



# The participation of new technology-based firms in EU-funded R&D partnerships: The role of venture capital



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## ABSTRACT

This paper investigates the participation of new technology-based firms (NTBFs) in EU-funded R&D partnerships. We examine whether venture capital (VC)-backed firms are more likely to enter these partnerships than their non VC-backed peers and the role of the ownership and governance of the VC investor. We resort to a mixed method approach. We use qualitative information collected through interviews with managers of NTBFs and VC firms to better illustrate our deductively derived theoretical hypotheses, that are then tested through a large scale econometric analysis. The econometric analysis takes advantage of the VICO dataset, which includes longitudinal data on 8346 NTBFs from seven European countries observed from 1995 to 2008, out of which 758 were VC-backed. The econometric results show that VC backing has a strong positive impact on NTBFs' participation in EU-funded R&D partnerships, but the magnitude of this effect rapidly decreases with NTBFs' prior experience of this type of partnership. Moreover, the magnitude of the impact of VC backing considerably differs depending on the type of investor with bank and government VC exhibiting the strongest positive effects.

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## 1. Introduction

The receipt of venture capital (VC) is a fundamental milestone for entrepreneurial ventures that operate in high-tech industries (hereafter: NTBFs, new technology-based firms.<sup>2</sup> See e.g., [Gompers and Lerner, 2001](#)). The entrepreneurship literature has highlighted that, in addition to financial resources, VC firms provide portfolio companies with valuable support in designing their organization and strategy, and improving their capabilities ([Gorman and Sahlman, 1989](#)). In particular, previous studies have shown that VC-backed NTBFs have a greater propensity to form partnerships with other firms than their non-VC-backed counterparts (see e.g.,

[Gans et al., 2002](#); [Hsu, 2006](#); [Colombo et al., 2006](#); [Lindsey, 2008](#); [Ozmel et al., 2013b](#)). NTBFs typically possess distinctive technological capabilities (e.g., the capability to develop an innovative biotech compound for therapeutic use) that need to be combined with other specialized assets and capabilities they do not possess (e.g., clinical testing capabilities) to generate an economic return. Partnerships are a fundamental mechanism allowing NTBFs to gain access to these complementary assets and capabilities ([Tece, 1996](#); [Gans and Stern, 2003](#)).

Collaborative R&D projects funded by the European Union (EU) under the Framework Programmes for Research and Technological Development (FPs) and other supporting schemes are a prominent example of partnerships that may be beneficial to NTBFs ([Colombo et al., 2009](#)). These collaborative projects generally involve a minimum of three organizations (incumbent firms, NTBFs, academic institutions, public research organizations, and other public institutions) located in different member States. Calls for tenders published by the European Commission (EC) cover a wide spectrum of scientific and technological fields. Consortia of applicants fiercely compete to get a grant that subsidizes a considerable portion of the costs of the project. These collaborative R&D partnerships are the key research and innovation policy instrument used by the European Commission to foster knowledge exchange, sharing and recombination between partners located in different

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<sup>1</sup> The opinions expressed by the author in this publication in no way commit the European Court of Auditors.

<sup>2</sup> As noted by [Storey and Tether \(1998\)](#), defining what is a NTBF is not a simple matter. NTBFs are defined here as young companies that operate in high-tech industries and are not controlled by another firm (even though other firm or institutions, such as a VC firm, may possess a minority stake). There is no general consensus as to the age threshold beyond which a firm ceases to be a NTBF. Most studies use a threshold comprised between 10 and 25 years. Here we adhere to the 25 year threshold originally proposed by [Little \(1977\)](#).

EU countries and overcome the innovation gap between Europe and its key competitors, the US and Japan in particular.<sup>3</sup>

In principle, EU-funded R&D partnerships should be especially attractive for NTBFs, due to the generous subsidy participants receive from the EU and the double quality signal generated by the receipt of a competitive grant and the endorsement by other members of the consortium. In fact, NTBFs do not have a solid track record, are subject to considerable information asymmetries and, as a result, are often financially constrained (Carpenter and Petersen, 2002; Hall, 2002; Denis, 2004). However, NTBFs encounter serious obstacles in entering these partnerships. These difficulties are clearly documented by the fact that small and medium enterprises (SMEs), of which NTBFs are an important sub-category, accounted for an amount of about 3 billion Euros corresponding to only 16.3% of the 7th FP budget (European Commission, 2012).<sup>4</sup> This percentage is particularly low, considering that in 2013 SMEs accounted for 99.8% of all enterprises active in the EU28 non-financial business sector, 66.8% of total employment, and 58.1% of the value added (European Commission, 2014). Indeed, ensuring an active involvement of NTBFs in EU-funded R&D partnerships has been repeatedly declared as a top-priority by the European Commission (2008).

One may wonder whether VC backing has a positive effect on the propensity of NTBFs to participate in EU-funded R&D partnerships, as it does on the propensity to establish other types of partnership. Despite the conceptual interest and practical relevance of this issue, it has so far gone almost unremarked (see Colombo et al., 2006 for an exception). In addition, previous studies have unanimously recognized that the *prior experience of R&D partnerships* is the most influential factor increasing the likelihood of a firm engaging in subsequent R&D partnerships (Sakakibara, 2002; Hernán et al., 2003; Marín and Siotis, 2008; Barajas and Huergo, 2010). Therefore, one may wonder whether the effect of VC backing on the participation of NTBFs in EU-funded R&D partnerships is moderated by the experience of previous participations. Lastly, the VC literature has recognized that VC investors are heterogeneous along several dimensions. A dimension that is receiving increasing attention in the VC literature is their *ownership and governance*. Previous studies have distinguished *independent* and *captive* VC investors (Dimov and Gedajlovic, 2010; Andrieu, 2013; Da Rin et al., 2013). Independent VC (IVC) firms manage closed-end funds organized as limited partnerships, in which the fund providers (pension funds, other institutional investors and individual investors) serve as limited partners and the manager of the fund as general partner (Sahlman, 1990). Captive VC investors are structured as investment vehicles or business units of a parent company, which provides the capital to be invested by the VC investor. The parent company is a non-financial company in the case of corporate VC (CVC) investors, a bank in the case of bank-affiliated VC (BVC) investors, and a governmental body in the case of governmental VC (GVC) investors (see again Da Rin et al., 2013). While IVC and CVC investors are diffused worldwide, the massive presence of BVC and GVC investors is an important peculiarity of the European VC industry (Bottazzi and Da Rin, 2002; Bertoni et al., 2015). Depending on their ownership and governance, different types of VC investor have different objectives and adopt different investment strategies (Gompers, 2002; Hellmann et al., 2008; Dimov and Gedajlovic, 2010; Dushnitsky,

2012; Bertoni et al., 2015). Therefore, whether VC backing favors (or hinders) participation in EU-funded R&D partnerships may well depend on VC investors' *ownership* and *governance*. In sum, in the present paper we address the following research questions: does VC backing influence NTBFs' propensity to enter into EU-funded R&D partnerships? Is this effect moderated by a NTBF's prior experience of these partnerships? Is it moderated by the ownership and governance of the VC investor?

In tackling these research issues, we resort to a mixed method approach that combines qualitative and quantitative analyses (see e.g., Edmondson and McManus, 2007). We first build on arguments inspired by the VC literature to deductively develop our theoretical hypotheses. Then, we use qualitative evidence collected through interviews with NTBFs' and VC firms' managers for cross-validation. In particular, we have interviewed the owner-managers of 6 NTBFs that participated in EU-funded R&D partnerships and were VC-backed at the time of their first participation. In addition, we have interviewed the managers of 8 VC firms to collect their opinion and attitude about the participation of portfolio companies in EU-funded R&D partnerships (for privacy reasons, the interviewed NTBFs will be referred to as EV1, ..., EV6, and the interviewed investors as VC1, ..., VC8. See Table A1 in Appendix for an illustration of the characteristics of these firms). The illustrative examples from the "real world" that we provide enrich and deepen our theoretical arguments giving practical insights related to the hypotheses. An additional advantage of the qualitative evidence is to generate better understanding of the different mechanisms and processes that underlie our theoretical hypotheses (see Edmondson and McManus, 2007, p. 1157. See also e.g., Colombo et al. (2014), Arora et al. (2013) for recent work adopting a similar approach. See Table B1 included in the on-line Appendix for more complete qualitative evidence collected through the interviews). Lastly, we provide quantitative evidence obtained through econometric estimates on a large sample of European VC-backed and non-VC-backed NTBFs. For this purpose, we take advantage of the VICO database, a large-scale longitudinal dataset on NTBFs located in seven European countries (Belgium, Finland, France, Germany, Italy, Spain and the United Kingdom).<sup>5</sup> The VICO database relies on information in-sourced from both commercial databases (i.e., Thomson One, VC pro-Database and Zephyr) and country-specific proprietary databases for each of the seven countries under consideration. In building VICO, several other secondary sources (e.g., VC investors' and investee NTBFs' websites) were used to crosscheck information accuracy. The main advantage of using the VICO database for this study is that it allows to overcome the well-known deficiencies of commercial databases as regards coverage of VC outside of the US, notably the underrepresentation and mischaracterization of captive investors (see Section 3.1 for further details). The VICO database includes data on 8346 NTBFs, which were less than 25 years old in 2010, were independent at their founding date (i.e., not controlled by other business organizations), operate in high-tech manufacturing and services industries, and are observed between 1995 and 2010. Out of these firms, 758 are VC-backed. For all NTBFs included in the VICO database, we collected data on their participation in EU-funded R&D partnerships from the CORDIS database. 643 of these firms participated in one or more EU-funded projects. Out of these latter firms, 168 were also VC-backed.

<sup>3</sup> Accordingly, the annual budget allocated since 1984 to FPs, the main program for funding R&D partnerships, has been constantly growing, nearly doubling every 10 years (Eurostat, 2011). In the 7th FP (2007–2013) alone, 32 billion Euros have been allocated to the Cooperation Programme, the main instrument under which collaborative R&D partnerships are funded.

<sup>4</sup> Of the about 91,000 participations in 7th FP projects, 16,000 are from SMEs receiving an average EU contribution of 253,000 euros. The SME participations represent 10,807 individual SMEs out of the 27,549 individual organizations participating in the 7th FP (see again European Commission, 2012).

<sup>5</sup> The VICO database was created by the 7th FP VICO project (<http://www.vicoproject.org/>) and has been used by several previous studies that were interested in assessing the "treatment effect" of VC investments on the growth, exit and economic performance of European NTBFs, and detecting differences among investor types (see e.g. Croce et al., 2013; Bertoni et al., 2015; Cumming et al., 2013; Grilli and Murtinu, 2014a, 2014b).

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