA	-0.454*** (0.089)	-0.480*** (0.090)	-0.339** (0.170)	-0.458*** (0.089)
Current ratio	-0.002 (0.003)	-0.001 (0.003)	-0.003 (0.004)	-0.002 (0.003)
Grants		0.253*** (0.024)		
Grants ($t-1$)			0.083* (0.048)	
Public support sentiment				0.104*** (0.039)
Constant	-2.311*** (0.075)	-2.395*** (0.077)	-2.712*** (0.184)	-2.327*** (0.076)
Observations	65,368	64,581	20,728	65,368
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Wave FE	Yes	Yes	Yes	Yes
VCE	Robust	Robust	Robust	Robust
Pseudo R^2	0.1146	0.1206	0.1136	0.1149

3.2.2 Second phase: a propensity score matching estimator

In our second step, we measure the ex post effect of access to market-based finance on firm growth. We analyse firms' growth across three broad dimensions: (1) total assets and components (fixed assets, split into tangible fixed assets, intangible fixed assets and current assets, split into other current assets, accounts receivable, and inventory); (2) internal reinvestment

performance (retained earnings); and 3) employment growth (number of employees).

The growth in the variable of interest is the ratio between the variable at time $t+1$ divided by the variable at time t minus 1, where t is the year the firm answered the survey. We also use the average annual growth for two years period to consider whether using market-based financial instruments may have effects over a longer time span.

Table 5 (Continued)

Panel B: Marginal effects			
<i>Specification</i>	2	3	4
<i>Dependent variable:</i>	Access to MBF	Access to MBF	Access to MBF
Financing gap	0.003 (0.004)	0.008 (0.007)	0.004 (0.004)
Financial leverage	0.022*** (0.004)	0.014** (0.006)	0.024*** (0.003)
Sales growth	0.0006 (0.0005)	0.0008 (0.0008)	0.0006 (0.0005)
Listed	0.024*** (0.003)	0.024*** (0.005)	0.024*** (0.003)
SMEs	-0.022*** (0.002)	-0.014*** (0.003)	-0.023*** (0.002)
Age	-0.00004 (0.00004)	-0.00005 (0.00006)	-0.00003 (0.00004)
ROA	-0.038*** (0.007)	-0.021** (0.011)	-0.036*** (0.007)
Current ratio	-0.0001 (0.0001)	-0.0002 (0.0002)	-0.0001 (0.0001)
Grants	0.020*** (0.002)		
Grants ($t - 1$)		0.005* (0.003)	
Public support sentiment			0.008*** (0.003)
Observations	64581	20728	65368
Industry FE	Yes	Yes	Yes
Country FE	Yes	Yes	Yes
Wave FE	Yes	Yes	Yes
VCE	Robust	Robust	Robust

Source: Matched database SAFE-Orbis. All firms (large and SMEs). Specification 1 refers to the baseline model. Specifications 2 and 3 include the grant dummy variable and its lag respectively. Specification 4 includes the public support sentiment variable. Panel A shows regression coefficients while Panel B displays marginal effects for only specifications that include grants variables. See Appendix Table 13 for a description of the variables. Standard errors are in parentheses. In all specifications, we include Industry FE, Country FE, and Wave FE. Pseudo R -squared is the McFadden Pseudo R -squared statistic. SAFE period analysed: 2009–2020. Stars denote usual statistical intervals, namely, *** p value < 0.01; ** p value < 0.05; * p value < 0.1

We use a matching estimator to assess the effect of market-based finance on firms' performance (Rubin, 2004). In formal notation, Y_{1i} is the value of the outcome variable, i.e., total assets growth, when unit i is subject to treatment (i.e., the issuance of the market-based instrument), and Y_{0i} is the value of the same variable when unit i is not subject to the treatment. The

objective is to measure the ATET (average treatment effect on the treated) group—(i.e., the effects on those firms that issued market-based instruments), that is, the average difference that would be found if everyone in the treated group received treatment, compared with that if none of these firms in the treated group received

treatment. Formally, given the knowledge of \mathbf{X} , the ATET is as follows:

$$\text{ATET}(X) = E(Y_1 - Y_0 | T = 1, X), \quad (2)$$

where $T=1$ refers to the treated group. The problem is that, for a treated unit i , Y_{0i} cannot be directly observed. Matching estimators (Imbens, 2004) provide a possible solution to this problem as they assign to treated individuals the missing potential outcomes Y_{0i} by using those of comparable firms not exposed to treatment.

Among the several matching estimators proposed in the literature (see Imbens, 2004), we choose propensity score matching with the k -nearest-neighbour algorithm (Li, 2012; Rosenbaum & Rubin, 1983, 1984). This estimator computes the ATET¹¹ by selecting n comparison units, where propensity scores are nearest to the treated unit to be analysed (Li, 2012). In our case, the treatment variable is the issuance of market-based instruments, while the outcome variable is represented by the growth of the variables mentioned above, calculated as the difference between the parameter under investigation 1 and 2 years after the event.

The propensity score $p(x)$ is the conditional probability of a firm issuing market-based financial instruments, given the value of the observed firm's characteristics. The dependent variable is the binary variable (*Access to MBF_{i,t}*) in the probit analysis, which indicates a firm's use of market-based finance; X_{t-1} is a vector of explanatory variables relative to firm i for the year before the use of market-based finance including those described above (financing gap, leverage, profitability, past sales growth, current ratio, listed status, age, use of grants, sector, country, and wave). What makes a variable relevant and appropriate is the extent to which it affects the probability of being subject to treatment. Formally:

$$p(x) = \Pr\{T = 1 | X_{t-1}\} = E(T | X_{t-1}) \quad (3)$$

In addition, the set of explanatory variables chosen has to satisfy the balancing property, which requires that after the matching, the distributions of the covariates and the propensity score between the treated and the control groups are similar.

We then employ the k -nearest neighbour matching algorithm and identify $k=4$ matched (control) observations from the sample of firms that did not use market-based finance (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 four matches¹² equally weighted, using nearest neighbour matching and controlling for heteroscedasticity (Abadie et al., 2001).¹³ The distance is measured in terms of the propensity score. Finally, the ATET takes the following form:

$$\text{ATET} = \frac{1}{N_1} \sum_{i \in \{T=1\}} (Y_{1,i} - \sum_{j \in \{C_i\}} h_{ij} Y_{0,j}) \quad (4)$$

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_{ij} is a weight assigned to the untreated firm j when it is matched with firm i .

We repeat the same approach to test the ex post growth of public grant-backed issuing firms (treated group) compared to issuing firms that have not used public grants (i.e., the control group). In this case, the propensity score is obtained using a probit model in which the dependent variable is the use of public grants in the previous 6 months (see Table 6, Column 5). The matching estimator is run on the whole sample, and we conduct an in-depth investigation of our data based on the subsamples of firms in terms of size (SMEs versus large companies), age (mature firms versus young firms), and listed status (firms that were already listed before responding to the survey versus unlisted firms).

¹¹ Heckman (1997) states that the ATET is relevant in the evaluation of the effects of a specific programme on the target for which it is designed. The ATE is less useful because it includes the effect on firms that are not targets of the programme.

¹² Empirical studies often use four matches, following Abadie and Imbens (2002), who demonstrate that four matches are sufficient to reduce the mean-squared error. We also conduct analysis with three matches, with similar results.

¹³ We ensure that, for each treated unit, the matched control group includes firms from the same country and in the same year.

Table 6 The output of the robustness checks

Specification	1	2	3	4	Selection model	
					5	6
Dependent variable	Access to MBF	Access to MBF	Access to MBF	Access to MBF	Grants	Access to MBF
Financing gap	0.033 (0.056)	0.038 (0.056)	0.046 (0.055)	0.052 (0.054)	0.201*** (0.035)	0.071 (0.178)
Fin. leverage	0.257*** (0.047)	0.271*** (0.045)	0.279*** (0.046)	0.297*** (0.044)	0.532*** (0.027)	0.229 (0.342)
Sales growth	0.008 (0.007)	0.008 (0.007)	0.008 (0.007)	0.008 (0.007)	0.004 (0.005)	-0.003 (0.016)
Listed	0.284*** (0.041)	0.285*** (0.041)	0.289*** (0.040)	0.291*** (0.040)	-0.045 (0.033)	0.282*** (0.095)
SMEs	-0.262*** (0.028)	-0.265*** (0.028)	-0.273*** (0.028)	-0.277*** (0.028)	-0.063*** (0.019)	-0.284*** (0.073)
Age	-0.0004 (0.0005)	-0.0004 (0.0005)	-0.0004 (0.0005)	-0.0003 (0.0005)	-0.0013*** (0.00003)	-0.001 (0.001)
ROA	-0.490*** (0.093)	-0.500*** (0.093)	-0.458*** (0.092)	-0.471*** (0.091)	-0.307*** (0.057)	-0.672** (0.280)
Current ratio	-0.0004 (0.003)	0.001 (0.003)	-0.001 (0.003)	0.001 (0.003)	-0.002 (0.002)	0.009 (0.009)
Grants	0.252*** (0.024)	0.253*** (0.024)				
Cash/Current liabilities		-0.009 (0.013)		-0.011 (0.013)	-0.056*** (0.009)	
Cash/TA	-0.109 (0.079)		-0.140* (0.078)			
Constant	-2.400*** (0.080)	-2.412*** (0.077)	-2.310*** (0.067)	-2.327*** (0.076)	-1.885 (-1.306)	-1.227*** (-0.04)
Observations	63308	63308	63807	65368		67709
Industry FE	Yes	Yes	Yes	Yes		Yes
Country FE	Yes	Yes	Yes	Yes		Yes
Wave FE	Yes	Yes	Yes	Yes		Yes
VCE	Robust	Robust	Robust	Robust		Robust
Pseudo R ²	0.1214	0.1213	0.1153	0.1149		
Selection model: Rho						-0.032 (0.740)
Selection model: Wald Chi2						1186.30

Source: matched database SAFE-Orbis. All firms (large and SMEs). Specifications 1–4 include additional variables in our main models (cash/current liabilities and cash/total assets). Specifications 5 and 6 refer to probit models with sample selection, in which the selection equation includes all our main variables plus cash/current liabilities. For this model, we report the rho correlation coefficient and the Wald Chi2. See Appendix Table 13 for a description of the variables. Standard errors are in parentheses. We include Industry FE, Country FE and Wave FE in all specifications. Pseudo R-squared is the McFadden Pseudo R-squared statistic. SAFE period analysed: 2009–2020. Stars denote usual statistical intervals: ***: p -value < 0.01; **: p -value < 0.05; *: p -value < 0.1

4 Empirical findings and discussion

We group our empirical results into four parts: in Sect. 4.1, we comment on findings related to how the use of public grants is associated with access to market-based finance. In Sect. 4.2, we present the robustness tests on the probit model. Here, we also introduce a probit model where the dependent variable is the use of public grants. In Sect. 4.3, we discuss our results on ex post growth performances of issuing firms, while in Sect. 4.4, we deal with ex post growth of public-grant-backed issuing firms.

4.1 Main results on the relationship between the use of public grants and access to market-based finance

Table 5 reports our main empirical results from the probit analysis on the use of market-based finance. Our baseline model is in Column 1 of Panel A (regression coefficients). In Columns 2 and 3, we add the two dummy variables on the public support (contemporaneous and lagged), while in Column 4, we consider the dummy variable on the perceived improvement in the access to public financial support schemes (i.e., public support sentiment) instead. We also set out the average marginal effects for the specifications that include public support in Panel B of Table 5.

We begin with the firm-related control variables. Our estimates show that, as expected, access to market-based finance is driven positively by financial leverage and negatively by profitability (see Bongini et al., 2021; Vismara et al., 2012; Gao et al., 2013; Ritter et al., 2013). We interpret these results as the effort of firms to exploit funding diversification opportunities when they are more indebted, while firms with higher profitability tend to use fewer external funding sources as expected by the pecking order theory of funding (Myers, 1984; Myers & Majluf, 1984). Looking at the margins, we see that the magnitude is slightly higher for profitability than for leverage. Conversely, the financing gap is not statistically significant. Regarding the firm size dummy, SMEs have a lower likelihood of accessing market-based finance, suggesting that they still encounter,

ceteris paribus, more difficulties than large firms. These results are in line with the life cycle theory of firms' financial choices (Berger & Udell, 1998; Carey et al., 1993; Meyer, 1998) and with several studies relative to firms' financial patterns in Europe (Bongini et al., 2021; De Jong et al., 2008; Lawless et al., 2015; Moritz et al., 2016; Psillaki & Daskalakis, 2009). In addition, the listed status drives access to market-based finance. Listed firms are more experienced in using market-based financial instruments than unlisted private companies that are more opaque; hence, a positive and statistically significant coefficient is also expected.

As regards the role of public financial support in particular, the empirical results show a statistically significant effect of grants on access to market-based finance (Columns 2 and 3). This provides new evidence for the so-called *behavioural additionality* hypothesis (Buisseret et al., 1995; Feldman & Kelley, 2006; Takalo & Tanayama, 2010). According to this hypothesis, government support may change SMEs' behaviour or that of other stakeholders towards SMEs as the use of public-support schemes conveys a positive signal to investors.

Intriguingly, even the perceived improved availability of public financial support schemes displays a statistically significant coefficient, suggesting that firms that believe these public aids are more available for their financing are more likely to use market-based financial instruments. As discussed above, this variable might serve as a proxy for positive changes in supply-side factors in capital markets that can lower firms' financial constraints and drive the association between capital raising and growth.

In terms of magnitude, our findings show that firms benefitting from public support issue new equity and/or bonds 2 percentage points more often than those that report no such support, though the percentage becomes smaller (around 1 percentage point) when we look at the public support sentiment variable. Overall, our results imply that public policies supporting credit markets may have a positive impact on SMEs' market-based funding through a relaxation of the financial constraints they normally face, confirming the research hypothesis H.1.

4.2 Robustness tests on probit analysis results

Next, we employ a set of tests to verify the robustness of our baseline results. As a first check of robustness, we address the possibility of omitted variable bias in our previous estimates. Therefore, we include two alternative liquidity variables in the analysis: cash and cash equivalent to the current liabilities and cash-to-total-assets ratios. The two variables are included since firms that can generate high levels of cash might not need to access market-based finance to diversify their funding sources. Columns 1 and 2 of Table 6 report the estimated coefficients, which show these variables do not significantly affect the firms' decision to access market-based finance.

As another robustness test on the access to market-based finance and the use of grants, we develop a sample selection model (Van de Ven & Van Praag, 1981), in which the dependent variable of the selection equation is the firm's use of grants. We want to check if, once the determinants of the use of public grants are taken into account, our estimates on the probability of access to market-based finance remain robust.

Specifically, there might be a source of bias in the probit estimates if the correlation between the error terms of the main equation and the selection equation is statistically different from zero. First, we detect the instrumental variable running the specification reported in Columns 3 and 4, where we delete the variable grants from covariates. We verify that the cash-to-current liabilities ratio is an effective instrumental variable since it does not influence market-based finance. Column 5 of Table 6 reports our estimates for the selection model, where we include all the main model variables and the cash to current liabilities ratio. The main model (Column 6) confirms the previous results, except for the coefficient of financial leverage. Our estimates for selection model ρ are not statistically different from zero, meaning that our probit estimates from Table 5 are unaffected by a selection bias on the variable *Grants*.

As a third robustness test, we run our analysis across different time windows. Notably, we should expect governments to strengthen public financial support schemes and SMEs to make greater use of them during financial and economic downturns. This should hold, in particular, when bank loans become more rationed and harder to obtain for

riskier and more informationally opaque borrowers, such as small businesses; this was seen recently during the COVID-19 pandemic. Accordingly, we check whether our results are confirmed for non-crisis periods in which public financial support schemes are "less critical" for the economic survival of SMEs.

Table 7 compares the results for the whole period (Columns 1 and 2) with those for 2014–2020, where we exclude the years more affected by the global financial crisis (2009–2010) and by the sovereign debt crisis (2011–2013). In the subsample (Columns 3 and 4), the public support variable coefficients increase significantly and become statistically more robust (especially the lagged grant variable). These findings reinforce the idea that, after periods of crises when growth opportunities become more available, the use of public grants can help firms overcome the financial constraints that they built during the preceding prolonged negative phase of the economic cycle.¹⁴

Moreover, this evidence also supports the certification theory of public financial support (Hottenrott et al., 2018; Kleer, 2010; Lerner, 1999; Meuleman & DeMaeseneire, 2012). According to this view, public grants lead to additional effects beyond the applicant's direct cash injection. They function as a quality certification channel informing capital market investors about a small firm's otherwise hard-to-evaluate prospects. Indeed, if public grants facilitate access by firms to market-based finance even during non-crisis periods, the certification hypothesis is confirmed by the reduction of informational asymmetries. This reduction is persistent and not merely limited to scenarios of amplified uncertainty such as those caused by financial crises and/or economic downturns. In

¹⁴ Relatedly, Harrison et al. (2022) discuss the implications of credit constraints facing small businesses. They point out that during a crisis period, increased lender risk instigates a reduced supply of credit, and in the subsequent post-crisis period, SMEs with escalated risk and declined profits endure significant difficulties in obtaining bank loans (what they refer to as the borrower-balance-sheet channel). In this way, they argue that supply effects initially emerge through the bank-lending channel and then shift to the borrower-balance-sheet channel over a period of financial crisis, thereby hampering firms' growth potential during the initial stages of a new positive phase of the economic cycle.

Table 7 Robustness checks on time windows

<i>Specification</i>	Main model (full period)		2014–2020 subsample	
	1	2	3	4
<i>Dependent variable</i>	Access to MBF	Access to MBF	Access to MBF	Access to MBF
Financing gap	0.04 (0.055)	0.129 (0.105)	0.052 (0.093)	0.155 (0.159)
Fin leverage	0.277*** (0.044)	0.215** (0.089)	0.477*** (0.067)	0.486*** (0.128)
Sales growth	0.008 (0.007)	0.014 (0.014)	0.016 (0.010)	0.029* (0.018)
Listed	0.301*** (0.040)	0.373*** (0.085)	0.430*** (0.059)	0.567*** (0.192)
SMEs	−0.280*** (0.028)	−0.217*** (0.052)	−0.318*** (0.040)	−0.172*** (0.077)
Age	−0.0005 (0.0005)	−0.0009 (0.001)	−0.0008 (0.0011)	−0.0007 (0.0014)
ROA	−0.480*** (0.090)	−0.339** (0.170)	−0.722*** (0.145)	−0.985** (0.253)
Current ratio	−0.001 (0.003)	−0.003 (0.004)	−0.005 (0.004)	0.004 (0.007)
Grants	0.253*** (0.024)		0.318*** (0.039)	
Grants ($t-1$)		0.083* (0.048)		0.198*** (0.076)
Constant	−2.395*** (0.077)	−2.712*** (0.184)	−2.388*** (0.103)	−2.692*** (0.227)
Observations	64581	20728	41652	14059
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Wave FE	Yes	Yes	Yes	Yes
VCE	Robust	Robust	Robust	Robust
Pseudo R^2	0.1206	0.1136	0.128	0.1366

Source: Matched database SAFE-Orbis. All firms (large and SMEs). Specifications 1 and 2 report the results of the full-sample period model employing the variables *Grants* (non-lagged and lagged) displayed in Table 6 (Columns 2 and 3). Specifications 3 and 4 show the results for the SAFE survey time window starting from 2014 up to March 2020 (i.e., SAFE round n. 22) across non-crisis times. See Appendix Table 13 for a description of the variables. Standard errors are in parentheses. All firms' accounting data are lagged (i.e., $t-1$) relative to SAFE survey variables. We include Industry FE, Country FE, and Wave FE in all specifications. Pseudo R squared is the McFadden Pseudo R squared statistic. Stars denote usual statistical intervals: *** p value < 0.01 ; ** p value < 0.05 ; * p value < 0.1

sum, we can conclude that public financial support schemes foster access to bank credit and market-based finance even in periods when those grants are less critical for SMEs' financial sustainability.

Finally, as a last set of robustness tests, we consider additional variables to control for country heterogeneity. In our main model, we control for country-fixed effects. We conduct additional tests to overcome the concern that this econometric choice may not be the best strategy; in Table A1 (see online supplementary materials), we report on additional tests in which we added a set of country variables (such as GDP, type of legal system, minority shareholder protection, level of corporate transparency, and intensity of public financial support). Furthermore, the country-specific public support variable (measured as the amount of government loan guarantees to SMEs scaled by GDP) can be useful to tackle another concern of our research setting. Our reliance on self-reported survey data might present some limitations despite our use of lagged firm-level accounting data for the survey variables. In this sense, a country variable that captures (as a proxy) the geographical dispersion in the public policies related to financial support of SMEs can offer insights in this direction. In addition, we test our results by removing the year-fixed (wave-fixed) effects to take account of time variation. We use a time trend variable to verify any discernible pattern (upward, downward, or flat) with respect to the time trajectory of the dependent variable.

Looking at the new probit results reported in Table A1, we observe that the time trend coefficient is negative and highly significant (see Specification 2), suggesting a downward pattern of the dependent variable across time (i.e., the firms' access to market-based finance is decreasing). In Specification 3, which includes our set of country variables, we find out that our main results do not substantially change despite the fact that the size of the country's economy (GDP), the legal system origin based on Common or Scandinavian law, and the level of minority shareholder protection show a significant positive association with the dependent variable. Regarding the country variable that captures the intensity of financial public support (Specification 4), the regression coefficient turns out to be positive but not significant. Again, our main results are largely confirmed.

In conclusion, the analysis presented in this section aimed to address the robustness of our results. This was achieved by incorporating additional variables and considering selection bias, which partially mitigate concerns related to endogeneity. It is important to note that there may be other sources of endogeneity attributable to

unobserved confounding variables, such as whether the firm pre-planned access to market-based finance before seeking public support certification. While these factors could be relevant, their practical observation poses significant challenges.

4.3 Main results on the growth of issuing firms

The propensity score is run using the specification that includes public support presented in Column 2 of Table 5. Figure 2 confirms that the propensity score distribution after the matching is similar for the treated and control groups.

Tables 8 and 9 display our main findings on the (ex post) effect of access to market-based finance on a firm's growth. Table 8 summarises the descriptive statistics on SMEs' ex post growth rates by splitting the sample into firms that have accessed the market and those that have not and firms that, before accessing the market, have used public grants or not. Table 9 exhibits the results based on the propensity score analysis. Both tables report the average rate of growth of 1 year (Panel A) and 2 years (Panel B) time-windows.

In general, the growth of SME issuers (Column 2, Table 8) has been robust in both time windows as they report an increase in total assets up to 3.4% after 1 year and 5.5% after 2 years. In particular, investment in fixed assets exhibits a robust growth rate of 7% and 10.9% for the 1- and 2-year periods, respectively. These rates are greater than for the unmatched subsample of non-issuing SMEs (Column 3, Table 8).

Based on the propensity score results, Table 9 reports the differential growth rates of issuing firms with respect to the matched control group of non-issuer firms. Column 1 reports the results for the whole sample and shows that access to market-based finance has a positive and statistically significant effect on subsequent growth in terms of assets (and most of its components) but not in terms of employment. In particular, the use of market-based finance increases the growth of issuers relative to the control group of non-issuers firms by 1.1% in terms of total assets (Panel A) in 1 year and by 2.1% considering the 2 years (Panel B). The overall growth is mainly attributed to fixed assets (2.7% after 1 year and 3.5% after 2 years) and within these results to the intangible component, where the growth rate differential reaches 4.8% in the 1-year window and 7.6% after 2 year. This supports the assumption that issuers' access to market-based instruments is carried out to invest and exploit growth

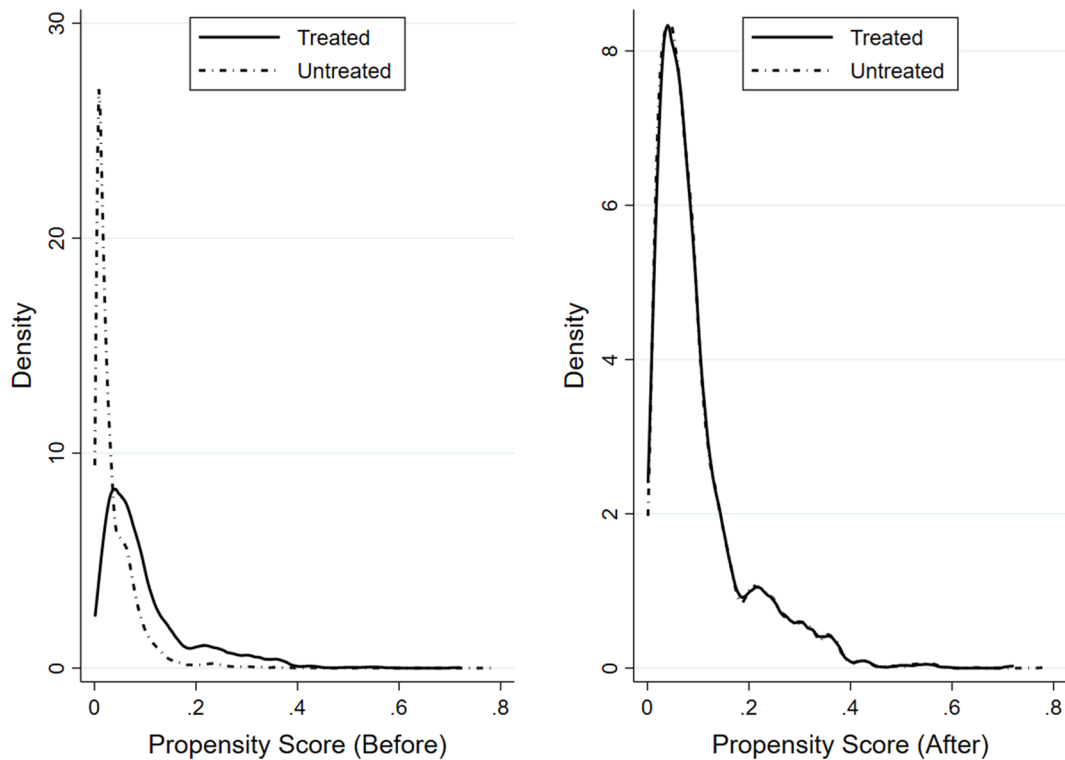


Fig. 2 Propensity score distribution before and after the matching. Figure 2 plots the distribution of the propensity score before the matching (left graph) and after the matching (right graph). The continuing line represents the distribution of the propensity score of firms in the treated group, i.e., firms that

reported the use of market-based financial instruments in the past 6 months, while the dashed line represents the distribution of the propensity score of firms in the control group, i.e., firms that did not use those instruments. SAFE period analysed: 2009–2020. Source: matched database SAFE-Orbis

opportunities. These findings are largely in line with previous studies. Didier et al. (2021) identify a similar pattern for listed, mainly large, firms in 65 countries. Revest and Sapio (2013) identify a positive effect of market-based finance on total asset growth for UK SMEs, albeit limiting the analysis to the second-tier public equity market (AIM). More recently, Darmouni and Papoutsi (2022) analyse the dynamic evolution of firm assets for a sample of new issuers in the euro area up to 5 years after their bond issuance. They conclude that new issuers in the Eurozone tend to invest more in long-term assets and (only in the first year) in cash. Furthermore, the authors do not find an increase in shareholder funds, which might be used to finance share buybacks, as happened in the USA for seasoned bond issuers (Acharya & Plantin, 2019; Farre-Mensa et al., 2020). Overall, these findings are a strong signal of the enhanced capacity of firms that have diversified their external sources to finance the expansion of their activities.

Next, we turn to the results by specific categories of firms. Column 2 in Table 9 shows the results for SMEs. New issuers among SMEs tend to grow more than SMEs in the control group in fixed and tangible assets after 1 year. At the same time, the differential growth in terms of current assets is quite low and not statistically significant. By contrast, for large firms, the statistically significant differential growth in total assets appears to be driven mostly by strong growth in current assets and cash equivalents (i.e., other current assets) in both time windows. Figure 3 recaps the findings on the differential growth rates for SMEs and large firms.

Our interpretation of these results is linked to the different uses of the proceeds raised by firms issuing securities. While SMEs tend to use the proceeds to expand their production capabilities through fixed operating capital (i.e., new investments for growth-oriented business strategies), large, more mature firms mostly increase their total assets through an expansion

Table 9 Differential growth rates of issuing versus non-issuing firms. Propensity score results

	All	SMEs	Large	Young	Established	Listed	Unlisted
Panel A: 1-year growth rate							
Total assets	0.011*	0.006	0.028**	-0.004	0.014**	0.044**	0.006
Fixed assets	0.027*	0.026**	0.019	0.025	0.024**	0.018	0.024**
Tangible fixed assets	0.021*	0.026**	-0.013	-0.014	0.020*	-0.004	0.018
Intangible assets	0.048*	0.081**	0.05	0.091	0.056*	0.041	0.079***
Number of employees	0.007	0.006	0.000	0.007	0.002	0.011	0.002
Retained earnings	0.024*	0.021	0.041*	0.03	0.025**	0.117***	0.015
Current assets	0.013*	0.007	0.061***	-0.010	0.022***	0.053*	0.009
Other current assets	0.008	0.006	0.154**	0.057	0.029	0.179**	0.006
Accounts receivable	0.037**	0.028*	0.031	-0.02	0.044***	0.078*	0.025
Inventory	0.012	0.025	0.010	0.016	0.023	0.024	0.027*
Panel B: 2-year average growth rate							
Total assets	0.021***	0.017**	0.036**	0.024	0.020***	0.060**	0.017**
Fixed assets	0.035**	0.035**	0.051*	0.067	0.025*	0.01	0.042***
Tangible fixed assets	0.038***	0.040***	0.002	0.035	0.033**	0.000	0.038**
Intangible asset	0.076*	0.121**	-0.135*	0.121	0.026	0.051	0.073
Number of employees	0.004	0.005	0.010	0.003	0.001	0.023	0.002
Retained earnings	0.034**	0.028*	0.067**	0.037	0.028**	0.085*	0.029*
Current assets	0.015**	0.007	0.043***	0.005	0.015**	0.042	0.007
Other current assets	0.015	0.001	0.123***	0.103	0.009	0.146**	0.004
Accounts receivable	0.030**	0.019	0.017	-0.036	0.035***	0.063*	0.014
Inventory	0.012	0.016	0.012	0.008	0.017	0.016	0.018*

Source: Matched database SAFE-Orbis. See Appendix Table 13 for a description of the variables. Columns refer to the specific subsamples: all sample; SMEs; large firms; young firms (i.e., with age under 10 years); established firms; listed firms (i.e., firms already listed when answering to SAFE survey); unlisted firms. Differential growth rates (ATT) from the propensity score analysis are displayed. The propensity score is computed for each subsample, using the nearest neighbour matching with four neighbours. The treatment is access to market-based finance from the SAFE survey. The total number of observations is 53,210 for each accounting variable. SMEs are defined as firms with fewer than 250 employees. SAFE period analysed: 2009–2020. Stars denote usual significance intervals, namely, *** p value < 0.01; ** p value < 0.05; * p value < 0.1)

of current assets, pursuing alternative (less-growth-oriented) business strategies. These strategies are more likely directed to renovate or substitute the asset in place, respond to working capital needs, build up cash and financial assets reserves, or restructure and renew the existing debt. We obtain similar results for the listed and unlisted subsamples (Table 9). Private firms that use market-based finance show a statistically significant increase in fixed, tangible-fixed, and intangible assets in both periods under consideration. In contrast, the values for listed firms are not statistically significant.

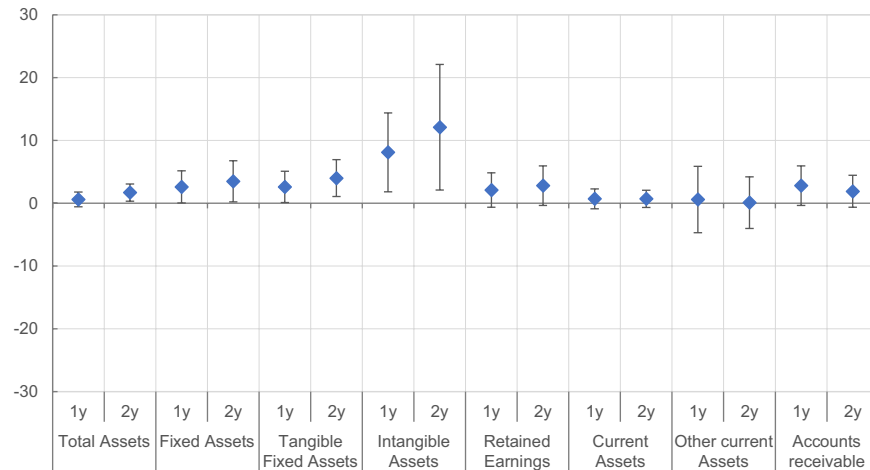
These results are strong confirmation of our hypothesis, H2.1, that access to market-based finance drives the growth performances of SMEs and unlisted firms. In addition, we find no statistically significant

effects on the growth of young firms, while established, more mature firms (with age higher than 10 years) benefit from market-based finance even in the short term (in the first year). For relatively young, less mature firms, additional time may be needed to exploit the potential benefits of external funding diversification.

Our analysis shows that access to market-based finance boosts firms' future growth, especially for SMEs and unlisted firms. Large firms display a lower differential growth (compared to SMEs and unlisted firms) triggered mainly by current asset growth.

As a robustness test of our propensity score results, we apply an alternative pre-treatment matching technique using the coarsened exact matching approach described in Blackwell et al. (2009). Existing studies

SMEs



Large firms

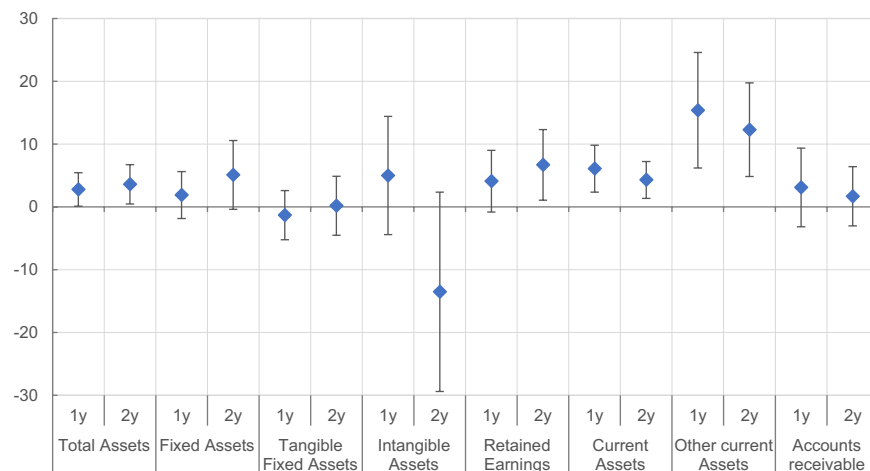


Fig. 3 Differential ex-post growth rates of issuing firms versus non-issuers—SMEs and large firms. Figure 3 shows issuers firms' differential ex-post annual growth rates across two-time windows (and its standard errors in vertical bars) versus a matched control group of non-issuers obtained from the propensity score model. The y-axis corresponds to the differential ex-post annual growth rates (in percentage) calculated as the difference between the average growth rates reported by the issuers and the ones of the matched control group of non-issuers. The x-axis shows the differential ex-post growth rates of the variables of interest across

two-time windows (1 year and 2 years after the event). The 2-year statistic corresponds to the average annual growth rate over the 2-year window. The propensity score is computed for each subsample (SMEs and large firms) using the nearest neighbour matching with four neighbours. The treatment is access to market-based finance from the SAFE survey. The total number of observations is 53,210. SMEs are defined as firms with fewer than 250 employees. The statistically significant p values of the differential growth rates are displayed in Table 9. SAFE period analysed: 2009–2020. Source: matched database SAFE-Orbis

on public grant effects use this test together with the propensity score (see, for example, Bertoni et al., 2018). Our main analysis results are largely confirmed (see Table A2 in the online supplementary materials).

4.4 Main results on the growth of public-grants-backed issuing firms

Our findings on the impact of public grants on firms' growth after issuing bonds or equity are displayed in Tables 8 and 10. In Table 8 (Column 4), the growth

Table 10 Differential growth rates of issuing firms based on the use of grants—propensity score results

	All	SMEs	Large	Young	Established	Listed	Unlisted
Panel A: 1-year growth rate							
Total assets	0.034**	0.036**	0.027	0.059	0.021*	0.079	0.025*
Fixed assets	0.035	0.050*	-0.012	0.139*	0.017	0.049	0.027
Tangible fixed assets	0.081***	0.072**	0.005	0.083	0.058**	0.043	0.078***
Intangible assets	0.004	-0.005	-0.071	0.097	0.013	0.201	-0.030
Number of employees	0.009	0.015	0.004	0.041	0.003	0.009	0.009
Retained earnings	-0.02	-0.091***	-0.013	-0.181*	-0.025	0.133	-0.040
Current assets	0.016	0.018	0.022	0.098	0.000	0.083	0.018
Other current assets	0.023	-0.016	0.141	0.014	0.038	0.476*	-0.011
Accounts receivable	0.032	0.025	0.127*	-0.06	0.042	0.014	0.076**
Inventory	0.007	-0.010	0.006	0.059	-0.014	0.095	-0.006
Panel B: 2-year average growth rate							
Total assets	0.055***	0.045**	0.028	0.195***	0.01	0.114*	0.044***
Fixed assets	0.061	0.081**	-0.01	0.078	0.013	0.169	0.026
Tangible fixed assets	0.068**	0.049	0.051	0.091	0.069**	0.113	0.062**
Intangible asset	0.068	0.079	0.068	0.065*	0.004	0.597	-0.009
Number of employees	0.004	0.007	0.019	0.063	0.012	-0.023	0.021
Retained earnings	-0.004	-0.016	0.070	0.012	-0.055*	0.069	-0.001
Current assets	0.02	0.017	0.001	0.072	0.006	0.044	0.009
Other current assets	0.021	-0.032	0.076	0.091	-0.004	0.226	-0.009
Accounts receivable	0.006	0.013	0.081	-0.002	0.014	-0.068	0.027
Inventory	-0.02	-0.025	-0.013	0.079	-0.018	0.03	-0.013

Source: Matched database SAFE-Orbis. The propensity score is run on the sub-sample of issuing firms between firms that have used public grants and those that have not. See Appendix Table 13 for a description of the variables. Columns refer to the specific sub-samples: all sample; SMEs; large firms; young firms (i.e., with age under 10 years); established firms; listed firms (i.e., firms already listed when answering to SAFE survey); unlisted firms. Differential growth rates (ATT) from the propensity score analysis are displayed. The propensity score is computed for each subsample, using the nearest neighbour matching with four neighbours. The treatment is the use of grants from the SAFE survey. The total number of observations is 2302 for each accounting variable. SMEs are defined as firms with fewer than 250 employees. The SAFE period analysed: 2009–2020. Stars denote usual significance intervals, namely, *** p value < 0.01; ** p value < 0.05; * p value < 0.1

rates for grants-backed issuers are higher (for most of our indicators) than the unmatched subsample of non-grants-backed issuers (last Column, 5). We see that SME issuers that have used public grants show remarkable growth in fixed assets, up nearly 11% after 1 year and equal to 14% after 2 years, pointing to substantial new investments to support their production capabilities. In the two periods, the unmatched group of non-grants-backed SME issuers reported a much lower growth of 6.1% and 10.1%.

Next, we turn to the results based on the propensity score analysis in which we use a matched control group of non-grants-backed issuers. Column 1 of Table 10 shows that compared to issuing firms that have not benefited from public grants, those that have used them

experience statistically significant higher growth in terms of assets (and most of its components).

In particular, using public grants increases the rate of growth of SMEs issuers relative to the control group of non-grants-backed firms by 3.6% in terms of total assets (Panel A, Column 2) in 1 year and by 4.5% after 2 years (Panel B). Firms' overall growth is mainly ascribed to investments in fixed assets (with 5.0% differential growth after 1 year and 8.1% across 2 years). Similar results are reported for the subsample of unlisted, private firms; while in the case of large firms, we find no significant evidence of higher growth in most of our indicators. Finally, we observe a relative decrease in retained earnings for SMEs and young firms; we believe that this result could be explained by the potential

negative short-term effect of higher differential investment, particularly in tangible fixed assets, on their net earnings in the first year after firms' capital expenditures with the proceeds of market-based financing.¹⁵ Figure 4 summarises our main results for SMEs and large-firm subsamples.

To the best of our knowledge, these findings represent novel evidence of the positive relationship between public grants and access to market-based finance that directly translates into subsequent strong SME growth. Thus, the impact of public guarantees on firm growth is discussed in terms of *economic additionality* (Bertoni et al., 2019; Bonfim et al., 2023; Bradshaw, 2002; Caselli et al., 2019; Lelarge et al., 2010; Schmidt & van Elkan, 2010; Uesugi et al., 2010), and our data confirm that this extends to the growth achieved through access to market-based finance (i.e., our hypothesis H2.2 is validated).

Adding the findings of this section to those above, we can argue that using public grants increases firms' access to market-based finance instruments, eases the financial constraints faced by SMEs, and improves their capacity to achieve higher growth. In this way, they grow faster than similar firms that have accessed market-based finance without using public grants.

Our economic interpretation of these findings is linked not only to the previously discussed *behavioural additionality* (Buisseret et al., 1995; Takalo & Tanayama, 2010), according to which government support may affect the behaviour of other stakeholders towards SMEs acting as a positive signal to market-based investors, but it can also improve the perceived riskiness of small issuers for market investors. In the case of equity financing, the credit risk mitigation offered by public grants to bank loans helps to attract new equity towards prospective high-growth/high-profit business projects thanks to the lowering of the cost of capital for firms. For new bond issuances, bank loans secured by public agencies free up the debt capacity of firms for both public and private placement bonds. We argue that these circumstances may be viewed as a direct

consequence of the certification hypothesis of public financial support (Hottenrott et al., 2018; Kleer, 2010; Lerner, 1999; Meuleman & DeMaeseneire, 2012), discussed in Sect. 2. Indeed, receiving public grants serves as a quality certification instrument that reduces uncertainty caused by informational asymmetries and the inherent opacity of SME issuers and informs capital markets investors about small firms' otherwise hard-to-evaluate prospects.

5 Further evidence on firm sub-samples

In this section, we present the propensity score results for relevant sub-groups of firms to provide more evidence on the composition of the main results. In this way, we further investigate the mechanisms and channels driving our results.

First, we investigate the heterogeneity across sectors, countries, and time periods, and second, we provide additional evidence on how the certification effect associated with the use of public grants helps to overcome informational opacity that may create obstacles to SMEs' access to finance and their growth. Table A3 in the online supplementary materials summarises relevant results across sectors, time periods, and different country groupings.

As concerns sector breakdown, we find that issuing firms in manufacturing present higher differential growth rates in terms of total assets and employment than non-manufacturing firms (i.e., service, commerce/trade, transport, and construction sectors). For non-manufacturing firms, current assets growth appears stronger than in the industry sector. In the more recent period of our sample (2014–2020), we observe higher total asset differential growth relative to the whole sample (2009–2020), but it is driven mainly by current assets, meaning that investment growth in productive fixed assets has been decreasing in more recent years.

Looking at more granular growth breakdowns at the country level, we observe that there are no clear differences among issuing firms of high GDP countries (i.e., Germany, France, Italy and Spain) relative to those of other smaller countries. Moreover, in Table 11, we consider the sub-sample of issuing firms that have used public grants, testing also a different country grouping based on the level of government support in terms of loan guarantees to SMEs scaled by GDP.¹⁶ We find that firms in

¹⁵ Indeed, strong and significant new investments in tangible fixed asset lead to greater depreciation expenses in the high-growth firms' profit and loss accounts, decreasing short-term net earnings and, *ceteris paribus*, retained earnings, while they entail increased expected net earnings in the future due to rising upcoming sales. Therefore, SME issuers that have used public grants could temporarily affect their short-term capacity of reinvesting their earnings by the significant increased investment in fixed assets. Large firms with less capital-expenditure-oriented use of proceeds of their capital market financing do not exhibit similar patterns of retained earnings (see also Fig. 4).

¹⁶ The sub-sample of firms with high public financial support is defined when the country ratio is above the overall median; low public support, otherwise (see Table 11).

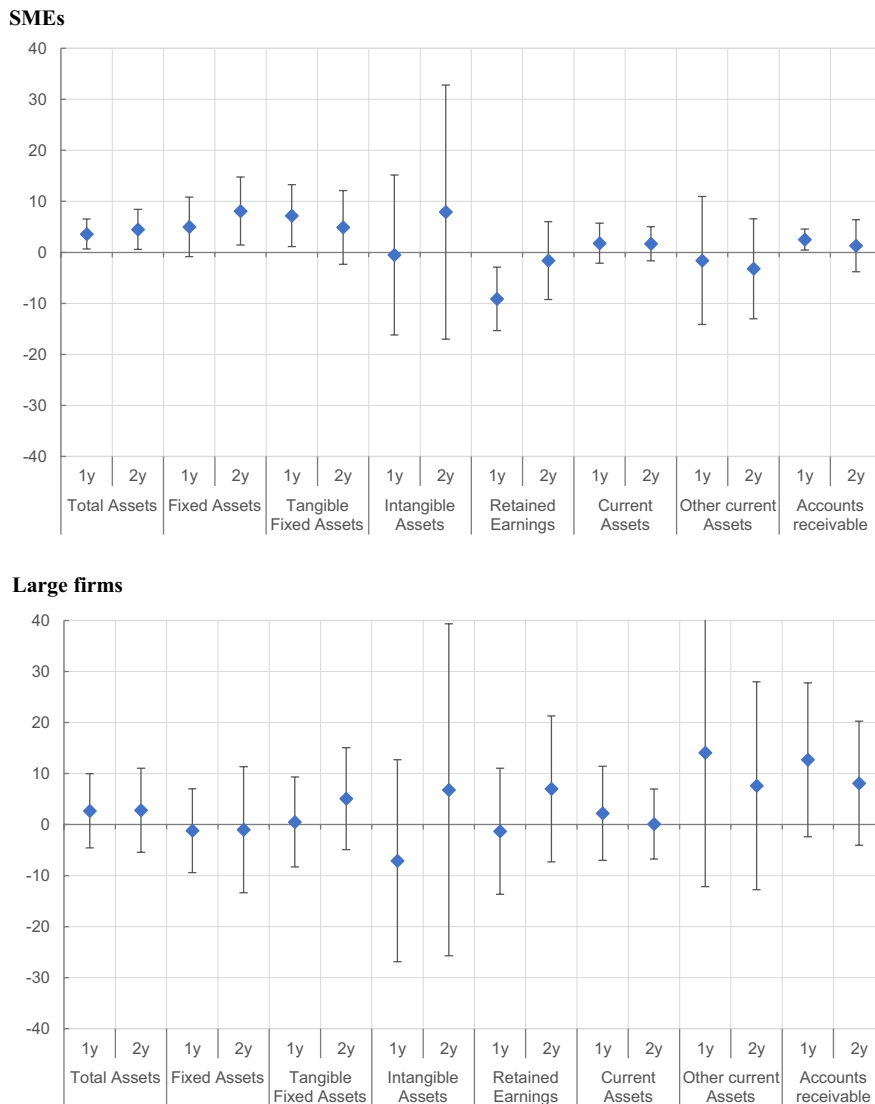


Fig. 4 Differential ex-post growth rates of issuing firms based on grants—SMEs and large firms. Figure 4 shows the differential ex-post annual growth rates across two-time windows (and its standard errors in vertical bars) of public grant-backed issuers firms versus a matched control group of issuers that have not used public grants. The y-axis corresponds to the differential ex-post annual growth rates (in percentage) calculated as the difference between the average growth rates reported by public grant-backed issuers and the ones of the matched control group of issuers that have not used public grants. The x-axis shows the differential ex-post growth rates of the variables of interest across two-time windows (1 year and 2 years

after the event). The 2-year statistic corresponds to the average annual growth rate over the 2-year window. The results are obtained from the propensity score model. The propensity score is computed for each subsample (SMEs and large firms) using the nearest neighbour matching with four neighbours. The treatment is the access to market-based finance of firms that have used public grants based on data collected from the SAFE survey. The total number of observations is 2302. SMEs are defined as firms with fewer than 250 employees. The statistically significant *p* values of the differential growth rates are displayed in Table 10. SAFE period analysed: 2009–2020. Source: matched database SAFE-Orbis

countries with high GDP and high governmental support display a significant differential growth in terms of total and fixed assets compared to firms in countries with low GDP and low levels of governmental support.

A second set of additional results focuses on the certification effect secured by the use of public grants. As discussed in Sect. 2, this effect might help overcome the informational opacity that hinders SMEs in their efforts

to access public or private capital markets. For instance, this is what is indicated by Hottenrott et al. (2018) when discussing on firms' access to additional sources of external funding.

We test this effect in our sample by computing a proxy for informational opacity, a measure of earnings quality, which is defined as the absolute value of the difference between net income and cash flow at time t scaled by total assets. This indicator is widely used in the standard financial accounting literature.¹⁷

A high earnings quality (that corresponds to a low value of the difference mentioned above) is perceived by the market as a strong signal of a firm's current performance visibility and, at the same time, conveys less uncertainty regarding future performances. Therefore, higher earnings quality is strongly associated with lower informational opacity.

Based on these arguments, Table 12 displays the propensity score results for the sub-samples of firms with high and low earnings quality (based on the overall sample median).

The more informationally opaque issuing firms (i.e., low earnings quality issuing firms) present a statistically significant higher differential growth in total assets (2.3% in the 1-year window and 3.6% after 2 years) than non-issuing firms, while the differential growth for the sub-sample of less informationally opaque issuing firms is slightly positive (only 0.03% and 0.07%) but not statistically significant. More remarkably, these findings are reinforced by the evidence for the sub-sample of issuing firms that have also used public grants relative to issuing firms that have not. Here, the differential growth is even higher than that of the non-grants-backed firms, displaying a total assets growth of 6.1% and 8.2% in the 2-year windows versus 1.8% and 3.3% of the issuers with no public grants. This evidence strongly suggests that the certification effect associated with the use of public grants and its spillover effects on additional forms of financing seems to be greater for more informationally opaque firms. Reducing the information asymmetries for such firms is critical to ease their access to external funding sources. Public policies can optimise the expected impact on firms receiving grants by taking into account that more informationally opaque firms could face higher constraints to potential growth.

¹⁷ See, for example, Dechow et al. (2010) for a comprehensive review of the earnings-quality measures.

6 Conclusions

This study deals with an important aspect of the scaling up of European SMEs: the role of access to market-based finance and public financial support schemes in fostering firm growth. Our research aims to fill a gap in the analysis of SMEs' access to finance by examining the combined effects of public grants and access to market-based finance on firm growth. In this respect, we recall the view of Cumming et al. (2018) that the literature on small business finance is still highly segmented and, further, that it is important to avoid studying forms of entrepreneurial finance in isolation to avoid missing spillovers from one form of finance to another. Another novel contribution of our work is also the focus on private placement channels of SME funding that often represents the primary component of access to market-based finance for small businesses.

We assess two issues: (i) the relationship between public financial support schemes and firms' access to market-based finance and (ii) the effect of market-based finance access and public grants on ex post firms' growth. For our purposes, we rely on an original dataset comprising around 31,000 European non-financial firms surveyed in the ECB/EC SAFE survey (across the period 2009–2020) matched with their financial statements sourced from the BvD ORBIS database. By integrating these two datasets, we can collect information on SMEs' decisions to raise new equity and bonds through public and private funding channels and their use of public grants.

Our findings indicate that SMEs using public financial support are more likely to access market-based finance sources. Our results also remain robust during non-crisis times, when the use of public grants to attenuate existing financial constraints can be fully exploited by SMEs to better achieve their growth potential. Our study shows that public grants should, therefore, play a greater role than serving as a counter-cyclical policy tool to help SMEs achieve financial sustainability and survive in times of crisis. Generally, we show that public financial support schemes help SMEs explore non-banking sources of funding, such as market-based finance. These findings also contribute to the literature by providing new evidence to support the so-called *behavioural additionality* hypothesis (Buisseret et al., 1995; Feldman & Kelley, 2006). According to this hypothesis, government support may change SME behaviour or that of other stakeholders towards SMEs—the use of public-support schemes conveys a positive signal to investors, increasing funding from sources other than bank loans.

Table 11 Granular growth breakdown of grants-backed issuing firms based on sectors, time periods, and countries

	All	Manufacturing	Non-manufacturing	2014–2020	Large countries	Small countries	High loan guarantees to SMEs countries	Low loans guarantees to SMEs countries
Panel A: 1-year growth rate								
Total assets	0.034**	0.036**	0.026	0.033	0.043**	0.035	0.036**	0.027
Fixed assets	0.035	0.02	0.024	0.077	0.060**	0.023	0.061*	−0.019
Tangible fixed assets	0.081***	0.048	0.059*	0.049	0.090**	0.008	0.085**	0.012
Intangible fixed assets	0.004	0.001	0.007	0.14	0.002	0.006	0.01	−0.062
Employment growth	0.009	−0.004	0.008	−0.014	0.017	−0.021	0.008	−0.016
Retained earnings	−0.02	−0.024	−0.070**	−0.004	−0.003	−0.064	−0.02	−0.073*
Current assets	0.016	0.044*	−0.01	−0.009	0.037	0.003	0.038	−0.019
Other current assets	0.023	0.025	−0.064	−0.155**	0.051	−0.062	0.012	−0.085
Accounts receivable	0.032	0.057	−0.002	0.045	0.051	0.07	0.037	0.016
Inventory	0.007	0.043	−0.038	0.016	0.004	−0.031	0.006	0.02
Panel B: 2-year average growth rate								
Total assets	0.055***	0.049**	0.047**	0.034	0.062***	0.052*	0.058***	0.044*
Fixed assets	0.061	0.055	0.016	0.06	0.085**	0.027	0.094**	−0.045
Tangible fixed assets	0.068**	0.080**	0.053	0.033	0.115***	0.008	0.0127***	−0.019
Intangible fixed assets	0.068	−0.019	0.181	0.268	0.101	0.073	0.061	0.078
Employment growth	0.004	−0.011	0.015	0.008	0.025	−0.017	0.019	−0.007
Retained earnings	−0.004	−0.03	−0.045	0.003	0.01	−0.019	0.008	−0.052
Current assets	0.02	0.039*	−0.011	−0.006	0.022	0.011	0.027	−0.013
Other current assets	0.021	0.022	−0.024	−0.079	0.064	−0.068	0.018	−0.043
Accounts receivable	0.006	0.021	−0.026	−0.004	0.02	0.028	0.009	−0.015
Inventory	−0.02	0.034	−0.049	0.004	−0.008	−0.021	−0.005	0.007

Source: Matched database SAFE-Orbis. The propensity score is run on the sub-sample of issuing firms. See Appendix Table 13 for a description of the variables. Columns refer to the specific subsamples: all sample; manufacturing firms, non-manufacturing firms (i.e., construction, service, trade and transport sectors); subsample period 2014–2020; large countries (in terms of GDP); small countries; high and low government loan guarantees to SMEs countries subsamples capture the intensity of a country-specific public financial support to SMEs. Government loan guarantees to SMEs are sourced from “Financing SMEs and Entrepreneurs. An OECD scoreboard (<http://www.oecd-ilibrary.org>).” These data are then scaled by GDP. High loan guarantees subsample represents countries with the indicator above the overall sample median. Firms' sector is based on SAFE survey self-reported answer to question D3 (What is the main activity of your enterprise?). Differential growth rates (ATT) from the propensity score analysis are displayed. The propensity score is computed for each subsample, using nearest neighbour matching with four neighbours. The treatment is the use of grants from the SAFE survey. SAFE period analysed: 2009–2020. Stars denote usual statistical intervals, namely, ****p* value < 0.01; ***p* value < 0.05; **p* value < 0.1

Table 12 Granular growth breakdown based on firms' informational opacity

	Issuer versus non-issuer firms			Grants-backed issuers versus non-grants-backed issuers		
	All	Low opacity (high EQ)	High opacity (low EQ)	All	Low opacity (high EQ)	High opacity (low EQ)
Panel A: 1-year growth rate						
Total assets	0.011*	0.003	0.023***	0.034**	0.018	0.061***
Fixed assets	0.027*	0.029	0.019	0.035	0.035	0.060**
Tangible fixed assets	0.021*	0.024	0.015	0.081***	0.062	0.062**
Intangible fixed assets	0.048*	0.059	0.004	0.004	-0.004	-0.082
Employment growth	0.007	-0.001	0.011	0.009	0.006	0.007
Retained earnings	0.024*	-0.007	0.047***	-0.02	-0.058*	-0.022
Current assets	0.013*	0.008	0.028**	0.016	-0.005	0.039
Other current assets	0.008	0.001	0.068*	0.023	-0.049	0.024
Accounts receivable	0.037**	0.027	0.050**	0.032	0.044	0.067
Inventory	0.012	-0.002	0.027	0.007	0.019	-0.003
Panel B: 2-year average growth rate						
Total assets	0.021***	0.007	0.036***	0.055***	0.033	0.082***
Fixed assets	0.035**	0.025	0.027	0.061	0.054	0.075**
Tangible fixed assets	0.038***	0.021	0.033**	0.068**	0.075	0.077**
Intangible fixed assets	0.076*	0.038	0.025	0.068	0.103	-0.152
Employment growth	0.004	-0.003	0.021***	0.004	0.024	-0.003
Retained earnings	0.034**	-0.0005	0.050**	-0.004	-0.045	0.015
Current assets	0.015**	0.008	0.030***	0.02	0.006	0.023
Other current assets	0.015	-0.011	0.085***	0.021	-0.028	0.041
Accounts receivable	0.030**	0.018	0.043***	0.006	0.017	0.011
Inventory	0.012	0.002	0.019	-0.02	0.006	-0.001

Source: Matched database SAFE-Orbis. Propensity score results based on firms' informational opacity subsamples. Columns refer to the specific subsamples: all sample; low opacity (high EQ) firms; high opacity (low EQ) firms. High opacity (low EQ) firms subsample is defined by a low earnings quality (EQ) index (i.e., under the overall sample median) computed as the absolute value of the difference between firms' net income and cash flow at time t scaled by total assets (Dechow et al., 2010). The earnings quality variable is lagged relative to the survey variable (i.e., the firm's access to market-based finance). Differential growth rates (ATT) from the propensity score analysis are displayed. The propensity score is computed for each subsample, using nearest neighbour matching with four neighbours. The treatment is the access to market-based finance from the SAFE survey (for the first three columns of the Table) and the use of grants (for the other three columns). SAFE period analysed: 2009–2020. Stars denote usual statistical intervals, namely, *** p value < 0.01; ** p value < 0.05; * p value < 0.1

Regarding ex post growth, our article suggests that the diversification of external funds via market-based instruments is basically carried out to exploit growth opportunities. We provide new evidence of a strong increase in SME investment in capital expenditures. Accordingly, we confirm that SMEs have used the proceeds to expand their production capabilities through fixed operating capital, pursuing new investments instigated by growth-oriented business strategies. By contrast, our results for large, more mature firms indicate that their asset growth is chiefly led by an expansion of current assets. In other words, these firms tend to carry out alternative (less-growth-oriented) business strategies directed towards

renovating or substituting the asset in place and working capital needs, building cash and financial asset reserves, or restructuring and renewing the existing debt. These results shed new light on SMEs' actual use of proceeds obtained by capital raising, filling a gap in the existing literature on market-based finance, which mainly focuses on the use of capital markets by large, listed firms.

Another relevant contribution of our study is related to the role of public grants in the ex post growth of issuers. We find that grants-backed SME issuers experience stronger and more statistically significant growth than firms in the control group (i.e., non-grants-backed issuers). In sum, our results suggest significant spillover

effects from public financial support and access to market-based finance, aiding the scaling up of SMEs; furthermore, firms that are more informationally opaque can profit more from these externalities. These findings have relevant corporate and policy-making implications.

From a firm perspective, public financial support may affect the attitude of other stakeholders, providing a positive signal to market-based investors and, at the same time, improving the perceived riskiness of issuers. In the equity financing case, the credit risk mitigation warranted by public grants securing bank loans lessens firms' cost of capital, attracting new equity investors towards high-growth business projects. In new bond issuances, the presence of bank loans secured by public agencies unlocks new firms' debt capacity for both public and private placement bonds. These positive effects can be directly linked to the hypothesis of public financial support certification (Hottenrott et al., 2018; Kleer, 2010; Lerner, 1999; Meuleman & DeMaeseneire, 2012). Accordingly, public grants provide a confirmation of quality that reduces

uncertainty arising from the intrinsic opacity of SME issuers and informs capital market investors about firms' prospects that are otherwise difficult to evaluate.

For policymakers, our results show that using taxpayer funds to finance public grants to support SMEs might have a beneficial multiplying effect, facilitating their growth through market-based finance. They also offer a new perspective on the effective cost of this kind of public policy. Our results on the significantly higher growth of grant-backed SMEs signal that those firms will most probably generate additional corporate taxable income and, hence, may produce new tax revenues that, to some extent, render these public policies self-financing.

In conclusion, our findings provide new evidence of the role of public financial support as a tool for ongoing support of SMEs in accessing market-based finance and growing their productive capacity and not only as the commonly viewed emergency instrument to counter the negative effects of financial crises and economic cycle downturns on the viability of small-sized firms.

7 Appendix

Table 13 List of variables

Variables	Description	Source
SMEs	Dummy variable equal to 1 for SMEs and zero otherwise. SMEs are defined as firms with fewer than 250 employees	ECB/EC SAFE survey
Age	Number of years	ECB/EC SAFE survey
Listed status	Dummy variable equal to 1 for listed firm and zero otherwise	ECB/EC SAFE survey
Profitability (ROA)	EBITDA/total assets (in periods $t-1$)	ORBIS BvD
Current ratio	Current assets/current liabilities (in periods $t-1$)	ORBIS BvD
Sales growth	Difference between the value of sales in period t and the average value of sales in periods $t-1$ and $t-2$, scaled by the average value in periods $t-1$ and $t-2$ where t is the year in which the firm has answered to the survey	ORBIS BvD
Financial leverage	Financial debt/total assets (in periods $t-1$)	ORBIS BvD
Financing gap	Computed as the sum of the change in fixed assets and in working capital with respect to the previous year minus cash flows, divided by total assets to scale for the size of the firm (in periods $t-1$)	ORBIS BvD
Access to MBF	Access to market-based finance. Dummy variable equal to 1 if firms declare to have issued new equity or new bonds in the previous 6 months and zero otherwise	ECB/EC SAFE survey
Public support sentiment	Dummy variable equal to 1 if firms have declared that the access to public financial support have improved in the previous 6 months and zero otherwise	ECB/EC SAFE survey
Cash/total assets	Cash and cash equivalents/total assets (in periods $t-1$)	ORBIS BvD
Cash/current liabilities	Cash and cash equivalents/current liabilities (in periods $t-1$)	ORBIS BvD
Asset coverage ratio	(Shareholder funds + long term debt)/fixed assets (in periods $t-1$)	ORBIS BvD
Ex-post growth rates	The ex-post annual growth of the accounting variable of interest is the ratio between the variable at time $t+1$ (and $t+2$) divided by the variable at time t (and $t+1$), minus 1, where t is the year in which the firm has answered to the survey. The 2-year growth rates are computed as arithmetic average of the annual growth rates	ORBIS BvD

Table 14 Correlation matrix

	Access to MBF	Financing gap	Financial leverage	Sales growth	Listed	SMEs	Age	Grants	ROA	Current ratio	Asset coverage ratio	Cash/TA	Cash/current liabilities	Public support sentiment
Access to MBF	1													
Financing gap	0.0133	1												
Financial leverage	0.0301	0.1002	1											
Sales growth	-0.0007	0.0418	0.0037	1										
Listed	0.0584	-0.044	-0.0329	0.007	1									
SMEs	-0.447	-0.0024	0.0348	0.0019	-0.144	1								
Age	0.0011	-0.0108	-0.0547	-0.0419	0.0624	-0.19	1							
Grants	0.0532	0.0323	0.0936	0.0032	0.0021	-0.0233	0.0191	1						
ROA	-0.028	-0.4062	-0.1285	0.0511	-0.0094	-0.0064	-0.0411	-0.0133	1					
Current ratio	-0.0096	-0.0321	-0.0282	-0.0005	0.0017	-0.0061	0.0466	-0.03	0.027	1				
Asset coverage ratio	-0.0099	-0.0105	-0.0952	0.0148	0.0009	0.0506	-0.0394	-0.0465	0.0033	0.143	1			
Cash/TA	-0.0237	-0.1714	-0.2994	0.0037	-0.0268	0.0878	-0.0554	-0.0942	0.2111	0.1286	0.2066	1		
Cash/current liabilities	-0.0156	-0.0849	-0.0974	-0.0025	-0.0059	0.0247	0.0225	-0.054	0.0975	0.7482	0.1243	0.4703	1	
Public support sentiment	-0.004	-0.0024	0.0175	0.0087	0.0033	-0.0128	-0.002	0.0939	0.208	-0.0021	-0.0168	-0.0136	-0.0041	1

Source: Matched database SAFE-Orbis. All firms (large and SMEs). Pearson correlation coefficients are displayed. See Appendix Table 13 for a description of the variables. SAFE period analysed: 2009–2020. Firms' accounting data are lagged relative to SAFE survey variables

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Declarations

Disclaimer The opinions expressed herein are those of the authors and do not necessarily reflect those of the ECB or the Eurosystem.

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