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The determinants of Public Grants and Venture Capital financing: Evidence from Europe

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Contents

Abstract

This analysis compares the characteristics of firms supported by public and private sources in early-stage financing to investigate funding patterns for innovative companies. It examines whether the two sources of funding target similar firms in the period 2008-2017 using a portfolio approach on EU-based firms raising either Venture Capital financing, public grants under the Horizon 2020 'SME Instrument' scheme, or both. The findings show that venture capitalists finance more innovative and younger firms, whereas public investors focus on smaller companies. This pattern is supported by robustness checks and expansions that address multiple dimensions of heterogeneity behaviours in the interaction of private and public funding.

Executive summary

Depending on their stage of development, young and innovative businesses rely on private and public sources of financing for their research and innovation activities. During the start-up phase, public funding is expected to de-risk research and technology development by covering the expenses of necessary failures, while private investors support mature, developed and ready-to-grow enterprises. Although it can be expected that there are relationships between different types of funding, most of research on funding for innovative companies focuses on a single source of funding and little is known about their complementarities and interactions. Because of the interplay between many forms of entrepreneurial finance, there is a need to take a portfolio approach rather than treating private and public sources of funding independently.

This report looks at the patterns of funding for innovative companies through a portfolio lens. It compares the characteristics of innovative companies supported by the SME Instrument (SMEI) grants of the European Innovation Council (EIC), whose objective is to foster high-risk and high-potential innovation ideas and to assists innovative firms to shape new markets, create growth, and achieve high return on investment, with the characteristics of European firms that received Venture Capital funding. The report examines whether these two types of funding in fact target and select companies at various stages of development and growth. This addresses one of the most common recommendations from program assessments, which says that public actors supporting innovative companies should make sure that they target the right beneficiaries. This should help to avoid funding firms that might receive private financing.

The report is based on funding patterns of public and private investors in financing small, young, and innovative EU-based enterprises in the period 2008-2017. Information on Venture Capital investors and transactions is retrieved from VentureSource. Information on 2020 SME Instrument public grants comes from the European Commission's Executive Agency for Small and Medium-sized Enterprises.

First, the report analyses the characteristics of firms that Venture Capitalists and public investors target. Second, it investigates potential heterogeneous effects that may drive differential investment behaviours such as the level of bank indebtedness and profitability of firms. Finally, it analyses the potential differential behaviours in the interplay between private and public investment by comparing early and later stages of private and public funding.

The analysis reveals that, firms receiving Public Grants are on average smaller, less innovative, and older than those raising Venture Capital funding. In addition, VC reaches more innovative businesses earlier than public grants. On the other hand, the funding of smaller and less capitalized enterprises appears to be a prerogative of public investors. Controlling for the level of bank debt and profitability, does not considerably change the results. Companies receiving public subsidies are more short term indebted, whereas companies funded by VCs are on average less indebted and, more oriented to long-term bank's debt financing. Moreover, more profitable firms show a larger probability of receiving a public subsidy than VC-backed firms. The results show no substantial differences in behaviours between private and public investors based on investment stage or round and are robust to alternative econometric specifications.

Summing up, the results show that, although sharing common ex-ante goals, the EIC SMEI targets very different types of companies than those selected by private investors. This can indicate that public sources of funding for innovation help companies that would not receive private investments and that it does not crowd out private money. This way the SMEI helps to overcome a market failure related to the lack of funding for innovative companies.

As the results show that VC are more eager to provide funding to relatively younger and smaller start-ups than the SMEI, they contradict the notion that public funding de-risks the start-up stage of development and private investors support mature, developed and ready-to-grow enterprises.

Another question is related to the fact that companies with different profiles are very likely to have different future growth and development trajectories. It would be thus of interest to compare the return on investment from public funding of innovation with the one of the private one.

1. Introduction

Young and innovative businesses use various sources of financing to fund their research and innovation (R&I) activities, depending on their stage of development. In the initial phases, research activity is mainly financed through internal and public sources and, when a venture is sufficiently mature and established, private investors enter (Auerswald and Branscomb, 2003). During the start-up phase, companies usually try to raise funds through private means including Venture Capital (VC) funds (Gompers and Lerner, 2001). In this context, public funding is expected to de-risk research and technology development by covering the expenses of necessary failures, while private investors support mature, developed and ready-to-grow enterprises.

Since most of research on funding for innovative companies focuses on a single source of funding, little is known about their complementarities and interactions. Because externalities exist across many forms of entrepreneurial finance, there is a need to take a portfolio approach towards entrepreneurial finance rather than treating private and public sources of funding independently (Cumming et al., 2018). To close this gap, the report looks at the patterns of funding for innovative companies through a portfolio lens and compares the characteristics of innovative companies supported by the SME Instrument (SMEI) grants, i.e. one of the most bold and innovative policy instrument to support break-through innovations in Europe, with the characteristics of European firms that received Venture Capital funding. The objective is to examine whether these two types of funding in fact target and select companies at various stages of development and growth. The findings should contribute to the debate concerning the rationale and design of public sector mechanisms that are expected to de-risk research and technology development while still bearing the consequences of failures.

The encouragement of entrepreneurship development is prominent on the agenda of policymakers around the world and supporting new businesses typically entails providing them with external finance (Lerner and Nanda, 2020). This is especially relevant in countries that do not have established VC markets despite having strong economies such as the EU (Gucciardi, 2022). Access to finance is still considered as one of the major bottlenecks to innovation commercialization and exploitation in Europe. To overcome this issue, policymakers create new funding instruments and allocate larger amounts of money in order to close the 'Valley of Death' and to secure the necessary financial resources for commercializing new technologies and products. Public source of funding and support for companies can take many forms. For example, the European Union annually supports and finances over 200,000 companies, including sole proprietorships, micro-enterprises, start-ups, and small and medium-sized enterprises, operating across all manufacturing and product sectors (Gampfert et al., 2016). Some of them are increasingly emulating the private VC industry by selecting companies with high growth potential and providing them with direct financial grants. Despite the recent pandemic shock, this occurs in parallel with the development of private financing instruments and the constant inflow of angel and venture capital funding (Bellucci et al., 2021; Bellucci et al., 2022)., This could potentially lead to either complementarity or substitution effects between these two categories of instruments. Indeed, while early resource allocations may increase the probability that start-ups secure VC funding (Shane and Stuart, 2002), public grants raised by young firms could also share comparable ambitions and information to VC investments together with the possibility of contributing as a firm's first capital investment (Berger and Hottenrott, 2021). Focusing on the first aspects, several recent studies have documented that public grants are interpreted as 'signals' (Bianchi et al., 2019) by Venture Capitalists who are more prone to invest towards such grant-backed start-ups (Lerner, 2000); Cumming, 2007); Söderblom et al., 2015; Howell, 2017; Giraudo et al., 2019, among the others).

On the other hand, if getting one source of funding reduces the need to raise another, there may be a risk of crowding out of investments between public subsidies and venture capital financing. Because both instruments target start-ups at the seed stage, young companies may consider public grants as an alternative to Venture Capital, and vice versa (Bertoni et al., 2015). Furthermore, Venture Capitalists may lose their interest in firms that have already received public grants, possibly because they might have already reached a certain level of development that no longer meets their investment criteria (Alperovych et al., 2020).

As a result, one of the most common recommendations from program assessments is to target the right beneficiaries. The European Court of Auditors, for example, specifically states that, while the SME Instrument promotes enterprises that meet the academic model of high-growth potential firms, it nonetheless invests certain SMEs that might have been funded by the market (ECoA, 2020). However, the research on R&I subsidies focuses mostly on evaluating public support to innovative companies (Lerner, 1999; Bronzini and Piselli, 2016; Howell, 2017) and does not examine whether the choice of beneficiaries of public support for R&I is optimal. Most empirical papers on financing innovative companies are based on data from single funding source (Cumming and Vismara, 2017). Only few papers use data from a variety of financial sources in the same analysis; exceptions include Cosh et al. (2009) for the UK and Robb and Robinson (2014) for the US. This way there is not enough evidence on what are the main criteria of selecting firms for public support for R&I and how private and public sources of R&I funding interact. As a result, it is not unexpected that the findings of studies examining public support for R&I remain unclear (Dimos and Pugh, 2016). The potential explanation of these inconclusive results might be related to the issue of selection of beneficiaries of public support

for R&I (Mina et al., 2021). In order to address this gap, we empirically analyse the characteristics of firms that are selected for funding by the SME Instrument and private Venture Capitalists. The objective is to use the portfolio approach to R&I funding and to jointly analyze the two sources of funding to investigate whether the SME Instrument targets firms similar to those backed by private investors. Our study resembles the analysis of the characteristics of firms financed by corporate and individual Venture Capitalists (Chemmanur et al., 2014) and a study looking at the effects of public and private funding on firms' innovative performance (Kou et al., 2020).

To analyze the funding patterns of public and private investors in financing small, young, and innovative EU-based enterprises in the period 2008-2017, we use collected data from several data sources. Information on Venture Capital investors and transactions is retrieved from VentureSource, a specialized commercial database by Dow Jones. This dataset has been integrated with information on public grants under the Horizon 2020 SME Instrument scheme, collected by the European Commission's Executive Agency for Small and Medium-sized Enterprises.

First, we test whether both Venture Capitalists and public investors exhibit similar patterns in financing small, young, and innovative enterprises. Our analysis reveals that, although sharing a common ex ante end goal, private and public investors target quite different types of firms. In particular, firms receiving Public Grants are on average smaller, less innovative, and more experienced than those raising Venture Capital funding. In addition, VC reaches more innovative businesses earlier than public grants. On the other hand, the funding of smaller and less capitalized enterprises appears to be a prerogative of public investors.

Second, we investigate potential heterogeneous effects that may drive differential investment behaviours such as the level of bank indebtedness and profitability of firms. We recognize that firms may use bank debt becoming a third way of funding that may potentially substitute or complement both public and private capitals. In this respect, we then investigate whether the difference in characteristics appearing for firms supported by public subsidies vs venture capital investments vary as a function of their bank debt level. Then, being the profitability of the financed companies the ultimate goal of both private and public financial investors, we analyze whether the differences in characteristics emerging for firms financed by public subsidies or VC investments change as a function of their profitability. Our findings reveal that, also controlling for bank debt and profitability, the differences in the characteristics of enterprises (size, innovation, and age) between those financed by public subsidies and those financed by venture capitalists do not change considerably. Interestingly, companies receiving public subsidies are more short term indebted, whereas companies funded by VCs are on average less indebted and, more oriented to long-term bank's debt financing. Moreover, more profitable firms show a larger probability of receiving a public subsidy than VC-backed firms.

Finally, we investigate the potential differential behaviours in the interplay between private and public investment by comparing early and later stages of private and public funding (i.e., Venture Capital early -and later-stages vs SME Instrument Phase 1 and Phase 2). Results show no substantial differences in behaviours between private and public investors based on investment stage or round.

Our findings are robust to several tests, such as the exclusion of firms that have received both types of financing from the estimations or the adoption of alternative definitions of innovation and size of the analysed firms.

The remainder of the paper is structured as follows. Section 2 describes the institutional setting of the EU SME Instrument. Section 3 presents the data and the empirical strategy. Section 4 explore the main findings including heterogeneous results, while Section 5 focuses on a battery of robustness tests. Lastly, Section 6 concludes.

2. The SME Instrument in Europe

Introduced in the Horizon 2020, the SMEI managed by the European Innovation Council (EIC) is aimed at highly innovative SMEs wishing to develop their growth potential (EC, 2015). The SMEI addresses the financing needs of internationally oriented SMEs, in implementing high-risk and high-potential innovation ideas. It aims at supporting projects that lead to major changes in how business (product, processes, services, marketing etc.) is done. It assists innovative SMEs to shape new markets, create growth, and achieve high return on investment. Since its inception, the Horizon 2020 SME Instrument has become an important source of public funding for European SMEs, contributing 50% of the total amount of public grants in 2017 (Bellucci et al., 2021b).

The SMEI resembles the Small Business Innovation Research (SBIR) programme, which operates in the United States and disburses around $2.2 billion each year (Howell, 2017). It was introduced in 1982 to strengthen the US high technology sector and support small firms. The SBIR program is representative of many targeted subsidy programs for high-tech new ventures at the state level and around the world.

Like the SBIR programme, the SMEI consists of three separate phases and a coaching and mentoring service for beneficiaries (EC, 2015). Participants can apply to Phase 1 with a view to applying to Phase 2 later or directly to Phase 2. In Phase 1, a feasibility study shall be developed verifying the technological as well as economic viability of an innovation. A successful proposal receives a lump sum of EUR 50,000. In Phase 2, innovation projects that demonstrate high potential in terms of company competitiveness and growth underpinned by a strategic business plan are supported. Proposals receive a contribution from the EU of between EUR 0.5 and 2.5 million. In addition, in Phase 3, SMEs can benefit from indirect support measures and services as well as access to the financial facilities support.

During the first two years of operation, the SMEI received 31,377 applications (Phase 1 and 2) in total and it funded 2,457 individual SMEs participating in 2,344 projects (EC, 2016). The overall success rate was 8.4% for Phase 1 and 5.5% for Phase 2. These rates are similar to those of private acceleration programs, which indicates that the SMEI is highly competitive.

3. Data and empirical strategy

3.1. Hypothesis development

There are plausible reasons to believe that the determinants of Venture Capital financing and Public Grants under the 'SME Instrument' scheme are similar. Since its inception, the objective of the SME Instrument is to address the financing needs of internationally oriented SMEs, in implementing high-risk and high-potential innovation ideas. It aims at supporting projects that lead to radical and disruptive changes in how business is done, and it supports a company's expansion into new markets, promote growth, and create high return on investment. Companies applying for the SME Instrument are assessed on their business and innovation merit (EC, 2016). The award criteria focus on the commercialization perspective, excellence in innovation and the capacity of the implementing team. Companies have to demonstrate that there is a market for their innovation and potential customers willing to pay for it. They are thoroughly tested against their knowledge of the market conditions, including the total potential market size and growth-rate, their understanding of competitors and their sales projections. The innovation they are presenting needs to have the potential to scale-up the company, which must be proved by a clear commercialization plan and a knowledge protection strategy, including an analysis of 'freedom to operate'. The applicant should show that its idea is a high-risk and high-potential innovation that stands out from competition and outperforms existing solutions. Finally, the capacity of the company's team to effectively commercialize and scale up the business is assessed. SME Instrument Phase 2 aims at supporting close-to-market activities, focusing on breakthrough innovations with market-creating potential and not research and innovation activities (A4SMES, 2018). Phase 2 beneficiaries are expected to know their market and have clearly identified relevant market opportunities, have sound and scalable business models and feasible implementation plans.

Venture Capital investors are very selective in their decisions with only 1/6th of 1% of new businesses manage to obtain VC funding (Kaplan and Lerner, 2010). Empirical evidence shows that they select companies based on revenue growth, expected returns, trends, sector and performance and that innovation is an important factor during the VC selection phase (Caselli et al. 2009; Chemmanur et al. 2011; Block et al. 2019). In Venture Capitalists' proposal screening, key criteria include the long-term growth and profitability of the industry in which the proposed business will operate (Hall and Hofer, 1993). In other words, relatively young firms with high growth potential and innovative performance supported with intellectual capital assets and high-quality human capital obtain significantly more VC financing (Baum and Silverman, 2004; Mueller et al., 2009; Behrens et al., 2012; Zhou et al., 2016; Kim and Lee, 2022).

The above comparison of the selection criteria of the SME Instrument and private Venture Capital investors show that they are very similar, which leads us to formulate the following hypothesis:

Hypothesis: Both Venture Capital investors and Public Granters aim at financing *(i)* small, *(ii)* young, and *(iii)* innovative enterprises.

3.2. Data and variables

For the purposes of this study, we collected data on EU-based firms raising either Venture Capital financing, public grants under the Horizon 2020 'SME Instrument' scheme, or both in the period 2008-2017. Data on Venture Capital financing is retrieved from VentureSource, a specialized commercial database by Dow Jones, which includes information on VC investment transactions, as well as on VC investors and VC-backed companies. This dataset was then integrated with information on public grants. Specifically, we make use of the SME Instrument related data that is collected by the EC's Executive Agency for Small and Medium-sized Enterprises (EASME). The EASME plans, administers, and monitors the execution of the SME Instrument calls. The information about awarded grants and their beneficiaries is public and can be accessed via the CORDA database, which is the primary source of results from EU-funded R&I projects. While VentureSource provides financial data related to the VC-backed firms for the year of the VC transaction or of the public grant, it does not include the same information for the years before which, however, should be investigated as potential candidates for the determinants of the VC investment or public grant. Hence, we matched the dataset with Orbis, a commercial database by Bureau van Dijk, which provides financial and industrial data for each accounting year retrieved from the balance sheets of firms based on information available from several official sources as business registers, firms' annual report, and credit bureau. Given that VentureSource and Orbis do not share a unique reciprocal identifier for an immediate link, the merger was conducted by matching common variables available in both databases, such as the company name, the web and e-mail addresses, and the telephone and fax numbers. The final matched database contains 8,057 observations, with the identifier being the single transaction (either the Venture Capital financing or the Public Grant). For each observation, the dataset includes information both on the characteristics of the deal and of target company. First, we know when the VC or SMEI transaction was completed, allowing us to chronologically rank transactions for the same company. This data also allows us to implicitly determine the age of the company at the date of the transaction, as the difference of its incorporation date and the transaction date. Second, our dataset includes both qualitative and quantitative information on the characteristics of the target company, such as a proxy for its size (expressed in terms of total assets) and for its ability to innovate (in terms of number of registered patents).

3.3. Model specification

To investigate the relation between public grants and Venture Capital, we adopt the following probit model specification:

$$Pr\,(PG) = \beta_0 + \beta_1 Assets_{t-1} + \beta_2 Patents_{t-1}\ \beta_3 Age_{t-1} + \phi_t + \phi_s + \phi_c + \epsilon_i \qquad (1)$$

where our dependent variable, *Pr(PG)*, is a dummy indicator that takes the value of one if the firm receives a Public Grant under the Horizon 2020 SME Instrument scheme, and zero if it receives Venture Capital financing in the analysed year. $Assets_{t-1}$ is the natural logarithm of the total assets reported in the balance sheet by the firm for the year before raising a Venture Capital investment or a Public Grant. $Patents_{t-1}$ is an indicator that takes the value of 1 for firms having applied for the filing of patent in the year before raising a Venture Capital investment or a Public Grant, and 0 otherwise. Age_{t-1} is the natural logarithm of the age of the firm the year before raising a Venture Capital investment or a Public Grant. Our model also includes yearly fixed effects, φ_t, to capture common shocks related to every transaction in each year. We also incorporate sector, φ_s, and country, φ_c, fixed effects to control for systematic differences in the characteristics of financed firms across sectors and countries. Lastly, ε_i is the error term, clustered at the firm level.

4. Results

4.1. Baseline results

Table 1 reports the coefficient estimates of Equation (1). Column (1) reports the benchmark specification that includes only the three variables accounting for the size, age, and innovation ability of VC/PG-backed firms, while in the specifications in columns (2)-(4) we progressively add different sets of fixed effects. Specifically, year fixed effects control for common time-varying shocks that might affect the probability of raising Public Grants with respect to VC investments, sector fixed effects allow us to consider time-invariant unobservables correlated with financing that are

sector-specific, while country fixed effects account for time-invariant unobservables correlated with financing that are specific to the country, respectively.

We find that the coefficient for the *Assets* indicator is negative and highly statistically significant across the specifications of the model, with the coefficients ranging between -19 and -22%. Moreover, when we look at *Patents* we get that, again, the coefficients are negative and statistically significant, with the magnitude of the coefficients materially varying across the specifications. Lastly, we find the *Age* of target companies being positively correlated – and with a high level of statistical significance – with the probability of raising a Public Grant (vs a VC). In this case, the coefficients range between 0.65 and 0.8.

Overall, these findings seem to suggest that - despite being moved by a similar ex ante ultimate goal - private and public investors target quite different types of firms. In particular, firms receiving Public Grants are on average smaller, less innovative and more experienced than those raising a Venture Capital investment. This is an interesting result especially if compared with the spirit of the SMEI, whose aim is to finance high-potential (and innovative) young firms. Indeed, it seems that private financing manages to reach more innovative firms at an earlier stage than public investors. On the other hand, it seems that the other differential outcome of public with respect to private investors is the financing of smaller and less capitalized firms, which is probably linked to the fact that such companies are less marketable.

Overall, these results corroborate the view that public and private investors, despite being guided by a similar spirit, show very different outcomes. In particular, Venture Capitalists manage to finance more innovative and younger firms, while public investors focus on smaller companies. This result is consistent with previous findings suggesting that there are qualitative differences in start-ups raising public vs private funds (Bellucci et al., 2021b). These findings recall the results of a study analysing the characteristics of firms financed by corporate and independent Venture Capitalists (Chemmanur et al., 2014). In a direct comparison, corporate VC tend to fund more innovative, younger and riskier, although less profitable firms than independent VC. In the context of this study, SMEI beneficiaries resemble the profile of firms backed by independent rather than corporate VC.

Table 1: Baseline Results

Panel A – Probit

	Public Grant			
Dependent Variable	(1)	(2)	(3)	(4)
Assets $_{t-1}$	-0.197***	-0.205***	-0.223***	-0.196***
	(0.014)	(0.016)	(0.018)	(0.019)
D_Patents $_{t-1}$	-0.811***	-0.384***	-0.625***	-0.458***
	(0.079)	(0.094)	(0.104)	(0.108)
Age $_{t-1}$	0.794***	0.799***	0.646***	0.668***
	(0.032)	(0.036)	(0.041)	(0.045)
Observations	4,742	4,742	4,742	4,742
Year Fixed Effects	No	Yes	Yes	Yes
Sector Fixed Effects	No	No	Yes	Yes
Country Fixed Effects	No	No	No	Yes

Panel B – Marginal Effects

	Public Grant			
Dependent Variable	(1)	(2)	(3)	(4)
Assets $_{t-1}$	-0.060***	-0.049***	-0.046***	-0.037***
	(0.004)	(0.003)	(0.003)	(0.003)
D_Patents $_{t-1}$	-0.245***	-0.093***	-0.129***	-0.086***
	(0.023)	(0.022)	(0.021)	(0.019)
Age $_{t-1}$	0.240***	0.193***	0.133***	0.126***
	(0.007)	(0.007)	(0.008)	(0.008)
Observations	4,742	4,742	4,742	4,742
Year Fixed Effects	No	Yes	Yes	Yes
Sector Fixed Effects	No	No	Yes	Yes
Country Fixed Effects	No	No	No	Yes

Note: The analysis covers Venture Capital and Public Grants raised in the period between 2008 to 2017 by firms operating in the European Union. The table reports regression results of the Probit estimation of equation (1) on the full sample (Panel A) and its marginal effects (Panel B). Public Grants is a categorical variable which takes the value of 1 if the firm raises a Public Grant and 0 if the firm raises a Venture Capital investment in the analysed year. *Assets* $_{t-1}$ is the natural logarithm of the total assets reported in the balance sheet by the firm for the year before raising a Venture Capital investment or a Public Grant. *Patents* $_{t-1}$ is an indicator that takes the value of 1 for firms having applied for the filing of patent in the year before raising a Venture Capital investment or a Public Grant, and 0 otherwise. *Age* $_{t-1}$ is the natural logarithm of the age of the firm the year before raising a Venture Capital investment or a Public Grant. The table reports coefficients of a Probit estimation followed by standard errors, clustered at the firm level, in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

4.2. Heterogeneous effects

Our baseline estimations consider three among the most relevant aspects that both private and public investors look at when financing start-ups. In this section, we investigate potential heterogeneous effects due to two relevant aspects which can also drive differential investment behaviours such as the level of bank indebtedness and profitability of firms. In a second analysis, we also investigate the potential differential behaviours in the interplay between private and public investment by comparing early and later Venture Capital stages Phase 1 and 2 SME Instrument, respectively.

4.2.1. Debt and profitability

Start-ups face greater challenges in obtaining bank funding (Colombo and Grilli, 2017), owing to the inherent riskiness of the concept and the lack of or limited availability of information - particularly formal (e.g. financial statements) - that banks must analyze in order to offer loans. At the same time, we cannot rule out a priori the possibility that these companies may be able to obtain bank financing, allowing them to use financial leverage for both long-term debt and current operations in the early months and years of their existence. From this point of view, bank debt is therefore a third way to access the funding of these companies, potentially substituting for or complementing both public and private capital in the form of equity.

In this spirit, we then investigate whether the difference in characteristics appearing for firms supported by public subsidies vs venture capital investments vary as a function of their bank debt level. If the results are in line with those of the baseline, we could conclude that bank debt per se does not constitute a distinguishing factor in Venture Capitalists' and public investors' investing strategies.

To test this effect, we estimate an augmented version of Eq. (1) now including three different variables in two distinct estimates. First, we introduce two indicators for short-term and long-term bank debt. This estimation allows us to control for the level of bank debt, as well as distinguishing between its use for current activities or for investments. In the second estimation, we introduce the leverage ratio indicator, which is computed as the debt-to-total-assets ratio. This estimation allows us to test the relevance of bank debt while parametrizing it to the equity size of the company.

Table 2 (Columns 1 and 2) shows the estimation results. First, findings reveal that when we control for bank debt, the differences in the characteristics of enterprises (size, innovation, and age) between those financed by public subsidies and those financed by venture capitalists do not change considerably. Indeed, these results confirm those of the baseline, i.e. a larger probability that companies financed by public grants are on average smaller (probability between 2 and 4%), less innovative (10-12%) and older (13%). Interestingly, we can also note that companies receiving public subsidies are on average more indebted - even compared to their capital size (Leverage) - but that this debt is mainly driven by short term or current activities. On the other hand, companies raising VCs are on average less indebted and, where they get finance by a bank, are on average more oriented to finance long-term investments. This result seems also consistent with their greater ability to generate innovation through patents.

The profitability of the financed companies is the ultimate goal of the financial players, be they public (through subsidies) or private (via VC investments). The former category because policymakers often have the strengthening of the financed companies among their policy objectives; the latter because Venture Capitalists look for an increase in the value of the acquired shares as well as a profitable exit option when investing. In this perspective, the level of profitability of companies could influence the investor's behavior by modifying the strategy of public and private interventions. As a result, we look into whether the differences in characteristics emerging for firms financed by public subsidies or VC investments change as a function of their profitability.

Hence, we augment Eq. (1) with three indicators in three distinct estimations, by proxying profitability with EBIT, ROE, and Profit Margin indicators, respectively. Again, should we find no changes in the signs of the coefficients related to the size, innovation, and age, then we can conclude that current profitability does not act as a distinctive factor in the investment strategies of public and VC investors.

Table 2, Columns 3 through 5, shows the estimation results. Results confirm what already emerged from the baseline estimations, thus controlling for past profitability of VC/PG-backed firms does not affect the differential probability of raising one or the other based on size, level of innovation, and age. At the same time, we find that firms that are more profitable have a larger probability of receiving a public subsidy than VC-backed firms. One probable explanation is that, in comparison to start-ups, older firms are more likely to generate profits.

Table 2: Heterogeneous Effects – Debt and Profitability (Panel A – Probit)

	Public Grant				
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Assets $_{t-1}$	-0.248***	-0.160***	-0.308***	-0.297***	-0.301***
	(0.027)	(0.031)	(0.047)	(0.034)	(0.047)
D_Patents $_{t-1}$	-0.699***	-0.616***	-0.460*	-0.546***	-0.453*
	(0.150)	(0.155)	(0.273)	(0.180)	(0.271)
Age $_{t-1}$	0.773***	0.812***	0.983***	0.905***	0.976***
	(0.059)	(0.068)	(0.097)	(0.070)	(0.097)
ST debt $_{t-1}$	0.259***	0.186**			
	(0.083)	(0.091)			
LT debt $_{t-1}$	-2.821***	-3.114***			
	(0.368)	(0.334)			
Leverage (ln) $_{t-1}$		0.381***			
		(0.133)			
EBIT $_{t-1}$			0.011***		
			(0.002)		
ROE $_{t-1}$				0.002***	
				(0.000)	
Profit Margin $_{t-1}$					0.011***
					(0.002)
Observations	2,666	2,340	1,165	1,808	1,139
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes

Table 2 (cntd): Heterogeneous Effects – Debt and Profitability (Panel B – Marginal Effects)

	Public Grant				
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Assets $_{t-1}$	-0.043***	-0.026***	-0.049***	-0.058***	-0.048***
	(0.004)	(0.005)	(0.007)	(0.006)	(0.008)
D_Patents $_{t-1}$	-0.121***	-0.100***	-0.073*	-0.106***	-0.072*
	(0.025)	(0.024)	(0.043)	(0.034)	(0.042)
Age $_{t-1}$	0.133***	0.131***	0.156***	0.175***	0.155***
	(0.009)	(0.010)	(0.014)	(0.012)	(0.014)
Observations	2,666	2,340	1,165	1,808	1,139
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes

Note: The analysis covers Venture Capital investments and Public Grants raised in the period between 2008 to 2017 by firms operating in the European Union. The table reports regression results of the Probit estimation of equation (1) on the full sample (Panel A) and its marginal effects (Panel B). Public Grants is a categorical variable which takes the value of 1 if the firm raises a Public Grant and 0 if the firm raises a Venture Capital investment in the analysed year. The table reports coefficients of a Probit estimation followed by standard errors, clustered at the firm level, in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

4.2.2. Investment round and SMEI phases

As already anticipated, companies seeking for a SME Instrument can either apply to a Phase 1 instrument, directly to a Phase 2 one, or to both. The Phase 1 instrument is a lump sum of 50,000 euros that companies utilize to establish their initial stages of operations (e.g., feasibility studies, business ideas). In other terms, this type of instrument seems to mimic early stages of VC funding which have similar objectives. On the other hand, Phase 2 contribution is based on a proposal, which might provide resources in a range between EUR 500,000 and EUR 2.5 million, with applying firms that need to demonstrate high potential in terms of corporate competitiveness and growth supported by a strategic business strategy. Given the amounts and the underlying objectives, Phase 2 instrument seems to be more comparable to later stage VC investments. Different objectives may lead to different investment behaviours, which may affect the features of firms that are more likely to receive private or the public investment.

So far, our results have not taken into account this difference. We now aim at controlling for such a potential heterogeneous behavior by estimating Eq. (1) on two subsets of firms, i.e. the first limited to those start-ups that have raised either a SMEI Phase 1 or an Early Stage VC investments (or both); the second limited to those that have received either a SMEI Phase 2 or a Later Stage VC investments (or both).

Table 3 shows the results, with Col. 1 and 2 focusing on the first and second subsets of firms, respectively. Interestingly, we find no substantial differences in behaviours between private and public investors based on investment stage or round. Indeed, we get negative signs for Assets and Patents, as well as a positive one for Age, thus corroborating our baseline results.

Table 3: Heterogeneous effects – Early Stages vs SMEI Phase 1, Later Stages vs SMEI Phase 2

Panel A – Probit

	SMEI Ph.1	SMEI Ph.2
Dependent Variable	(1)	(2)
Assets $_{t-1}$	-0.392***	-0.249***
	(0.079)	(0.030)
Patents $_{t-1}$	-1.622***	-1.289***
	(0.395)	(0.199)
Age $_{t-1}$	0.588***	0.947***
	(0.158)	(0.070)
Observations	376	1,854
Year Fixed Effects	Yes	Yes
Sector Fixed Effects	Yes	Yes
Country Fixed Effects	Yes	Yes

Panel B – Marginal Effects

	SMEI Ph.1	SMEI Ph.2
Dependent Variable	(1)	(2)
Assets $_{t-1}$	-0.083***	-0.052***
	(0.015)	(0.006)
Patents $_{t-1}$	-0.345***	-0.270***
	(0.075)	(0.040)
Age $_{t-1}$	0.125***	0.198***
	(0.031)	(0.013)
Observations	376	1,854
Year Fixed Effects	Yes	Yes
Sector Fixed Effects	Yes	Yes
Country Fixed Effects	Yes	Yes

Note: The analysis covers Venture Capital investments and Public Grants raised in the period between 2008 to 2017 by firms operating in the European Union. The table reports regression results of the Probit estimation of equation (1) on the full sample (Panel A) and its marginal effects (Panel B). SMEI Phase 1 is a categorical variable which takes the value of 1 if the firm raises a SMEI Phase 1 and 0 if the firm raises an Early stage of Venture Capital investments in the analysed year. SMEI Phase 2 is a categorical variable which takes the value of 1 if the firm raises a SMEI Phase 2 and 0 if the firm raises a Later stage of Venture Capital investments in the analysed year. *Assets* $_{t-1}$ is the natural logarithm of the total assets reported in the balance sheet by the firm for the year before raising a Venture Capital investment or a Public Grant. *Patents* $_{t-1}$ is an indicator that takes the value of 1 for firms having applied for the filing of patent in the year before raising a Venture Capital investment or a Public Grant, and 0 otherwise. *Age* $_{t-1}$ is the natural logarithm of the age of the firm the year before raising a Venture Capital investment or a Public Grant. The table reports coefficients of a Probit estimation followed by standard errors, clustered at the firm level, in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

5. Robustness checks

5.1. Alternative definitions of the dependent variables

In our baseline model, we have investigated how differently the size, innovation ability, and age of firms are associated to their probability to obtain a Public Grant with respect to a Venture Capital investment. At the same time, some firms can be recipient of both instruments – even though in different times – thus potentially leading to a misinterpretation of our findings. In this case, it could be possible that the results obtained on the entire sample of companies are (at least partially) influenced by the companies that received both instruments.

To exclude this possibility and confirm our previous findings, we then replicate the model presented in Eq. (1) limiting the sample to companies that exclusively received Venture Capital or Public Grants in the analyzed period. The results, shown in the Table 4, reassure about the robustness of our main results. Indeed, excluding enterprises that have received both types of financing from the estimations has no effect on the signs and significance of the estimated coefficients, which are consistent with the baseline model. These findings are robust to each specification of the model, regardless of whether the different sets of fixed effects are incorporated (see Col. (1) to (4) of Table 4).

At the same time, this category of firms could behave similarly to the recipient of Public Grants or VC only. If this were not the case, we would have a hint of the fact that this category has independent and distinct determinants from the other two. We then replicate the model of Eq. (1) limiting the analysis to companies that received both instruments in the sample period. The result of the estimate shows coefficients in line with the expected signs, but statistically not significant. This suggests that such firms are not immediately comparable to those that receive only one type of funding and suggest that they should be considered as a distinct category of investigation.

Hence, we consider firms being recipient of both Venture Capital and Public Grants in the sample period within a separate group of firms. In order to test whether the behaviour of this specific category of firms is statistically different from the others, we replicate again the model of Eq. (1) modifying the dependent variable to allow three different categories: (i) the group of firms raising VC investments only ("VC"); (ii) the group of firms receiving both VC and PG ("VC + PG"); (iii) the group of firms recipient of Public Grants only ("PG"). We then estimate an ordered probit model with a three-category dependent variable. This estimation allows us to determine whether the characteristics of firms ultimately receiving both types of financing are different from the ones of the VC-backed or the public granted only.

Panel A of Table 5 shows that our three investigated determinants (i.e., size, innovation, and age) are relevant in determining the probability of getting a VC, a Public Grant, or both. We then look at the related marginal effects. First, the results presented in Col. 1 and 3 of Panel B confirm the differences in the characteristics of firms that receive a VC and those that receive a PG. Indeed, VC-backed firms are typically significantly larger in terms of total assets (+0.074) than public granted firms (-0.066). Similarly, the probability of raising a VC is significantly larger for more innovative firms (+0.226), while the probability of receiving a Public Grant is higher in case of older firms (+0.265). When we look at the specific characteristics of firms who received both instruments, we find that the estimated probabilities lay in the range of coefficients estimated for the VC and PG categories only. At the same time, interestingly, the marginal effects have the same signs of public granted firms, despite the estimated coefficients are smaller in magnitude for assets (-0.008 vs -0.066), patents (-0.038 vs -0.188), and age (0.033 vs 0.265). These findings seem to suggest that the characteristics of firms associated with a higher probability of raising both instruments are similar to those receiving a Public Grant only.

5.2. Alternative definitions of explanatory variables

In this section, we test the robustness of our results adopting alternative definitions of the innovation and size of the analysed firms.

5.2.1. Innovation

In our baseline model, we have adopted patents as the indicator signalling the presence of technological innovations. This approach is consistent with the developed literature on innovation (e.g., Soete and Wyatt, 1983; Griliches, 2007; Trajtenberg, 1990; Eaton and Kortum, 1996; Eaton and Kortum, 1999; Kortum, 1997; Kanwar and Evenson, 2003; Furman et al., 2002; Hagedoorn and Cloodt, 2003). In particular, we have taken as regressor a dummy variable indicating the presence of new patents the year before the firm receives either the VC financing or the Public Grant. In order to assess the robustness of these findings, we replicate the baseline model of Eq. (1) replacing this indicator with two other alternative proxies. On one side, we use a dummy variable, $D\_Patent\ ever_{t-1}$, indicating whether the firm has ever filed a patent prior to receiving the private or public financing. In this way, we control for the fact that the

beneficial effects of innovation – proxied by the presence of patents – can materialize after more than one year from the filing. On the other side, we adopt a continuous variable, *Patent count*$_{t-1}$, which provides quantitative information on the number of registered patents. This approach allows us to test whether the intensity of innovation – rather than only its presence –differently determines how private and public financing are raised. The results of these analyses are presented in Table 6, Col. (1) and (2), and show that the probability of raising a VC vs a Public Grant is significantly higher also in the presence of patents registered some years before the financing (-0.746) and when the intensity of innovation is higher (-0.143).

As a further test, we also estimate a new version of the baseline model using a different proxy for innovation which is often adopted to analyse the macro-economic determinants of equity financing, i.e. the expenditure in Research and Development (e.g., Gompers and Lerner, 1999; Cherif and Gazdar, 2011; Pradhan et al., 2017). In particular, we use a dummy indicator, R&Dt-1, that is equal to 1 if the firm has a positive R&D expenditure the year before the financing, and zero otherwise. The result of this estimation is shown in Table 6, Col. (3), and confirms our previous findings. Specifically, firms that have spent financial resources on research and development in the past year have a higher probability of raising a VC instead of a public grant.

5.2.2. Size

In the economic literature, the size of a firm is usually proxied by three main indicators (Dogan, 2013): total assets (e.g., Deesomsak, 2004; Isik et al., 2017; Nanda and Panda, 2018; Khatap et al., 2011; Saliha and Abdessatar, 2011), total sales (e.g., Rajan and Zingales, 1995; Wiwattanakantang, 1999; Huang, 2006; Isik et al., 2017; Serrasqueiro and Nunes, 2008; Shubita and Alsawalhah, 2012), and the number of employees (e.g., Holzmuller and Kasper, 1991; Isik et al., 2017; Bonaccorsi, 1992; Archarungroj and Hoshino, 1998; Isik et al., 2017; Serrasqueiro and Nunes, 2008). While in most cases the choice of which indicator should be used is not discussed (Dang et al., 2018) or is mainly motivated by constraints on data availability (Hart and Oulton, 1996), a few more recent studies suggest that the choice of the size indicator could in principle affect the results of estimated models (Vijh and Yang, 2013). Hence, similarly to Didier et al. (2015), we test the robustness of our baseline specification of the model by alternatively substituting total assets – our main indicator – with total sales and the number of employees as proxies for the firms' size. If the results were consistent with those obtained using total assets, we may confirm that the company size is one of the predictors of VC financing regardless of how it is defined.

Table 6, Columns (4) and (5), show the results of the robustness test replicating the estimation of the model in Eq. (1) but substitutes total assets with (the natural log of lagged) total sales and number of employees, respectively. We find that in both cases the probability of raising a Public Grant – with respect to VC-backed firms – is higher for smaller firms, as evidenced by the negative and statistically significant coefficient associated to total sales (-0.259) and to the number of the employees (-0.042), with the related estimated marginal effects equal to -5.3% and -0.8%, respectively. Hence, our baseline results are reassuringly robust to alternative definitions for the firms' size.

5.3. Endogeneity issues

In the previous sections we investigated which characteristics of the companies could be considered as potential determinants of public and private investors. To do so, we examined the size, innovation, and age indicators in the year prior to the VC investment or the Public Grant. This choice allows us to reduce the risk of possible endogeneity issues of the estimated models, given that the characteristics of the firms may not be influenced by the subsequent private or public financing under investigation.

At the same time, obtaining a VC investment or Public Grant frequently necessitates a lengthy period of negotiation and evaluation by the investors. In certain circumstances, this period might also be longer than one year, thus potentially invalidating our results due to endogeneity concerns.

To overcome this potential issue and further test the robustness of our results, we replicate the estimations of the Eq. (1), anticipating the lag of the regressors from one to two years ahead of year of the VC investment or of the Public Grant. Reassuringly, the results shown in Table 7 are in line with what we obtained in the baseline estimations, independently of the inclusion of the different sets of fixed effects.

6. Conclusions

Motivated by previous research that examined the characteristics of firms financed by corporate and individual Venture Capitalists, as well as the effect of public and private funding on firms' innovative performance (Chemmanur et al.,

2014; Kou et al., 2020), we compare the characteristics of European firms supported by public and private sources in early-stage financing from 2008 to 2017. Using a portfolio approach based on firms raising either Venture Capital financing, public grants under the Horizon 2020 SME Instrument scheme, or both, we empirically test whether: (i) both Venture Capitalists and public investors exhibit a similar pattern in financing small, young, and innovative enterprises; (ii) potential heterogeneous effects that may drive differential investment behaviours in terms of level of bank indebtedness and profitability of firms; (iii) the potential differential behaviours in the interplay between private and public investment by comparing early and later stages of private and public funding.

Our analysis shows that, despite having the same ex-ante goals, private and public investors target very different types of firms. Firms that receive Public Grants are generally smaller, less innovative, and more experienced than those receiving Venture Capital funding. Furthermore, VC reaches more innovative enterprises earlier than public grants. On the other hand, public investors seem to be more prone to fund smaller and less capitalized firms. When bank debt and profitability are accounted, the differences in the characteristics of enterprises (size, innovation, and age) between those financed by public subsidies and those financed by venture capitalists are not significant. Companies receiving public subsidies are more indebted in the short term, whereas companies funded by VCs are less indebted and, more oriented to long-term bank's debt financing. Moreover, profitable firms are more likely to receive public subsidies than VC-backed firms. In terms of financing stage, there are no significant differences in behaviours between private and public investors based on investment stage or round. These findings are robust to several tests like the adoption of alternative definitions of innovation and size of the analyzed firm or the exclusion of firms that have received both types of financing from the analysis.

Annex

Table 4: Robustness test – Alternative definitions of the dependent variable: Exclusion of the mixed category

Panel A – Probit

	Public Grant				
	Mixed excluded				Mixed only
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Assets $_{t-1}$	-0.222***	-0.251***	-0.268***	-0.237***	0.015
	(0.016)	(0.019)	(0.024)	(0.026)	(0.087)
D_Patents $_{t-1}$	-1.443***	-1.026***	-1.371***	-1.133***	0.265
	(0.127)	(0.164)	(0.190)	(0.196)	(0.273)
Age $_{t-1}$	0.867***	0.940***	0.801***	0.828***	0.078
	(0.036)	(0.043)	(0.052)	(0.057)	(0.217)
Observations	4,282	4,282	4,282	4,282	119
Year Fixed Effects	No	Yes	Yes	Yes	No
Sector Fixed Effects	No	No	Yes	Yes	No
Country Fixed Effects	No	No	No	Yes	No

Panel B – Marginal Effects

	Public Grant				
	Mixed excluded				Mixed only
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Assets $_{t-1}$	-0.062***	-0.054***	-0.046***	-0.036***	0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.028)
D_Patents $_{t-1}$	-0.405***	-0.222***	-0.237***	-0.172***	0.085
	(0.034)	(0.033)	(0.029)	(0.027)	(0.087)
Age $_{t-1}$	0.243***	0.203***	0.138***	0.126***	0.024
	(0.007)	(0.007)	(0.008)	(0.008)	(0.070)
Observations	4,282	4,282	4,282	4,282	119
Year Fixed Effects	No	Yes	Yes	Yes	No
Sector Fixed Effects	No	No	Yes	Yes	No
Country Fixed Effects	No	No	No	Yes	No

Note: The analysis covers Venture Capital investments and Public Grants raised in the period between 2008 to 2017 by firms operating in the European Union. The table reports regression results of the Probit estimation of equation (1) on the full sample (Panel A) and its marginal effects (Panel B). The dependent variable, *Public Grant – Mixed excluded* (Columns (1) to (4)), is a dummy variable which takes the value of 1 if the firm raises a Public Grant only, and 0 if the firm raises a Venture Capital investment only in the analysed period (firms raising both Public Grants and Venture Capital investments are excluded from the sample). The dependent variable, *Public Grant – Mixed only* (Column (5)), is a dummy variable which takes the value of 1 if the firm raises a Public Grant, and 0 if the firm raises a Venture Capital investment, limitedly to firms raising both Public Grants and Venture Capital investments in the analysed period. *Assets* $_{t-1}$ is the natural logarithm of the total assets reported in the balance sheet by the firm for the year before raising a Venture Capital investment or a Public Grant. *Patents* $_{t-1}$ is an indicator that takes the value of 1 for firms having applied for the filing of patent in the year before raising a Venture Capital investment or a Public Grant, and 0 otherwise. *Age* $_{t-1}$ is the natural logarithm of the age of the firm the year before raising a Venture Capital investment or a Public Grant. This table reports coefficients of a Probit estimation followed by standard errors, clustered at the firm level, in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5: Robustness test – Alternative definitions of the dependent variable

Panel A – Ordered Probit

	Categorical variable (0 = VC; 1 = VC+PG; 2 = PG)			
Dependent Variable	(1)	(2)	(3)	(4)
Assets $_{t-1}$	-0.190***	-0.189***	-0.211***	-0.185***
	(0.014)	(0.015)	(0.017)	(0.019)
D_Patents $_{t-1}$	-0.632***	-0.261***	-0.479***	-0.334***
	(0.074)	(0.084)	(0.096)	(0.097)
Age $_{t-1}$	0.766***	0.734***	0.582***	0.606***
	(0.032)	(0.035)	(0.038)	(0.043)
Observations	4,742	4,742	4,742	4,742
Year Fixed Effects	No	Yes	Yes	Yes
Sector Fixed Effects	No	No	Yes	Yes
Country Fixed Effects	No	No	No	Yes

Panel B – Marginal Effects

	VC	VC+PG	PG
Dependent Variable	(1)	(2)	(3)
Assets $_{t-1}$	0.074***	-0.008***	-0.066***
	(0.006)	(0.001)	(0.005)
D_Patents $_{t-1}$	0.226***	-0.038***	-0.188***
	(0.023)	(0.005)	(0.018)
Age $_{t-1}$	-0.299***	0.033***	0.265***
	(0.012)	(0.003)	(0.011)
Observations	4,742	4,742	4,742
Year Fixed Effects	No	No	No
Sector Fixed Effects	No	No	No
Country Fixed Effects	No	No	No

Note: The analysis covers Venture Capital investments and Public Grants raised in the period between 2008 to 2017 by firms operating in the European Union. The dependent is a Categorical Variable which takes the value of 2 if the firm raises a Public Grant only, 1 if it raises both a Venture Capital investment and a Public Grant, 0 if the firm raises a Venture Capital investment only in the analysed period. *Assets* $_{t-1}$ is the natural logarithm of the total assets reported in the balance sheet by the firm for the year before raising a Venture Capital investment or a Public Grant. *Patents* $_{t-1}$ is an indicator that takes the value of 1 for firms having applied for the filing of patent in the year before raising a Venture Capital investment or a Public Grant, and 0 otherwise. *Age* $_{t-1}$ is the natural logarithm of the age of the firm the year before raising a Venture Capital investment or a Public Grant. Panel A reports coefficients of an Ordered Probit estimation followed by standard errors, clustered at the firm level, in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively. Panel B reports the marginal effects of the Ordered Probit estimation (model in Panel (A) col (1)) followed by standard errors, clustered at the firm level, in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6: Robustness test – Alternative definitions of the explanatory variables: Innovation and Size

Panel A – Probit

	Public Grant				
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Assets $_{t-1}$	-0.185***	-0.201***	-0.211***		
	(0.019)	(0.019)	(0.019)		
Employees $_{t-1}$				-0.259***	
				(0.037)	
Sales $_{t-1}$					-0.042**
					(0.017)
D_Patent $_{t-1}$				-0.538***	-0.562***
				(0.121)	(0.134)
D_Patent ever $_{t-1}$	-0.746***				
	(0.087)				
Patent count $_{t-1}$		-0.143**			
		(0.058)			
R&D $_{t-1}$			-0.436**		
			(0.203)		
Age $_{t-1}$	0.663***	0.669***	0.681***	0.663***	0.584***
	(0.046)	(0.045)	(0.045)	(0.054)	(0.052)
Observations	4,742	4,742	4,742	2,723	2,528
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes

Table 6: continued

Panel B – Marginal Effects

	Public Grant				
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Assets $_{t-1}$	-0.034***	-0.038***	-0.040***		
	(0.004)	(0.003)	(0.004)		
Employees $_{t-1}$				-0.053***	
				(0.007)	
Sales $_{t-1}$					-0.008**
					(0.003)
D_Patent $_{t-1}$				-0.110***	-0.109***
				(0.024)	(0.025)
D_Patent ever $_{t-1}$	-0.137***				
	(0.015)				
Patent count $_{t-1}$		-0.027**			
		(0.011)			
R&D $_{t-1}$			-0.083**		
			(0.039)		
Age $_{t-1}$	0.122***	0.127***	0.129***	0.136***	0.113***
	(0.008)	(0.008)	(0.008)	(0.010)	(0.009)
Observations	4,742	4,742	4,742	2,723	2,528
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Sector Fixed Effects	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes

Note: The analysis covers Venture Capital investments and Public Grants raised in the period between 2008 to 2017 by firms operating in the European Union. The table reports regression results of the Probit estimation of equation (1) on the full sample (Panel A) and its marginal effects (Panel B). The dependent variable, *Public Grant*, is a dummy variable which takes the value of 1 if the firm raises a Public Grant, and 0 if the firm raises a Venture Capital investment in the analysed period. This table reports coefficients of a Probit estimation followed by standard errors, clustered at the firm level, in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7: Robustness test – Endogeneity

Panel A – Probit

	Public Grant			
Dependent Variable	(1)	(2)	(3)	(4)
Assets $_{t-2}$	-0.188***	-0.199***	-0.199***	-0.166***
	(0.014)	(0.016)	(0.019)	(0.020)
D_Patents $_{t-2}$	-0.795***	-0.432***	-0.716***	-0.563***
	(0.082)	(0.100)	(0.116)	(0.120)
Age $_{t-2}$	0.671***	0.744***	0.568***	0.587***
	(0.031)	(0.037)	(0.041)	(0.047)
Observations	4,264	4,264	4,264	4,264
Year Fixed Effects	No	Yes	Yes	Yes
Sector Fixed Effects	No	No	Yes	Yes
Country Fixed Effects	No	No	No	Yes

Panel B – Marginal Effects

	Public Grant			
Dependent Variable	(1)	(2)	(3)	(4)
Assets $_{t-2}$	-0.060***	-0.049***	-0.042***	-0.032***
	(0.004)	(0.004)	(0.004)	(0.004)
D_Patents $_{t-2}$	-0.253***	-0.107***	-0.153***	-0.109***
	(0.025)	(0.024)	(0.024)	(0.022)
Age $_{t-2}$	0.214***	0.185***	0.121***	0.113***
	(0.008)	(0.007)	(0.008)	(0.008)
Observations	4,264	4,264	4,264	4,264
Year Fixed Effects	No	Yes	Yes	Yes
Sector Fixed Effects	No	No	Yes	Yes
Country Fixed Effects	No	No	No	Yes

Note: The analysis covers Venture Capital and Public Grants raised in the period between 2008 to 2017 by firms operating in the European Union. The table reports regression results of the Probit estimation of equation (1) on the full sample (Panel A) and its marginal effects (Panel B). Public Grants is a categorical variable which takes the value of 1 if the firm raises a Public Grant and 0 if the firm raises a Venture Capital investment in the analysed year. *Assets* $_{t-2}$ is the natural logarithm of the total assets reported in the balance sheet by the firm two years before raising a Venture Capital investment or a Public Grant. *Patents* $_{t-2}$ is an indicator that takes the value of 1 for firms having applied for the filing of patent two years before raising a Venture Capital investment or a Public Grant, and 0 otherwise. *Age* $_{t-2}$ is the natural logarithm of the age of the firm two years before raising a Venture Capital investment or a Public Grant. The table reports coefficients of a Probit estimation followed by standard errors, clustered at the firm level, in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 8: Summary Statistics

Variables	Obs.		Mean		Std. Dev.		Min		Max	
	VC	PG	VC	PG	VC	PG	VC	PG	VC	PG
Assets$_{t-1}$ (ln)	3,047	1,695	6.997	6.721	1.948	2.039	0.000	0.001	13.762	12.899
D_Patents$_{t-1}$	3,047	1,695	1.956	0.049	0.397	0.216	0.000	0.000	1.000	1.000
Age$_{t-1}$ (ln)	3,047	1,695	1.389	2.070	0.702	1.069	0.000	0.000	4.533	4.745
ST debt$_{t-1}$	1,770	1,555	0.411	0.537	0.492	0.499	0.000	0.000	1.000	1.000
LT debt$_{t-1}$	1,770	1,555	0.998	0.758	0.047	0.429	0.000	0.000	1.000	1.000
Leverage$_{t-1}$ (ln)	2,991	1,294	0.231	0.217	0.372	0.259	0.000	0.000	4.251	2.634
EBIT$_{t-1}$	700	1,000	-28.986	0.267	34.185	25.086	-99.968	-98.590	67.536	98.196
ROE$_{t-1}$	1,206	1,190	-87.310	-17.289	145.195	106.616	-919.655	-963.023	206.549	593.390
Profit Margin$_{t-1}$	690	995	-29.783	-0.849	33.856	25.177	-99.183	-97.508	71.090	98.196
Employees$_{t-1}$ (ln)	1,941	1,266	2.547	2.416	1.237	1.180	0.000	0.000	7.952	5.805
Sales$_{t-1}$ (ln)	1,873	1,247	5.365	5.771	2.858	2.750	0.000	0.000	12.659	11.194
D_Patents ever	3,047	1,695	0.326	0.080	0.469	0.272	0.000	0.000	1.000	1.000
Patents count$_{t-1}$ (ln)	3,047	1,695	0.351	0.088	0.829	0.436	0.000	0.000	4.942	3.920
R&D$_{t-1}$	3,047	1,695	0.018	0.009	0.134	0.097	0.000	0.000	1.000	1.000
Assets$_{t-2}$ (ln)	2,683	1,581	6.993	6.655	1.977	2.116	0.000	0.000	13.762	13.007
D_Patents$_{t-2}$	2,683	1,581	0.196	0.048	0.397	0.214	0.000	0.000	1.000	1.000
Age$_{t-2}$ (ln)	2,683	1,581	1.465	2.051	0.737	1.106	0.000	0.000	4.522	4.736

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