



European  
Commission

## POLICY BRIEF

# Financing R&D and Innovation for Corporate Growth: What new evidence should policymakers know?

Pietro Moncada-Paternò-Castello, Antonio Vezzani,  
Fernando Hervás and Sandro Montresor

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### 1. Introduction

A large number of firms continue to face financial constraints which have been intensified by the 2008 financial crisis. The interplay of EU specific economic characteristics makes the funding shortfall for innovative projects particularly acute in Europe. In particular, EU high-tech start-ups and young innovative SMEs are seriously financially constrained; this has been identified as a major barrier to their growth, to which policymakers strive to find suitable solutions (European Commission, 2013).

In a context where investments in innovation are at the core of firms' competitiveness strategies and on the top of countries' and regions' "growth and jobs" policy agendas, a better understanding of the current and emerging drivers and barriers for innovation financing is crucial.

This policy brief relies on the results of a recent European Conference<sup>1</sup> on the subject. It presents recent empirical evidence and attempts to draw a number of policy-relevant messages to be brought to the attention of policymakers.

### 2. Background

The financing of R&D and innovation activities is susceptible to market failures. Extensive evidence has shown that these failures are mainly related to the innate uncertainty of innovative projects, the difficulties innovators face in appropriating their benefits and the asymmetric information and moral hazard that pervade relationships between lenders, equity investors and borrowers (Hall and Lerner, 2010).

Research on financial sources and constraints to firms' growth strategies has grown enormously in recent decades, producing an extensive number of results, whose research and policy implications merit further scrutiny. For example, evidence on the consequences a firm's capital structure has on its capacity to finance R&D and innovation (and vice versa) has shed new light on the relative merits of bank-based versus market-based financial systems as sources of finance (Dosi, 1990; Brown et al., 2009). However, whether this generates country specificities within Europe in the finance-innovation-growth link that could be exploited by policymakers for the sake of innovation deserves further investigation (Revest and Sapio, 2012).

<sup>1</sup> The Fourth European Conference on Corporate R&D and Innovation (CONCORDi-2013) – Seville, Spain, 26-27 September 2013 – focused on 'Financing R&D and innovation for firms' growth', organised by the European Commission's Joint Research Centre  
<http://iri.jrc.ec.europa.eu/concord/2013/index.html>

The related issue of the gap between the external and internal costs of R&D investments is also in need of further analysis. The ways in which companies could mitigate the opacity of their innovative projects in investors' eyes and their lack of collateralisable assets, the remedies against the morally hazardous behaviours (e.g. self-dealing) of their managers with respect to internal cash flows and their understandable reluctance to invest external capital in risky projects, are only some of the issues of the phenomenon at stake (Hall & Lerner, 2010).

Furthermore, the available evidence confirms that firms' specificities, such as location, sector of activity, size and age, need to be considered when analysing the magnitude and implications of the "financing gap". In this respect, younger and smaller firms have more difficulties in gaining access to finance and in obtaining long-term loans and they are commonly characterised by lower levels of equity capital (Cooley and Quadri, 2001). These generally more severe financial constraints affect their innovation investments and, as recent research shows, their growth performance and persistence (Ciriaci *et al.*, 2012).

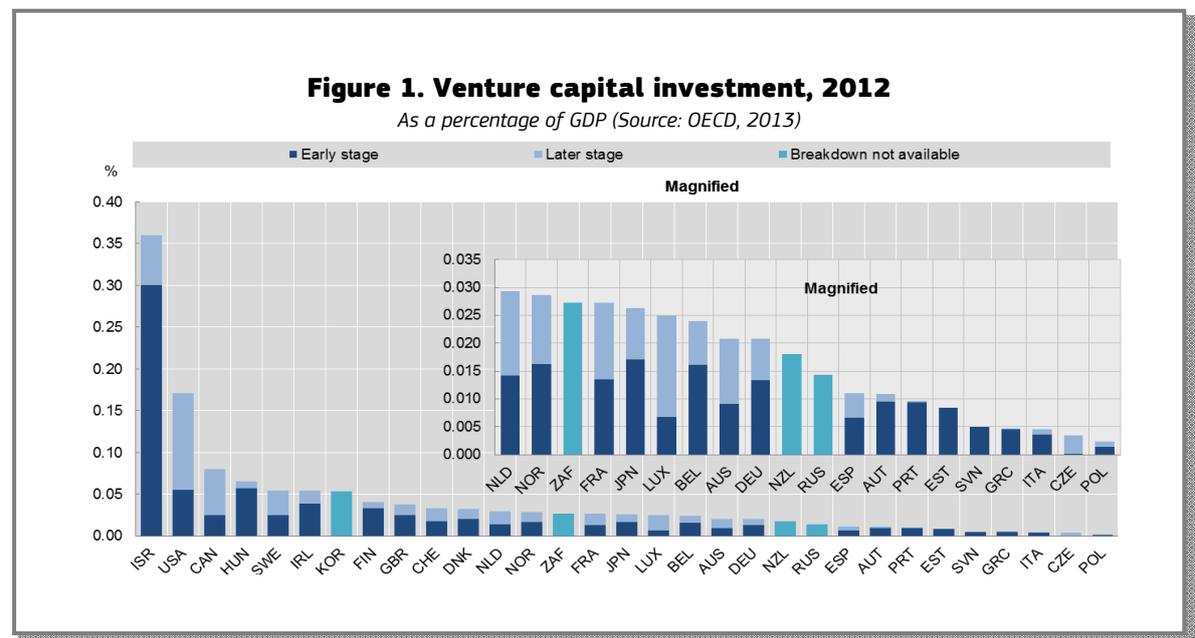
The evidence of the failures that affect the financing of R&D and innovation has stimulated a lot of work on the need for public policy to overcome these failures at different levels – national, supra- and sub-national – and on the policy measures needed to actually achieve it. At the same

time, research on the role of financing facilitators, like venture and seed capital, business angels, and crowdsourcing (to mention a few) has grown.

Important results have been achieved also in this field (O'Sullivan, 2006; Hall and Lerner, 2010), shedding light on the important European specificities with respect to the US. This is for example the case of the quantitative and qualitative deficits of its venture capital industry: as Figure 1 shows, European countries lag behind the USA in terms of venture capital investments. In addition to that, the failures of their high-tech stock markets and the shortage of high-risk loans (Revest and Sapio, 2012) are the most significant. Some of these specificities have been aggravated as a result of the financial crisis.

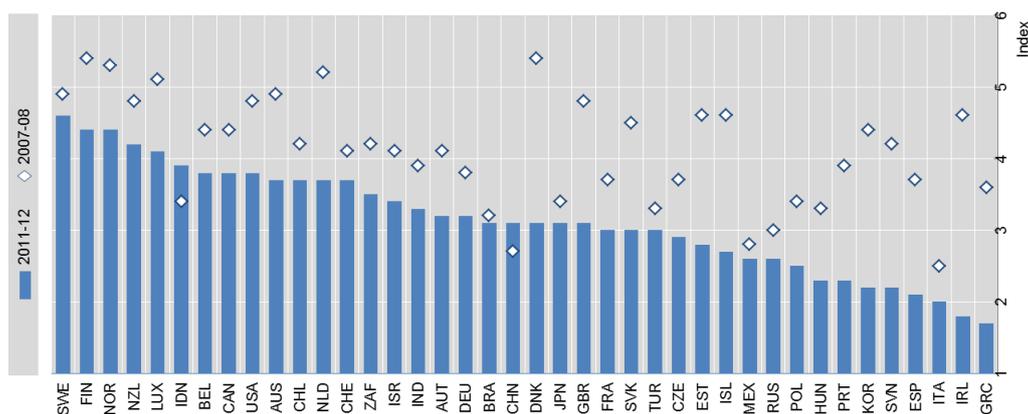
As Figure 2 shows, access to loans for companies located in some Member States has severely worsened during 2011-12 as compared with the 2007-08 period.

This new context calls for further scrutiny of the policy options available to improve this situation. On the one hand, direct policy measures – such as the use of R&D tax credits – need careful policy assessment in order to assess their "additionality" and exclude the risk of crowding-out effects (Santarelli and Vivarelli, 2002; Ientile and Mairesse, 2009). On the other hand, indirect policy measures – such as institutional support to private venture capital, or to a public form of venture capital (Bonaccorsi and Montaina, 2012) – should control for



**Figure 2. Ease of access to loans, 2007-08 and 2011-12**

Scale from 1 to 7 from hardest to easiest, weighted averages (Source: OECD, 2013)



their actual role in enabling the development of already innovative companies (“coach function”), rather than in picking-up companies that only have the potential to become so (“scout function”) (Bottazzi and Da Rin, 2003).

### 3. New evidence from CONCORDi-2013

The CONCORDi-2013 Conference was structured around two topics which aimed to represent two sides of the same coin, namely the issue of R&D and innovation financing for corporate growth. Topic 1 took a company-level perspective and focused on the financial sources available, the constraints that firms perceive in accessing them, and the strategic choices they need to take to transform them into superior innovation and growth. Topic 2 took a policy perspective, addressing the effectiveness of the financing facilitators which firms use (e.g. venture capital, business angels and crowdsourcing), the policy needs that they pose, and the kind of actions and measurements needed to address them. In the following two sections, the main evidence presented for each topic is summarised and main policy-relevant messages highlighted.

#### 3.1 Financial sources, constraints and firms' growth strategies

Assessing the importance of various external factors affecting firms' R&D efforts and innovative activities is crucial to understand the issue at stake. The studies presented during CONCORDi-2013 reinforce

previous evidence on the negative impact of financial constraints on innovative activities; furthermore, they highlight the importance of non-financial hurdles. There is a high degree of heterogeneity among firms. In particular, financial constraints are most common for those with higher innovative potential, and whose environment is characterised by high uncertainty and limited information disclosure.

Evidence presented during the conference shows that by adopting certain behaviours, firms can either reduce or magnify their financial constraints. How firms' own behaviours affect market perceptions and the severity of financial constraints is thus a relevant dimension to be analysed to properly understand the finance-innovation mechanism. In this respect new important evidence emerged from the conference. Strong intellectual property activities (patent applications and scientific publications) are associated with greater R&D activities in high-technology sectors, and attenuate the financial constraints. This occurs especially for small firms, for which information asymmetries may be particularly high and collateral value is low.

**Policy-relevant message 1:** *The quality and quantity of financial disclosure rules/practices positively affect firms' investment in R&D as well as the speed of firms' growth, especially in high-tech industries. Besides, it appears that the tax treatment of R&D has a relatively stronger effect on R&D in less innovative industries.*

Moreover, it was shown that the relation between firms' financial constraints and their innovative activities is not linear and

unidirectional. New, robust evidence of two-way feedback effects (bi-directional) was provided. More precisely, these papers show that what makes firms more financially constrained is in fact their R&D and innovation activities, while the start of such activities appeared to be initially less financially constrained.

**Policy relevant message 2:** *The financing challenges of innovation do not stop when a firm introduces a new product or service, but continue – and may in fact intensify – in the early stages of diffusion.*

Finally, findings from the existing literature on the interaction between firms' financial constraints, innovative investments and exports have been confirmed. In addition, it has been proved that this interaction is dependent on the availability (or lack) of financial resources. Moreover, it seems that financial constraints can shape the relation between innovative activities and exports in a very particular way: if financial constraints bind, export and innovative activities are less likely to be complementary to each other.

**Policy relevant message 3:** *Financial constraints (or the level of financial health of the firm) intertwine with product competition in preventing firms from investing in R&D to gain foreign market shares and to grow.*

### **3.2. Public policies, policy means and financing facilitators**

A first set of policies which merit investigation are those concerning R&D tax credits. Evidence from the recent works presented during the CONCORDi-2013 show that R&D tax incentive schemes targeting large companies could generate positive effects. In the case of the UK, in particular, an increase of 18% in business R&D has been estimated with respect to the counterfactual scenario of no tax credit; thus implying a user cost elasticity of 1.35. Furthermore, it is better to have two policy instruments rather than just one: the combination of R&D tax credits and R&D subsidies is effective in preventing crowding out effects, as evidence shows from the Belgian experience. In fact, evidence shows that the effects of R&D tax credits and R&D

subsidies are differentiated according to the characteristics of the firm and of R&D projects. In the case of the new French R&D tax credit scheme, which is particularly generous in terms of the resources dedicated to it (it has absorbed 0.25% of its GDP), important specificities arise. It was estimated that this programme has led to a 13% increase of business R&D, but without a visible increase in innovation output as measured by patent applications. This result emphasises the need to include appropriate output indicators among the ex-ante objectives and subsequent evaluation criteria of such policy schemes, in order to ensure that private returns to R&D (e.g. in terms of patent applications) are achieved.

**Policy relevant message 4:** *The latest empirical evidence point to positive impacts of tax credit schemes in the levels of business R&D spending. Such schemes should be tailored to firms' specificities and combined with other instruments to avoid crowding-out effects. Besides the increase of R&D, schemes should also target and be evaluated in terms of innovative outputs.*

A closer look at the issue of effectiveness of R&D subsidies provides additional interesting insights. Looking at the Flemish scheme, which treats funds supporting the Research (R) phase differently from those devoted to the Development (D), shows that targeting "R" induces more private investment than targeting "D". In addition, there are significant "cross-effects" with more significant spill-overs stemming from the "R" support to the "D" private performances; these effects depend highly on the size of the firms targeted. In the Finnish experience subsidies are allocated - through the selection of the Finnish agency TEKES - to more technologically challenging, riskier and more novel innovation projects. However, important differences arise depending on firm size: commercial risk is negatively correlated to subsidy decisions for SMEs, but positively correlated for large firms. Finally, the experience of the Spanish CDTI agency shows that young firms, exporters, large firms, firms operating in high/medium-tech industries, and especially firms with previous experience in similar programmes, are more likely to use R&D subsidies.

**Policy relevant message 5:** *The size of firms and some specific characteristics (such as the level of internationalisation and innovation intensity) are important determinants of the positive impact of R&D subsidies. Large firms and high-tech sectors seem to benefit more, particularly when subsidies target earlier phases of knowledge creation (R vs. D) and more risky projects.*

Finally, new indications on what are the best (and new) financial support policies favouring the growth of new innovative firms have been presented. As European new R&D-intensive firms seldom become very big, public policies try to address this issue in different ways. However, new evidence from Germany shows the difficulty of such a task. Results from the analysis presented at the Conference show that R&D subsidies targeting young firms are not effective, unless such firms operate in high-tech sectors. On the other hand, empirical evidence indicates that public venture capital may not be a policy solution in Europe. Private VC appears to be more conducive to firm growth than public VC funding. The "crowdfunding" scheme<sup>2</sup> - a potentially new important way to finance new technology-based ventures - has several interesting characteristics: the existence of a large number of co-founders already indicates the cases in which there will be eager consumers. It seems that crowdfunding is evolving along the same lines as venture capital and could represent an interesting option for the public sector to select, with the help of citizens, the innovative projects to be funded.

**Policy relevant message 6:** *Existing public instruments seem not well suited to supporting the growth of new innovative companies, except in high-tech sectors. Private venture capital appears in this respect more effective than public VC.*

#### **4. Policy relevant conclusions from CONCORDi-2013**

The main results deriving from CONCORDi-2013 merit some research and policy considerations.

<sup>2</sup> This is the collective effort of individuals who network and pool their money, usually via the Internet, to support efforts initiated by other people or organisations.

(I) Financial constraints are important obstacles to R&D and innovation in European firms, and the importance of these obstacles depend on factors that are both internal and external to the firms. The lack of firms' internal liquidity together with the lack of collateral assets (typical of SMEs) dampens corporate R&D and innovation activities. At the same time, strong competition and the lack of demand are almost as important obstacles as are financing constraints. This sheds new light in the way financial constraints need to be addressed: not just as merely innovation barriers, but also as a problem related to market selection mechanisms (demand for innovation).

(II) The reduction of information asymmetries can considerably lower the barriers to access financial resources for corporate R&D and innovation activities: high level practices of financial disclosure, patenting and publications are positive information signals to investors and prove to positively affect firms' investment in R&D/innovation as well as the speed of firms' growth. Public policies can favour good practices of financial disclosure.

(III) Moreover, the difficulty of accessing finance and its limited availability may apply to external financial sources, especially to bank loans, as banks generally do not possess the scope, financial products and competencies to deal with investment in high-tech projects (especially by young firms). Hence, venture capital could be considered (still) a suitable external financing mechanism as it reduces the time needed to reach the market and commercialise new ideas, especially for high-tech start-ups operating in capital-intensive industries. Nonetheless, there are concerns that private venture capital is ultimately the proper instrument for financing R&D and innovation projects (often with medium/long-term perspectives), especially because the former has a short-term horizon to harvest returns (the VC exit time is usually around the third year) and the latter the opposite. This in turn may produce a detrimental effect on the ability of VC-backed companies to produce real value for the economy, i.e. new products and jobs. New emerging instruments, as crowdfunding, should be considered (and

further investigated), possibly in combination with other financial sources.

(IV) In general, [policy remedies to financial shortages and barriers do not show crowding-out effects, but their additionality is very sensitive and not yet systematic](#). This implies that accurate design and coordination among different policy actions is needed to fully exploit their complementarities and synergies, and maximise their effectiveness. One policy method that fits all the cases would be an ideal approach but it does not seem to be available. In fact, [tax incentives, subsidies and grants have different impacts depending on firms' size, industries, project specificities \(riskiness, newness\), growth phases, and on whether product or service characteristics are taken into account](#). Moreover, mechanisms to use public venture capital in combination with other instruments should be further investigated and analysed.

(V) Finally, the great heterogeneity of companies and framework conditions across countries and regions calls for much more systematic and comprehensive empirical evidence based on proper indicators. For this reason better policy analyses and constant monitoring of the instruments used should be envisaged. Accordingly, both scientists and policymakers participating in CONCORDi-2013 called for [establishing a stronger network of R&D and innovation policy evaluators to support the proper implementation of the upcoming European financial support instruments agreed for the period 2014-2020](#).

## 5. Open questions for policy and further research needs

Drawing on the results of CONCORDi-2013, a number of open questions on EU policy issues are still open and deserve some further research and policy debate, e.g.:

**(i) EU framework conditions favouring the financing of risky corporate R&D and innovation activities**

- What are the most prominent framework conditions to address?
- Is EU policy addressing them with adequate instruments and speed?

**(ii) EU funding sources supporting Research & Innovation (R&I) in enterprises**

- Is there room for possible synergies between EU funding sources (e.g. those to support R&I investments in SMEs)?
- Is there a recipe for the best mix of general-purpose policy with targeted policy measures to address market imperfections in financing firms' R&I?

**(iii) EU policy-making support, policy evaluation and experimentation**

- What specific science-based analysis is most urgent to support EU policymakers?
- Should future policy measures to ease access to investment in R&I be tested before their launch (e.g. the ICT Vouchers Scheme pilot initiative)? Should these measures be systematically monitored and evaluated to ensure efficiency and effectiveness?

In order to help answering these questions, *future research* agendas should address, among others, the following topics:

a) The magnitude, and thus relative importance, of the various external barriers to innovative activities; these include factors that determine why and when innovative firms are willing (or forced) to take action to alleviate their financial constraints

b) The relation between firm growth and financial constraints (mechanisms; quantitative importance; heterogeneity).

c) The costs and benefits, related to both firms and governments, of putting in place different mechanisms for attenuating financial constraints in research and innovation activities.

Finally, there is a general demand for more and better data to implement relevant analyses, which would allow, among the others, to disentangle sector specificities and to extend the analyses to more countries or clusters of homogenous regions.

## Bibliography

- Bonaccorsi, Andrea, Montaina, Marco, 2012, The public role in financing innovative companies: shifting from venture capital to seed investment. Paper I4G
- Bottazzi, Laura and Da Rin, Marco, 2003, Financing entrepreneurial firms in Europe: Facts, issues, and research agenda, CESifo Working Paper Series.
- Brown, James R., Fazzari, Steven M. and Petersen, Bruce C., 2009, Financing innovation and growth: Cash flow, external equity, and the 1990s R&D boom, *The Journal of Finance*, 64(1), 151-185.
- Ciriaci, D., Moncada-Paternò-Castello, P. and Voigt, P., 2012, Does size or age of innovative companies affect their growth persistence? Evidence from a Spanish panel of innovative firms - In *IPTS Working Papers on Corporate R&D and Innovation series* - No. 3/2012. ISBN 978-92-79-25989-0; European Commission, Sept. 2012.
- Cooley, T. F. and Quadrini V., 2001, Financial Markets and Firm Dynamics, *American Economic Review* 91, 1286-1310.
- Dosi, G., 1990, Finance, innovation and industrial change, *Journal of Economic Behaviour & Organization*, 13(3), 299-319.
- European Commission, 2013, Lesson learned from a decade of innovation policy – Directorate-General Enterprise and Industry, June 2013
- Hall, Bronwyn H. and Lerner J., 2010, The Financing of R&D and Innovation, in Hall, Bronwyn H. and Rosenberg, Nathan (eds.), *Handbook of the Economics of Innovation*, North Holland.
- Hervás, F., Moncada-Paternò-Castello P., Montresor, S. and Vezzani, A. (2013) "4<sup>th</sup> European Conference on Corporate R&D and Innovation: Financing R&D and Innovation for Corporate Growth in the EU (CONCORDi-2013) Background Note" - European Commission EUR 26138 EN – Joint Research Centre – Institute for Prospective Technological Studies - Scientific and Technical Research series - September 2013.
- Ientile, D. and J. Mairesse, 2009, A policy to boost R&D: Does the R&D tax credit work? *EIB Papers* Vol. 14, No. 1, pp. 144-169.
- Moncada-Paternò-Castello, P., Hervás, F., Montresor, S. and Vezzani, (2013) "4<sup>th</sup> European Conference on Corporate R&D and Innovation: Financing R&D and Innovation for Corporate Growth in the EU (CONCORDi-2013) Summary Report" - European Commission EUR 26307 EN – Joint Research Centre – Institute for Prospective Technological Studies - Scientific and Technical Research series, - November 2013.
- OECD (2013), *Entrepreneurship at a Glance 2013*, OECD Publishing.
- O'Sullivan, Mary, 2006, Finance and innovation, in Fagerberg, Jan, Mowery, David C. and Richard R. Nelson, *The Oxford Handbook of Innovation*, 240-265.
- Revest, Valerie and Sapio Alessandro, 2012, Financing technology-based firms in Europe: what do we know, *Small Business Economics*, 39(1), 179–205.
- Santarelli, Enrico and Vivarelli, Marco, 2002, Is subsidizing entry an optimal policy? *Industrial and Corporate Change*, 11(1), 39–52.

## Papers presented at CONCORDi-2013<sup>3</sup>

### TOPIC 1 - FINANCIAL SOURCES, CONSTRAINTS AND FIRMS' GROWTH STRATEGIES

- Alex Coad, Gabriele Pellegrino and Maria Savona (2013) "The Long Good-Bye: A Longitudinal Analysis of Barriers to Innovation"
- Markus Simeth and Michele Cincera (2013) "Corporate Science, Innovation and Firm Value"(\*)
- Maria Elena Bontempi Investment-uncertainty relationship: differences between intangible and physical capital"
- Gabriele Pellegrino, Maria Savona (2013) "No Money, No Honey? Financial versus Knowledge and Demand Constraints to Innovation"
- Henry Lahr and Andrea Mina (2013) "Dynamic financial constraints and innovation: Evidence from the UK Innovation Survey panel"
- Hans Löf and Pardis Nabavi (2013) "How to Finance Innovation Persistently? A Panel Data Study on Exporting Firms in Sweden"
- James R. Brown and Gustav Martinsson (2013) "Financial Disclosure, Tax Policy and Innovation"
- Dirk Czarnitzki, Bronwyn H. Hall and Hanna Hottenrott (2013) "Patents as Quality Signals? The Implications for Financing Constraints on R&D"
- Carlo Altomonte, Maria Luisa Mancusi and Andrea Vezzulli (2013) "R&D investments, Financial Constraints and Export"

### TOPIC 2 - PUBLIC POLICIES, POLICY MEANS AND FINANCING FACILITATORS

- Hanna Hottenrott, Cindy Lopes-Bento and Reinhilde Veugelers (2013) "Direct and Cross-Scheme Effects in R and D Subsidy Programs: Theory and Evidence"
- Dirk Czarnitzki and Julie Delanote (2013) "R&D subsidies to small young companies: should the independent and high-tech ones be favoured in the granting process?"
- Tanja Tanayama and Anna-Leena Asikainen (2013) "R&D Subsidy Allocation – What's the Role of Firm Size?"
- Peter Teirlinck, Daniel Neicu and Stijn Kelchtermans (2013) "Differentiating behavioural additionality effects of R&D tax credits"
- Antoine Bozio, Delphine Irac and Loriane Py (2013) "The impact of the research tax credit on R&D and innovation: evidence from French firms"
- Elena Huergo (2013) "Impact assessment of R&D subsidies in Spain: some preliminary results"
- Luca Grilli and Samuele Murtinu (2013) "New technology-based firms in Europe: market penetration, public venture capital and timing of investment"
- Irem Guçeri (2013) "Impact of R&D Tax Incentives: Evidence from UK Micro BERD Data"
- Alessandro Cordova, Johanna Dolci and Gianfranco Gianfrate (2013) "The Bearable Lightness of Crowdfunding: International Evidences from High-tech Projects"

<sup>3</sup> Most of the CONCORDi-2013 papers are accessible at the following website: <http://iri.jrc.ec.europa.eu/concord/2013/papers.html>.

## European Commission, Joint Research Centre – Institute for Prospective Technological Studies

E-mail: [jrc-ipts-secretariat@ec.europa.eu](mailto:jrc-ipts-secretariat@ec.europa.eu)

Tel.: +34 954488318

Fax: +34 954488300

<http://ipts.jrc.ec.europa.eu>

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### Abstract

The Policy Brief addresses the results of a recent European Conference on the Financing R&D and Innovation (CONCORDi-2013: <http://iri.jrc.ec.europa.eu/concord/2013/index.html>). It presents recent empirical evidence on the topic and attempts to draw a number of policy-relevant messages to be brought to the attention of policymakers, as well as open questions requiring further research to address policy needs. This document provides state-of-the-art evidence and the most recent value-added results, summarised as follows: a) Financial constraints are important obstacles to R&D and innovation in EU firms, and the importance of these obstacles depend on factors that are both internal and external to firms. b) The reduction of information asymmetries can considerably lower the barriers to access financial resources for corporate R&D and innovation activities. c) Among external financial instruments, bank loans are the least attractive, while venture capital is (still) considered suitable for financing R&D and innovation projects, although they have a too short a time horizon to yield returns. Crowdfunding has been identified as a new emerging financial instrument. d) Policy remedies to financial shortages and barriers are not affected by crowding-out, but their additionality is very sensitive and not yet systematic. Public venture capital and public use of crowdfunding are issues to be further investigated. e) The great heterogeneity of companies and framework conditions across countries and regions calls for better analyses and monitoring of instruments. f) Both scientists and policymakers participating to CONCORDi-2013 called for establishing a stronger network of R&D and innovation policy evaluators to support the proper implementation of the upcoming European financial support instruments agreed for the period 2014-2020.

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