



SPRING OF INNOVATION
BY
THE RESEARCH NETWORK ON INNOVATION

FINANCING INNOVATION IN A
TURBULENT WORLD
ACTORS, LOGICS, TOOLS

CONSIGLIO NAZIONALE DELLE RICERCHE -
ROMA, ITALIA



BOOK OF ABSTRACTS

- Session 1: p.2
- Session 2: p.12
- Session 3: p.18
- Session 4: p.29
- Short Biographical Notes: p.34
- Publication opportunities: p.40

Financing Innovation in a Turbulent World

Actors, Logics, Tools

23 March 2018
CNR, Rome, Italy

Opening words: Corrado Bonifazi, Director of IRPPS-CNR, Blandine Laperche President of Research Network of Innovation, Isabelle Laudier, Director Institut CDC pour la recherche France.

Introduction: Daniele Archibugi (CNR, Rome, Italy), Andrea Filippetti (CNR, Rome Italy), Innovation Investment and Economic Recovery

Session 1: Innovation policies and the financing of innovation

Chair: Sergio Arzeni (International Network for SMEs, OECD)

Serenella Caravella, Francesco Crespi (Università Roma Tre, Italy), Supply-side and demand-side innovation policies and their combination into policy mixes: new evidence from Italian microdata

serenella.caravella@gmail.com, francesco.crespi@uniroma3.it

Recent years have seen a growing interest in the analysis of the interdependence between policy measures supporting business R&D activities and innovative investments (OECD, 2010). In this respect the notion of “policy mix” is taking momentum in innovation studies, which have shown that the joint use of different policy instruments and their interaction crucially shape innovation dynamics (Guerzoni & Raiteri, 2015).

By adopting this perspective, the present article focuses on the supply-side and demand-side innovation policy instruments and provides evidence on their isolated and combined impact on private firms’ R&D expenditures.

While supply side policies are widely used, demand side instruments are less diffused (Edler & Georghiou, 2007). The former consist of direct and indirect financial incentives, including grants and concessional loans or tax credits, respectively aiming at increasing the marginal rate of return of innovative investments and at reducing the marginal costs associated with innovative investments. On the other hand, demand-side policies are aimed at the creation of a critical mass demand for goods and a service designed to encourage innovative investment. In this regard, the main instrument applied is public procurement, namely the acquisition by a public institution of products and services, which is particularly important in stimulating demand-driven innovative investments since it ensures the conditions to create or consolidate markets by reducing the level of uncertainty (Edquist, 2015; Geroski, 1990). This is especially true in those industries characterized by high R&D sunk costs (Chang & Andreoni, 2016;

Edler & Georghiou, 2007; Edquist & Edquist, 2015; Georghiou, Edler, Uyarra, & Yeow, 2014).

While systematic econometric analyses on the impact of demand side policies are rare (Aschhoff & Sofka, 2009; Guerzoni and Raiteri, 2015; Crespi and Guarascio, 2017), the impact of supply-side innovation policies on both firms' innovation input and output has been largely investigated by empirical analyses with mixed findings. However, most recent studies based on "quasi experimental settings", led to more convergent evidence in favor of the additionality hypothesis of direct (Almus & Czarnitzki, 2003) and indirect public funding on firms' innovative activities (Czarnitzki, & Hottenrott, 2011 Corchuelo Martínez-Azúa, & Martínez-Ros, 2009). This especially occurs under specific conditions (Czarnitzki & Licht, 2006; Czarnitzki & al, 2007; Görg & Strobl, 2007) depending on sectoral and geographical characteristic as well as institutional and environmental conditions (Hall and Van Reenen, 2000). The contribution of the present paper is to provide a quantitative analysis at the firm level of the impact of both demand-pull and technology-push instrument, by looking at the specific role of the combination of these two kinds of instruments into a policy mix. To this aim, we used a pulled dataset collecting information about 4.214 Italian manufacturing firms on innovation activities and balance-sheet data derived from the 6th and 7th CIS waves and the AIDA database, referring to the period 2010-2014. The empirical analysis consists of a quasi-experimental study, where the dependent variable is represented by firms R&D expenditures and the treatment variables refer to direct/indirect public funding to innovation as well as Public Procurement contracts. The impact of the two distinct instruments, representing supply-side and demand-side innovation policies respectively, are considered both in isolation and in combination.

The quasi-experimental strategy exploits a non-parametric matching algorithm, which is adopted in order to control for two sources of potential biases (Aerts & Schmidt, 2008). Firstly, the so-called "picking the winner" bias, taking place when governments select firms that are already more innovative than others in order to maximize the probability of success of their innovation policies. Secondly, firms that are able to apply for public sustain programs or for public procurement competitions, could possibly possess innovative capability advantages over firms that fail to spot opportunities to apply to public programs. In other words, the basic idea of matching is to find a wide group of non-treated individuals that are similar to the treated ones for all the relevant pretreatment characteristics. This group is used as substitute for the non-observable counterfactual group (Caliendo & Kopeinig, 2008). Though such procedure, it is possible to condense the vector of relevant pre-treatment characteristics¹ into a single scalar index, called the propensity score (Rosenbaum & Rubin, 1983). This measure represents the probability of being treated, given the relevant covariates. At a given value of the propensity score, the exposure to treatment should be random and therefore both treated and control units should be on average observationally identical except for the treatment.

The propensity scores have been computed for a whole sample and a reduced sample. In the latter, firms with "regular" public procurement contracts have been dropped in order to provide a more clear picture of the effect coming from the interaction of supply-push measures with innovative public procurement. Once estimated the propensity score referring for each treatment (see table 1), the average treatment effect on treated firms (**ATT**) has been computed by comparing differences on the mean of the target variable between the groups of treated and control. The **ATTs** are reported in tables 2a and 2b.

The empirical analysis provides several results. In particular, the joint impact of both supply-side and demand side policies is found to be positive and highly significant. Firms receiving

both treatments appear to have a greater impact on firms' R&D expenditures compared to those who receive the technology-push treatment in isolation. Moreover, firms involved in Public Procurement contracts without receiving direct or indirect R&D support, do not show additional R&D expenditure in comparison with the control group.

Table 1. Description of the treatments

Treatment	Treated	Control	Description
SP_Only	1.170	2.339	Firms receiving only direct/indirect public sustain
PP_Only	384	2.339	Firms receiving only public procurement contract
SP&PP	322	2.339	Firms receiving direct/indirect public sustain and public procurement contract
Reduced Sample			
IPP_Only	55	2.339	Firms receiving only innovative public procurement contract
SP&IPP	75	2.339	Firms receiving direct/indirect public sustain and innovative public procurement contract

Table 2a. Results (whole sample)

Treatment	5NNM	1NNM	3NNM	Kernel
SP_Only	1.026791* **	1.29345** **	1.097929 ***	1.510717 ***
IPP_Only	.4572425	-.3226154	-.3226154	-.7760685
SP&IPP	3.914337* *	1.671447 ***	1.635461 ***	1.771294 ***

Table 2b. Results (reduced sample)

Treatment	5NNM	1NNM	3NNM	Kernel
SP_Only	1.026791* **	.0689655 ***	.0649758 ***	.0803419***
IPP_Only	.4572425	.810576**	.6356891	.8576806
SP&IPP	3.914337* *	3.304866* **	3.013017** *	3.67365 ***

References

Aerts, K., & Schmidt, T. (2008). Two for the price of one?: Additionality effects of R&D subsidies: A comparison between Flanders and Germany. *Research Policy*, 37(5), 806-822.

- Almus, M., & Czarnitzki, D. (2003). The effects of public R&D subsidies on firms' innovation activities: the case of Eastern Germany. *Journal of Business & Economic Statistics*, 21(2), 226-236.
- Aschhoff, B., & Sofka, W. (2009). Innovation on Demand – Can Public Procurement Drive Market Success of Innovations. *Innovation*, 76(8), 803–876.
- Caliendo, M., & Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of economic surveys*, 22(1), 31-72. 1 The set of the observable variables adopted for the PSM includes: capital intensity, a measure on indebtedness, size, number of graduated, sector and geographical dummies.
- Chang, H.-J., & Andreoni, A. (2016). *Industrial Policy in a Changing World: Basic Principles, Neglected Issues and New Challenges*. 40 Years of the Cambridge Journal of Economics Conference, 1–52.
- Corchuelo Martínez-Azúa, B., & Martínez-Ros, E. (2009). The effects of fiscal incentives for R&D in Spain. Universidad Carlos III de Madrid.
- Crespi, F., Guarascio, D. (2017) The demand-pull effect of public procurement on innovation and industrial renewal, LEM WP Series 2017/19.
- Czarnitzki, D., & Hottenrott, H. (2011). R&D investment and financing constraints of small and medium-sized firms. *Small Business Economics*, 36(1), 65-83.
- Czarnitzki, D., & Licht, G. (2006). Additionality of public R&D grants in a transition economy. *Economics of Transition*, 14(1), 101-131.
- Czarnitzki, D., Ebersberger, B., & Fier, A. (2007). The relationship between R&D collaboration, subsidies and R&D performance: empirical evidence from Finland and Germany. *Journal of applied econometrics*, 22(7), 1347-1366.
- Edler, J., & Georghiou, L. (2007). Public procurement and innovation-Resurrecting the demand side. *Research Policy*, 36(7), 949–963.
- Edquist, C., & Edquist, C. (2015). *Papers in Innovation Studies Innovation - related Public Procurement as a Demand - oriented Innovation Policy Instrument Innovation - related Public Procurement as a Demand - oriented Innovation Policy Instrument*.
- Georghiou, L., Edler, J., Uyarra, E., & Yeow, J. (2014). Policy instruments for public procurement of innovation: Choice, design and assessment. *Technological Forecasting and Social Change*, 86, 1–12.
- Geroski, P. A. (1990). Procurement policy as a tool of industrial policy. *International Review of Applied Economics*, 4(2), 182–198.
- Görg, H., & Strobl, E. (2007). The effect of R&D subsidies on private R&D. *Economica*, 74(294), 215-234.
- Guerzoni, M., & Raiteri, E. (2015). Demand-side vs. supply-side technology policies: Hidden treatment and new empirical evidence on the policy mix. *Research Policy*, 44(3), 726-747.
- Hall, B., & Van Reenen, J. (2000). How effective are fiscal incentives for R&D? A review of the evidence. *Research Policy*, 29(4), 449-469.
- Mazzucato, M. (2015). *Innovation systems: from fixing market failures to creating markets* *. *Revista do Serviço Público*, 66(4), 627–640.
- OECD (2010), "The Innovation Policy Mix", in *OECD Science, Technology and Industry Outlook 2010*, OECD Publishing, Paris.
- Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), 41-55

Gianluca Orsatti (University of Turin, Italy), François Perruchas (INGENIO - CSIC UPV), Davide Consoli (INGENIO - CSIC UPV) and Francesco Quatraro (University of Turin, Italy), Public Procurement, local labor markets and green technological change: Evidence from US Commuting zones

gian.orsatti@gmail.com, davide.consoli@ingenio.upv.es, francesco.quatraro@unito.it

While all the avenues of the debate about climate change seemingly lead to innovation, the nature of the problem, of the possible solutions and the roadmap towards implementation remain highly contested. The academic and policy circles place great expectations in the prospect that technology, both old and new, can assist in striking that balance between running business operations within the limits of environmental sustainability while staying in the game for innovation and high competitiveness. There exists wide consensus on the importance of other forces that, alongside technology, can accelerate the transition to sustainable growth. For one, policy can create propitious conditions across the board, not just for technological innovation but, also, for promoting broader social engagement on the benefits of a low-carbon economy. It goes without saying that none of the above would be feasible absent a body of know-how that enables the necessary adjustments in the attendant technological, organizational and institutional domains. Last but not least, climate change is a global phenomenon with marked local manifestations, which entails that the dynamics of both policy and of the knowledge base carry strong spatial dimensions that cannot be neglected.

The present paper enters this debate with a view to explore empirically the extent to which policy and human capital enable or thwart local green innovation capacity in the local economies of the United States (US).

The three dimensions of interest for our study are connected in complex ways. To begin with, innovation in green technologies (GTs) suffers from a double externality problem that exacerbates the traditional uncertainty surrounding the development of new technologies. This provides a rationale for the second dimension of interest, namely public policy interventions that create positive preconditions for investments in GTs. The portfolio of available mechanisms is wide, and encompasses setting emission standards, stimulating the demand for green technologies (pull effect) or to restoring incentives for private investments in innovation (push effect). Last but not least, the scale of changes involved in these diverse but interconnected dimensions call upon specialized know-how. Human capital is a key asset to facilitate the development of new technology but the transition towards low-carbon economies requires capabilities beyond the strictly technical sphere, for example operation management skills to manage the reconfiguration of industrial processes as well as legal and administrative skills to comply with regulatory standards.

In the view proposed here the interplay between policy, technology and human capital offers a compelling framework to account for the space-bound co-existence of technology push and demand-pull forces. The paper draws on and contributes to this research by investigating whether and to what extent Green Public Procurement (GPP) of environmentally sustainable products and services enhances the introduction of new GTs in 722 US Commuting Zones (CZs) over the period 2000-2011. Our proxy for green innovation at local level is the stock of green patents granted to CZ residents. Importantly, we put forward the hypothesis that the local accumulation of competences represents a key enabling condition for the generation of new technologies in general. GTs show some specificity in this respect, in that they appear to

emerge as an outcome of the hybridization of a variety of technologies that often are loosely related with one another. The configuration of the local bundle of skills is therefore much important in affecting local differences in the capacity to sustain green inventive activities. The prevalence of abstract skills is crucial in this respect, in that it is related to cognitive abilities to combine ideas and inputs from different fields in new and previously untried ways.

Our results provide empirical support to our hypotheses, showing that GPP exerts a positive impact on the generation of GTs. In particular, we have found that a 1% increase in GPP engenders some 0.077% increase in the local stock of GTs. The government expenditure lever can therefore prove to be efficient in the promotion of technology-driven sustainability transitions. Moreover, we have found that GPP for services yield a stronger impact than GPP for products. This suggests the existence of bandwagon effects upwards in the value chain, for which the demand for green services stimulate the generation of the technologies that make them possible.

The configuration of the local labor market plays also a role in the dynamics of GTs generation. In particular, the prevalence of abstract skills is positively associated to the generation of GTs. Moreover, this specific set of skills moderates the effect of GPP on GTs, by magnifying its coefficient. According to our estimates, the overall impact of GPP in areas in which abstract skills are prevalent is almost twice the impact of GPP in areas in which this prevalence is not observed. Finally, our analysis allowed to investigate the differential impact of GPP and local skills bundle configuration on mitigation vis-à-vis adaptation oriented green technologies.

Our results bear important implications for policy. Dealing with climate change will require timely interventions to minimize the risks of further environmental damage while at the same time making the most of the opportunities provided by the reconfiguration of intertwined legislative, production, distribution and consumption systems. Transition assistance at all levels will be important for regions that are home to high emission industries, and thus candidates for disruption, as well as for regions that can leverage natural or built assets to seize opportunities for growth. Our analysis highlights two areas of intervention.

The first concerns the role of public expenditure in boosting technology-driven sustainable development. Most of the extant literature has focused on technology push or demand-pull deployment policies. We do not deny the relevance of these policy instruments. However, we show that besides these options, policymakers can affect the rate and the direction of green inventive activities by demanding for specific green services or products. While these are expected to satisfy specific needs of public administrations, the GTs that are produced are expected to be relevant for a wider set of economic activities, bearing important spillovers for prospective adopters. On the other hand, the transition to green growth entails much more than just new technologies, in that much of the innovation that is required is organizational and institutional. These innovations represent a break from established practice and entail considerable uncertainty about how to make the new practice work effectively. Therefore, supporting the creation and adaptation of human capital is the second domain of policy intervention. Active labor market policies are essential to both favor the rapid re-absorption of displaced workers and to counter, or prevent altogether, skill gaps. A smooth adaptation of the labor markets to these pressures calls upon dedicated efforts are needed to identify the direct (i.e. market demand) and indirect (i.e. through regulations) effects of dealing with climate change on existing occupational profiles and on the skills mix that is needed for new green activities. Beyond merely quantitative impact, public authorities should support business firms in facilitating the creation of decent jobs as they undergo transformations and adaptations of local labor markets to greener demands. In a dynamic perspective, nimble,

adaptable and focused education and training systems are the key to prepare the ground for an egalitarian transition to a low-carbon economy. Because climate change is a global phenomenon with strong territorial specificity, local labor market institutions will be at the forefront of the dual task of accommodating national or supranational regulations while seeking to promote incentives to stimulate sustainable business activities.

**Giovanni Cerulli, Bianca Potì, Raffaele Spallone (IRCrES CNR, Italy),
Fiscal incentives for research and development and their impact on
business R&D**

*IRCrES CNR. Research Institute on Sustainable Economic Growth, National Research Council (Italy)

bianca.poti@ircres.cnr.it, giovanni.cerulli@ircres.cnr.it

National governments have increasingly viewed foreign-controlled multinational enterprises as pivotal actors in the national economic system and as a potential motor for change and innovation.

In this article, we wish to understand and measure the importance of the tax incentive as a driver of R&D investments of MNE's.

A large body of literature has investigated how R&D tax incentives and corporate taxation can be an important element at the base of the location decision of a MNE's. From the arguments brought forward in the literature it seems that tax credits for R&D are a very appealing instrument for MNEs mainly for the following reason:

- MNEs operate more often in R&D intensive sectors and perform R&D more often than single-national firms.
- Tax credits for R&D tend to favour large R&D spenders (Mohnen 2013) because they provide to MNE's the opportunities to minimize corporate income taxes and to shift R&D costs between countries.
- Income-based tax incentives for R&D (tax breaks for income from trademarks, patents and other forms of intellectual capital) in the form of patent boxes etc. may be particularly appealing for MNEs with multiple R&D locations, because it may also provide them with incentives for shifting profits via licence income.
- The costs of applying for and administering R&D funding are considerably lower than in the case of direct R&D funding, which involves various eligibility checks. This may again favour large R&D spenders, which do not have to administer a large number of single funding applications. Moreover, a number of countries have no upper ceiling for returns from R&D tax credits.

We develop two counterfactual approaches to grasp evidences on the effects that the tax incentives on R&D have on MNEs' R&D inward business investments: a matching and a continuous treatment econometric models.

Firstly, we focus on the difference of the binary treatment status. The independent variable is inward BERD from 2000 to 2013 and we used a mix of sectoral and country control variables. We employ a matching model in two versions: dependent and independent variables

are both in log (except FDI variables) or both in level. A Log/log model allows to reduce the heterogeneity on both side (output and covariates values distribution) between Countries and the result shows a more important average effect of the presence of a fiscal policy as attractor of MNEs R&D investments.

We find out that the presence of R&D tax relief has a positive and significant effect on BERD Inward, mostly when we reduce the importance of the outlier values by a log/log version of the matching analysis. The interpretation we give of this result is that more similar are the countries compared and more the presence of a R&D fiscal policy can add in terms of MNE's Inward BERD attraction. This can be considered a pre-condition.

Then, in order to evaluate the impact of different intensity of R&D tax incentives on inward BERD we use a dose-response model. We look at the effect of the R&D fiscal policy in a group of countries (UK, France, Japan and the Netherlands) controlling with a small group of countries (Germany and Sweden) which have not adopted this policy, during the period 2008-2013. We look at how the policy effect varies as function of the level of R&D tax relief, i.e. the level of treatment exposure (or "dose"). In this model, we used only country level data. Data on tax incentive support to R&D comes from OECD source. Tax relief is calculated as following: starting from the tax incentive cost as a percentage of country GDP and multiplying for the GDP value, we obtain the value in level of the R&D fiscal incentive. The companies' relief is given by the ratio of the level of the R&D fiscal incentive on total BERD, which consists of total R&D expenditures (current and capital) carried out by all resident companies included R&D funded from abroad.

We are interested in estimating the causal effect of the treatment variable t (R&D tax incentives) on the outcome y (Inward BERD) within the observed sample, by assuming that treated and untreated units may respond differently both to specific observable confounders and to the "intensity" of the treatment t .

We find out that the effect is positive with an increasing trend. More precisely the difference between treated and non-treated countries remain stable until a dose of 40% (R&D tax relief as percentage of BERD by country) and it is around 5 billion INWARD BERD on average. Only after that dose, the average treatment effect increase steeply, that means higher relevance of R&D fiscal relief, government commitment and policy cost. In addition, in this case the trend is steeper when a log/log dose response model is adopted. Therefore, differences in structural characters and heterogeneity can reduce the policy effect on the attraction of MNEs' research investments.

In conclusion, structural and infrastructural differences among countries, if positively affecting BERD INWARD attraction, can compensate for a government's tax incentive policy. If countries are very much similar, the policy has a positive effect that is more relevant for higher dose of companies' R&D expenditure relief, but this can represent also a high cost for a country.

Laure Morel, Mauricio Camargo (University of Lorraine, France): the concept of “innovation vouchers”: an original approach to foster innovation financing using universities competencies

laure.morel@univ-lorraine.fr, mauricio.camargo@univ-lorraine.fr

By this current time of austerity, everyone seeks for getting more efficient R&D and innovation investments, as well as, innovating on products, processes or services. The same phenomenon could be observed when commercializing a new product; a project manager needs to have a clearer vision of an innovative project. Within this context, news business models are appearing, searching for improving the innovation capabilities of a territory. In this paper, we are interested particularly on the concept of « innovation vouchers », used widely in Anglo-Saxon countries but still emerging in France.

Innovation vouchers are small lines of credit provided by governments to small and medium-sized enterprises (SMEs) to purchase services from public knowledge providers with a view to introducing innovations (new products, processes or services) in their business operations (OECD, 2010). By analogy, we intend in this paper to show how this concept allows revisiting the enterprise university relationship by developing new ways of innovation financing. Therefore, in a period of budget reduction, the university could develop new tools to provide innovation support services to SMEs in a win-win relation. For example, a workshop named “ATI” (Transfer and Innovation Workshops) enables to train students, entrepreneurs, and scientists on real problems provided by the firms, and, at the same time, allows finding new ways of financing their projects of innovation.

Based on two concrete examples, a company in the field of ergonomic instruments and a second on the field of roadside mowing machines, the concept of innovation voucher was applied leading to create a new opportunistic dynamic of development giving benefits to both university and firms.

As the primary objective of an innovation voucher scheme is to encourage knowledge transfer between the higher education sector and small and medium-sized enterprises (SMEs), our analysis is focused on the vectors of knowledge transfer and creation. This analysis based on a longitudinal study (10 years) of two companies deploying joint-ATIs with a French Engineering School (ENSGSI) (Boly et al., 2017; Kleine et al., 2017). Figure 1 shows the firms' ATI project highlights. The 17 projects already realized focused on three areas: new product development, exploring new markets and innovation management issues. This experience shows that SMEs first motivation is related to technical short-term issues related to product development. However, as far as the relation became more trustful over the time, more strategic issues have been developed jointly. The higher level of maturity been represented is the firm's engagement in research projects. The subsequent discussion aims to underline some positive externalities regarding the main stakeholders of such projects: students, firms and researchers.

Firm	Sector	No of employees	Number of Joint projects	Type of project			Related Postgraduate students		
				New Product Development	New market exploration	Innovation management	Master	PhD	Post-doc
Firm 1	Ergonomics instruments	16	10	5	3	2	2	2	-
	Roadside mowing machines	350	7	3	2	1	1	1	1

From the point of view of students:

These projects are carried out as a part of their academic program. A dedicated period of one day per week is dedicated to their ATI project along the academic year, from October to June. It allows them to be familiar with the dynamics of industrial innovation projects, develop communication skills and technical competencies. However maybe the most important competencies are these related to self-directed learning skills. Indeed, these latter are of prime importance in the success of innovation processes. This led the teaching staff to set up a project aimed at integrating self-directed learning into the curriculum. The system is based on an alternation between active and reflexive phases. It also provides students with continuous support, thus transforming the role of the teachers into facilitators (Bary and Rees, 2006).

Point of view of the firms:

The ATI projects opened a strategic discussion space that allows SMEs to integrate external points of view and resources from outside of the firm. Because the projects are formalized through reports, conference paper or journal papers, the companies have higher documented results and so can be considered strategic issues. Consequently, one can note that innovation management and strategy start to be considered and integrated within the firms' day-to-day routines.

From the Point of View of Research

The ATI's are an opportunity to find a compromise between two academic activities: research and teaching. As these projects represent an occasion to apply and validate theories, methodologies and tools, they can both be of interest for the research or the pedagogic fields. Moreover, when integrating mixed teams of Master or PhD students, most of the time there is a synergistic effect that allows each other to be conscious and take the measure and their role as been part of an important and applied issue. As a non-negligible outcome, these projects will also contribute to one of the researchers' goals "publish or perish".

In conclusion, the concept of "innovation voucher" cannot be only reduced to a material aspect (financement) but also be considered with a non-material perspective that is today a real part in the value creation process.

References:

- Bary, R., Rees, M., 2006. Is (self-directed) learning the key skill for tomorrow's engineers? *Eur. J. Eng. Educ.* 31, 73–81.
- Boly, V., Morel, L., Camargo, M., 2017. Innovation management: twenty-three years of higher education in a French engineering school. *Ragioni Erasmus* 1.
- Kleine, K., Giones, F., Tegtmeier, S., Camargo, M., 2017. Building technology entrepreneurship capabilities, an engineering education perspective., in: *International Research Conference on Science and Technology Entrepreneurship Education*.
- OECD, 2010. *Innovation vouchers (Policy Document)*. Paris, France.

Session 2: Firms' innovation strategies and the role and internal and external resources for innovation

Chair: Bianca Potì (IRCrES CNR, Italy)

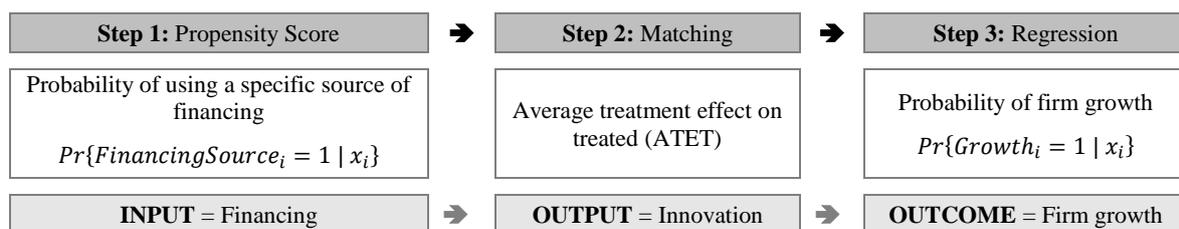
Anabela Santos (Université Libre de Bruxelles, Belgium), Michele Cincera (Université Libre de Bruxelles, Belgium), Giovanni Cerulli (IRCrES-CNR Italy), Assessing the additionality of innovation financing on firms' growth dynamics: New evidence from European Firms

asantos@ulb.ac.be; mcincera@ulb.ac.be; giovanni.cerulli@ircres.cnr.it

The aim of the present study is to explore the effect of eight sources of financing (internal funds, bank loan, credit line, trade credit, grants, equity, leasing and factoring) on innovation and then on firm growth. The conceptual framework is based on the assumption that using or obtaining access to finance (input) in one year gives the firm a better environment for introducing one or more innovations (output) in the following year. In this way, and according to the Schumpeterian theory (Schumpeter, 1934¹), firms can grow (in terms of size) through innovation.

The database used is from the anonymous "Survey on the Access to Finance of SMEs in the euro area" (SAFE), conducted together by the European Central Bank and the European Commission since 2009. We used data from the first surveys of 2014 and 2015 in order to build a panel leading to the assessment of firms' growth evolution. To assess the impact of financing on innovation behavior and then on firm growth, we consider a conceptual framework similar to that used by Cerulli and Potì (2012)² based on a three-step approach (Figure 1). The first two steps are based on Propensity Score Matching (PSM), and estimate the effect of financing on innovation. The third step takes the form of a regression estimation, considering the effect of innovation financing as an explanatory variable of firm growth.

Figure 1. Steps of methodological approach



Firm innovation behavior is measured by the number of innovation types launched in the market or in the firm's organization. Firms can introduce jointly or separately four types of innovation: i) Product or service; ii) Production process or method; iii) Organization of management; or iv) Marketing (new way of selling goods or services). Additionally, the dichotomous variable (Yes or No) used to measure innovation is also included in the analysis

¹Schumpeter, J. A. (1934). *The Theory of Economic Development - An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, Harvard Economic Studies 46, Translated by Redvers Opie, p. 255.

²Cerulli, G. and Potì, B. (2012). "The differential impact of privately and publicly funded R&D on R&D investment and innovation: the Italian case", *Prometheus*, 30(1), pp. 113 – 149. <https://doi.org/10.1080/08109028.2012.671288>

as an outcome for robustness purposes. In turn, firm growth is measured through the probability of firms increasing their turnover and their number of employees.

Globally, the results show a positive and significant effect of external sources of financing on innovation. However, not all external sources of financing have an effect or the same effect on innovation behavior (Figures 2 and 3). Furthermore, firms that used internal funds for their business development do not appear to be more innovative than those that have not used any type of financing. Firms that have issued equity financing, which includes venture capital and business angels, one year before, show a positive effect on innovation and the size of the impact is seen to be higher in comparison to other financing instruments. Surprisingly, grants show a more moderate positive effect on innovation compared to trade credit and factoring.

Figure 2. Effect of different types of financing on innovation (N° of different types)

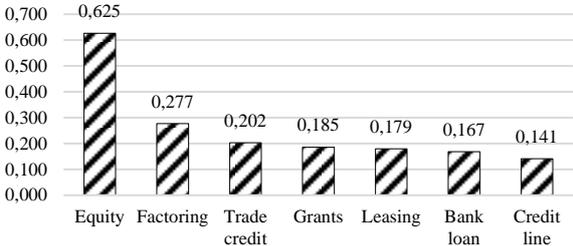
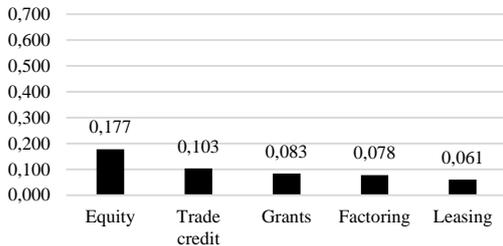


Figure 3. Effect of different types of financing on innovation (Yes/No)



Source: Authors’ own elaboration based on PSM results.
 Note: Results report the Average Treatment Effect on Treated (ATET). Control group corresponds to no use of financing. The sources of financing not reported in the figures are those not showing any significant effect.

As regards output additionality on firm growth, measured by turnover, Figure 4 shows that the highest impact occurs with firms that have issued equity financing. Grants, credit line, bank loan and leasing also showed significant output additionality on turnover growth, but the size of these effects is more modest compared to the effect of equity financing. Concerning output additionality on employment growth (Figure 5) the only significant and positive values are found for bank loan, credit line, grants and leasing. Equity financing seems to have no additional effect on employment level.

Figure 4. Average marginal effect of output additionality on firm growth (TURNOVER) by source of financing

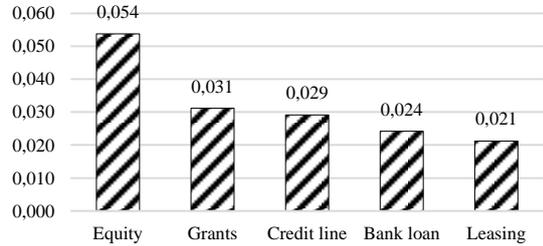
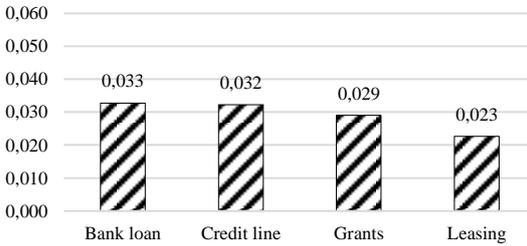


Figure 5. Average marginal effect of output additionality on firm growth (EMPLOYMENT) by source of financing



Source: Authors’ own elaboration based on Complementary log-log regression results.

As a complementary analysis and because firms can use each source of finance solely or jointly with others, the effect of using one or more than one source of financing was assessed. No significant difference between using one source and no use of financing emerges. Additionally, an optimal level of three different sources of financing appears to be the best combination for boosting the effect on innovation. Concerning the effect of output

additionality on firm growth, using only two different sources of financing is revealed to have a positive and significant effect on turnover and employment growth.

Keywords: Financing; Innovation; Firm growth; Europe.

JEL Classification: O16; O31; O47; O52.

Sandro Montresor (Kore University of Enna, Italy) and Antonio Vezzani (JRC- European Commission of Seville, Spain), Financing constraints and intangible investments: looking at innovative and non-innovative firms

sandro.montresor@unikore.it, antonio.vezzani@ec.europa.eu.

Intangibles represent nowadays fundamental inputs through which firms can produce more and/or more valuable output (Haskel and Westlake, 2017). Since the seminal work by Haltiwanger et al. (2005), the relevance of intangibles for growth and competitiveness has been abundantly investigated and proved to be nearly undeniable.

In particular, the analysis of intangible assets is of utmost importance for the investigation of the innovation performance of firms. Investing resources in intangibles, meant as a portfolio of knowledge-intensive assets of different nature, is an important firms' leverage to increase their knowledge-base and innovation impact (Montresor and Vezzani, 2016; Thum-Thysen et al., 2017). Investing in intangibles is possibly more important in a world that has become more turbulent and exposed to the burst and global transmission of economic crises and recessions. Indeed, in this scenario firms find increasingly more difficult to draw on "success-breeds-success" in innovation (Filippetti and Archibugi, 2011; Archibugi et al., 2013a, 2013b), and investing in R&D and non-R&D intangibles, like software, design, and human capital, to mention a few, becomes an important driver of their innovation performance.

Given the crucial role of intangibles in driving innovation, removing the barriers that could hamper the relative investments becomes also fundamental. Among these barriers, in a world exposed to financial turbulences and crisis, financing ones are for sure the most influential ones and thus deserve special attention (Hall et al., 2016)

The present paper looks at the relationship between financing barriers and (different types of) intangible investments at the firm level. In particular, it looks at whether the role that financing barriers can be expected to have in hampering intangible investments differs between innovators and non-innovators, and among the different kinds of intangibles which innovation can benefit from. In so doing, we aim at contributing to the theoretical and empirical literature on the barriers to innovation (D'Este et al., 2012; Coad et al., 2016) in different respects. First of all, we get closer to their role and investigate financing barriers to intangible investments, which can work as inputs to innovation, rather than to innovation as such, as this is an indirect impact. Second, we enlarge the scope of the analysis beyond R&D, which has attracted particular attention in the aftermath of a financial crisis (Hall et al., 2016), and we shed light on the barriers to non-R&D intangibles too. Third, while the extant literature has tried to assess what factors determine innovation barriers, we "reverse the order of causality" putting them on the right hand side of a model that accounts for different types of intangible investments.

Our empirical analysis makes an original combined use of two waves of the Innobarometer survey run by the European Commission ([link](#)), by exploiting its unique coverage of questions

about intangibles, innovation, barriers and a set of firm controls. More precisely, we try to go beyond the limitations normally imposed by the cross-sectional nature of the Innobarometer and link two consecutive waves (2014, 2015) through a pseudo-panel approach. By referring to the 2014 survey, we first group firms according to a set of structural characteristics (macro-sector, size and innovative status) and, for each group, we then compute the probability of having positive R&D investments, operating on international markets and in an oligopolistic market. We then use these variables to estimate the probability that a firm in the 2015 survey (belonging to the same group) encounters financing barriers. Finally, we use the “instrumented” financing barriers to account for intangible investments. To accommodate for the group structure of the instruments, our intangible variables are binary variables equal to 1 for firms with above group average investments and 0 otherwise. This two-step econometric strategy actually enables us to control for possible simultaneous bias in the estimation and somehow accounts for the endogeneity of financing barriers

The main result obtained so far can be summarized as follows. As expected, firms investing in R&D and operating on international markets have a lower probability of encountering financing barriers. Furthermore, firms operating in markets with few competitors (none, one or few competitors) have a much lower probability to encounter financing barriers than other firms, about 93% lower.

The impact of financing barriers on intangible investments is quite heterogeneous. They hamper R&D investments both for innovating and not innovating firms, but they are an obstacle for the organizational and training investments of innovative firms only, and for software investments only for non-innovative firms. Quite interestingly, branding and design investments do not seem to be affected by financing barriers. In brief, financing barriers do not appear a monolithic obstacle to intangible investments, as some of them are apparently undertaken even in their presence. Furthermore, being innovative rather than non-innovative actually makes a difference for the extent to which financing barriers hamper intangible investments.

Looking at other determinants of intangible investments, innovative firms seem to be sensitive to turnover performances (a measure of cash flow availability). The same does not hold true for non-innovators. Non-innovative firms appear to become less prone to invest in intangibles when their turnover decreases, but they do react to turnover increases.

All-in-all, financing barriers appears important in determining the choice of firms to build-up knowledge capabilities through intangible investments, but with interesting elements of heterogeneity between innovators and non-innovators and across different types of intangibles. Policy action directed to remove such a kind of barriers should thus be carefully tailored, as the innovative status of firms might urge a specific intervention and some intangibles might require addressing other kinds of obstacles. If the objective is to foster innovation and competitiveness, then avoiding keeping alive zombies firms (Ahearne et al., 2005) by specifically targeting innovative ones may contribute increasing the overall system performance.

References

- Archibugi, D., Filippetti, A., and M. Frenz (2013a). Economic crisis and innovation: Is destruction prevailing over accumulation? *Research Policy*, 42(2), 303-314.
- Archibugi, D., Filippetti, A., and M. Frenz (2013b). The impact of the economic crisis on innovation: Evidence from Europe. *Technological Forecasting and Social Change*, 80(7), 1247-1260.
- Coad, A., Pellegrino, G., & Savona, M. (2016). Barriers to innovation and firm productivity. *Economics of Innovation and New Technology*, 25(3), 321-334.
- D'Este, P., Iammarino, S., Savona, M., & von Tunzelmann, N. (2012). What hampers innovation? Revealed barriers versus deterring barriers. *Research policy*, 41(2), 482-488.
- Filippetti, A. and Archibugi, D. (2011). Innovation in times of crisis: National Systems of Innovation, structure, and demand. *Research Policy*, 40(2), 179-192.
- Hall, B.H., Moncada-Paternò-Castello, P., Montresor, S., A. Vezzani (2016) Financing constraints, R&D investments and innovative performances: new empirical evidence at the firm level for Europe, *Economics of Innovation and New Technology*, 25:3, 183-196.
- Haskel J. and Westlake, S. (2017). *Capitalism without Capital. The Rise of the Intangible Economy*. Princetown University Press.
- Haltiwanger, J. C., Sichel, D. E., & Corrado, C. (2005). *Measuring capital in the new economy*. University of Chicago Press.
- Montresor, S. & Vezzani, A. (2016). "Intangible investments and innovation propensity: Evidence from the Innobarometer 2013", *Industry and Innovation*, 23:4,331-352, DOI: 10.1080/13662716.2016.1151770.
- Ray D., © Robson A. (2018). Certified Random: A New Order for Coauthorship. *American Economic Review*, 108(2), 489-520.
- Thum-Thysen, A., Voigt, P., Bilbao-Osorio, B., Maier, C., Ognyanova, D. (2017). *Unlocking Investment in Intangible Assets (No. 047)*. Directorate General Economic and Financial Affairs (DG ECFIN), European Commission.

David Doloreux (HEC Montréal, Canada), Nadine Levratto (Paris Ouest Nanterre University, France) and Richard Shearmur (University MacGill, Canada), Internal R&D, external R&D services and Innovation: does complementarity between internal and external R&D services occur only in innovative manufacturing establishments?

nadine.levratto@parisnanterre.fr

Objectives

Over the past decade, a growing number of studies have identified the use of knowledge-intensive business services (KIBS) as a primary driver to innovation (Zhou et al., 2017; Shearmur and Doloreux, 2015; Mas-Tur and Soriano, 2014; Burger-Helmchen, 2012; Mas-Verdu et al., 2011; Muller and Zenker, 2001; den Hertog, 2000). However, despite these significant contributions, which claims the importance of the use of services for innovation, the study of the role and contribution of KIBS in enhancing innovation in SMEs has occupied a secondary position in relation to other drivers of competitiveness

that affect the internal capabilities, productivity and performance of SMEs. This paper explores whether R&D firms are more innovative, and whether they use more external services than non-R&D firms. Secondly, we investigate whether innovation and the use of R&D services are independently associated with R&D intensity. To our knowledge, there is no study that have addressed the use of external services for R&D whilst taking into account the degree of innovation as a possible explanatory factor. We analyse these questions through a unique firm-level dataset through an original survey on the use of KIBS by 804 manufacturing firms in the province of Quebec (Canada).

Literature review

The rationale to a possible interplay between the use of services and innovation finds its roots in the division of labor in innovation processes that accompanies the development of markets for knowledge. The cognitive theory of the firm (Noteboom 2009) insists upon the challenges any innovating firm faces to structure its technological knowledge and extend its capabilities to innovate. As the number of component in a new product or process increases, the use of external services becomes more frequent. On one hand, the increased complexity of innovation occurs risks and costs that the innovative firms cannot bear alone. This gives a strong incentive to cooperate with different partners through alliances, networks or other kinds of partnerships (Wassmer 2010). But the interest of external services is not only a solution to the firm's own limited resources and capabilities to deal with systemic and complex problems. KIBS also contribute to a better performance of the firm contributing to fill the knowledge gaps (Van Beers and Zand 2014). The complexity of innovation process often thus results in the integration of the different sources of knowledge and competences, a process in which KIBS take on an important function (Den Hertog 2000).

Methodology

We investigate the interplay between KIBS and R&D thanks to an empirical analysis resting upon individual data. The data used in the quantitative analysis originate in a firm-level survey carried out between April and June 2011, which purported to identify the characteristics and patterns in the developments of innovation in manufacturing firms. Another purpose of the survey was to investigate the use of different services in the innovation process of these firms. In all, 804 interviews were completed, with a response rate of 40.2% (804/2000). The response rate is within the range common in the innovation literature and when survey involved small and medium-sized firms. The sample mirrors the current structure of the manufacturing sector in the province of Quebec and its different sector.

Results

Three sets of results are found. First, we show that establishments that undertake R&D tend to make a more intensive use of R&D services than non R&D ones. R&D establishments, whether low-intensive or high-intensive, are far more likely to use R&D services than no R&D establishments. Moreover, the breath of R&D services increases with R&D intensity. Second, the results show that R&D performers, whether low-intensive or high-intensive, unequivocally innovation more than establishments with no R&D. When R&D services and business services are analyzed simultaneously, the results reveal that the patterns of service use – whether the use of R&D services or business service – remain the same for low-intensive R&D establishments but has changed slightly for high-intensive R&D establishments. From this perspective, another result obtained is that if establishments realize more R&D, they are more likely to use R&D services and use less other types of business services.

Contributions and Implications

For managers, our study highlights the importance to combine a large set of resources to reach a positive level of R&D intensity. Even if all resources are not equivalent since, as previously shown, R&D services have a stronger influence on R&D than business services, their effect is as much important as they are combined with other internal (for high-intensive R&D establishments) or external (for low-intensive R&D establishments) factors. Managers should be cautious of this interplay between different resources and the possible effects on R&D.

When defining a R&D policy and strategy and seeking resources to implement it, managers should determine which set of resources fits better with the objective targeted. We encourage managers to pay attention to our findings that the mix of external services used could depend on the R&D profile and that for low-intensive R&D establishments the interplay between R&D services and business services has a greater importance than in high-intensive R&D establishments in which the acquisition of R&D services combines better with product or process innovations..

Policy Speech: Matteo Maggiore, (Director of Communication, European Investment Bank), Financing innovation: the European Investment Bank experience

Chair: Daniele Archibugi (CNR Rome, Italy)

--

Session 3: Funding sources and management of innovation processes

Chair: Claudio Cozza (Area Science Park Trieste, Italy)

Sophie Boutillier, Dimitri Uzunidis (University of Littoral Côte d'Opale, France), The weak ties between the “banker” and the entrepreneur and the relevance of the analysis from the “resource potential of the entrepreneur”

sophie.boutillier@univ-littoral.fr, dimitri.uzunidis@univ-littoral.fr

According to the economic thought, the entrepreneur is the engine of innovation and of technical change. Since the 18th century, the question of technological innovation has been studied by many economists (Boutillier, 2014; Boutillier, Uzunidis, 2016), but the issue of innovation financing has generally been underestimated. The analysis aimed at explaining how to develop and disseminate technological innovation was central (Audretsch, 1995, 2006). However, the question of financing is frequently a major obstacle for entrepreneurs willing to develop their project. The entrepreneur is frequently apprehended by economists as the “Jack-of-all-trades” of capitalism (Lazear, 2005). This is after significant efforts that he manages to finance his project. The entrepreneur must find ways of financing by himself, in a context of high uncertainty. Due to this uncertainty, he cannot be considered as a rational calculator (Walras, 1874; Mises, 1949), his decisions are also the result of psychological and irrational factors (Menger, 1883; Shane, 2003).

In this paper, we do not define the entrepreneur as an individual but rather as the function which consists in identifying opportunities, investing, producing and innovating. In the same logic, we define the banker as the function which consists in gathering saving, financing production and innovation. Our hypothesis is that the relation between the entrepreneur and of the banker is characterized by “weak ties”. The “weak ties” are developed occasionally between two individuals who come from two different social spaces. These strength of a tie is a combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which characterize the tie (Granovetter, 1973: 1361). While the entrepreneur and the banker have the same objective, that is to say the issue of investment, their behaviors and strategies are not the same: the entrepreneur must find ways of financing, in a context of high uncertainty. The banker is accountable to savers, which explains the conservative attitude towards the financing of entrepreneurial innovation which was put forward at the beginning of the 19th century by Say (1803) and then, by Schumpeter (1911, 1942). In this context the main question dealt with in the paper is the following: according to the economic theory of the entrepreneur, how does the entrepreneur manage to develop stronger ties with the banker, which are necessary to reach their common aim?

Methodology

Our contribution is based on a literature review of the economic theories of the entrepreneur, starting from the analysis of Cantillon and Schumpeter; namely the founders of the economic theory of the entrepreneur. Our aim is to analyze the nature of the relationship between the innovative entrepreneur and the banker who has to finance the entrepreneurial innovation, and how the entrepreneur can persuade the banker to support his project. The main question is how the entrepreneur can reduce market uncertainty and information asymmetry through the development of a set of various resources (knowledge and social resources). At the beginning of the 18th century, Cantillon (1755) defined the entrepreneur as a risk-taker. Some years later, according to Smith (1759, 1776), the good entrepreneur is a “prudent man”. He had a negative image of the “projector”, unlike Bentham (1780, 1787) who built a very positive analysis of the projector as a risk-taker. The projector is according to Bentham the engine of the technical change thanks to strong ties with the banker. Nevertheless, at the beginning of the 20th century, Schumpeter (1911, 1942) denounced the banker’s negative attitude... To counter uncertainty, entrepreneurs have to develop networks of social relations through which they gather information of all kinds (technical, commercial, legal, administrative, etc.) allowing them to complete their project. These networks are constituted both at the individual and the family (including primary and later) and the social levels (including relations with public institutions, companies or others, but also more or less informal, friendly relations with colleagues or others), on the basis of a subtle dialectic between strong and weak ties (Granovetter, 1973).

Contributions

Our objective is to analyze how economists have apprehended the issue of financing of the function of the entrepreneur. We will thus show how entrepreneurial activity has gradually become considered as a socialized one and has benefited from the advantages of an institutional framework. For this analysis, we will mobilize four groups of ideas:

1/ **The institutional context reduces uncertainty:** to succeed, the entrepreneur needs to be inserted in a given institutional context which will reduce the degree of market uncertainty; eg: protection of private property, appropriate business regulation and so on (Baumol, 1990; Shane, 2003).

2/ The capacity of the entrepreneur to develop trust links depends on his socialization: In many cases, the entrepreneur is the first financier of his enterprise. On this basis, he can develop relationships with other partners, as such as with the banker, venture capitalists, and public administrations. The entrepreneur has to develop confidence relationships with a large set of actors. The capacity of the entrepreneur to develop these links depends on his socialization according to his social and family background, his studies, and his professional experience. To develop social networks, the entrepreneur needs to gather different kinds of resources which will help him to build a strong social network (Aldrich, Kim, 2007, Bourdieu, 1980, Granovetter, 1973, 1985).

3/ The context of the socialization of the entrepreneur: These different contingency elements produce a wide variety of ideal-types of entrepreneurs (Aldrich, 2011). The resources that the entrepreneur derives from the process of his primary socialization are not insignificant. The family is in many situations a substitute for the lack of commitment of the banker (Casson, 1982), but not all families are able to provide the same level of resources. In addition, the entrepreneurial function reflects a wide variety of activities. Not all entrepreneurs are creators of start-ups; entrepreneurship also resides in activities with low added value, where the question of financing, although less important with regard to the amounts to be mobilized, remains a risky activity in terms of the weakness of other resources that the entrepreneur is able to mobilize (knowledge resources and networks of social relations). According a Global Entrepreneurship Monitor's research, the main sources of funding of the entrepreneur are the "3F" (friends, family and foolhardy strangers).

4/ The technical and scientific knowledge of the entrepreneur: to stimulate the interest of the banker, venture capitalists or other financiers, the entrepreneur has to acquire knowledge, to demonstrate that he controls a given technological field. This knowledge is both tacit and codified (Arrow, 1962, Becker, 1965, Hayek, 1945, Schultz, 1961), and ensues from his degrees and professional experience.

A conceptual proposition, the resources potential of the entrepreneur

Our contribution is to propose the concept of the "resources potential of the entrepreneur", as a synthesis of these different theories. The resources potential of the entrepreneur is a set of three kinds of resources (knowledge, financial and social network resources) mobilized by the entrepreneur who is embedded in a given socioeconomic context. Our definition of a resource is based from the Penrose's definition (Penrose, 1959), according to which a resource is a means of wealth creation.

Within this resources potential, the financial resources are composed of the entrepreneur's own savings, bank credit, support from family and friends, various public subsidies, venture capital and crowdfunding. The entrepreneur has access to these different sources of financing through two other types of resources: knowledge resources and social resources or social networks. Networks of social relations can help the entrepreneur to capture several kinds of information (scientific, technical, commercial, legal, regulatory ...), which become knowledge through a previous process of knowledge accumulation. The financial resources are also partly the output of the scientific, technical, commercial, legal knowledge accumulated by the entrepreneur during his past existence, and networks of his network of social relations. These three pools of resources form the entrepreneur resource potential described in the table below (Boutillier, 2013; Boutillier, Uzunidis, 2017):

Resources	Description
Knowledge	Tacit knowledge acquired through family and professional socialization Codified knowledge acquired as part of primary and higher education
Financing	Effective financial resources: own savings, personal or family wealth Potential financial resources: access to credit, subsidies, prices, crowdfunding
Social network	Informal Social Network: Family, Friendly, Neighborhood Network Formal social relations network: network of social relations established within the school and university, professional and institutional framework

References

- ALCHIAN A., Uncertainty, evolution and economic theory, *Journal of Political Economy*, 58 (3), 211-221, 1950.
- ALDRICH H. E., *An Evolutionary Approach to Entrepreneurship. Selected Essays by Howard E. Aldrich*, Edward Elgar, 2011.
- ALDRICH H. E., KIM P., Small worlds, infinite possibilities? How social networks affect entrepreneurial team formation and search, *Strategic Entrepreneurship Journal*, 1(1), 147-165, 2007.
- ARROW K., Economic Welfare and the Allocation of Resources for Invention, in *The Rate and Direction of Inventive Activity*, Princeton University Press, 609-626, 1962.
- AUDRETSCH D. B., L'émergence de l'économie entrepreneuriale, *Reflète et perspectives de la vie économique*, tome XLV, 1, 43-70, 2006.
- AUDRETSCH D. B., *Innovation and Industry Evolution*, MIT Press, 1995.
- BAUMOL W., Entrepreneurship in economic theory, *American Economic Review*, 58 (2), 64-71, 1968.
- BAUMOL W., Entrepreneurship: productive, unproductive and destructive, *Journal of Political Economy*, 98 (5), 893-921, 1990.
- BECKER G., A Theory of Allocation of Time, *The Economic Journal*, 299, 493-517, 1965.
- BOURDIEU, P., Le capital social. Notes provisoires, *Actes de la recherche en sciences sociales*, 31 (1), 2-3, 1980.
- BENTHAM J., *An introduction to the principals of morals and legislation*, Clarendon Press, 1998/1780.
- BENTHAM J., *A Defense of usury*, Dodo Press, 2008/1787.
- BOUTILLIER S., Théories économiques de l'entrepreneur innovant, in RRI, dir, *Principes d'économie de l'innovation*, Peter Lang, 101-114, 2014.
- BOUTILLIER S., Social Capital of the Entrepreneur, in *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship*, London, Springer, 1665-1671, 2013.
- BOUTILLIER S., UZUNIDIS D., *L'entrepreneur*, ISTE, 2016.
- CASSON M., *L'entrepreneur*, Basil Blackwell, 1991/1981.
- GRANOVETTER M., The Strength of Weak ties, *American Journal of Sociology*, 78(6), 1360-1380, 1973.
- GRANOVETTER M., Economic Action and Social structures. The problem of Embeddedness, *American Journal of Sociology*, 91 (3), 481-510, 1985.
- HAYEK F. A., L'utilisation de l'information dans la société, *Revue française d'économie*, vol. 1-2, 117-140, 1945.
- KIRZNER I., *Concurrence et esprit d'entreprise*, Economica, 2005/1973.
- KNIGHT F., *Risk, Uncertainty and profit*, Houghton-Mifflin, 1921.

LAZEAR E. P., Entrepreneurship, *Journal of Labor Economics*, 23(4), 2005.
http://www2.econ.iastate.edu/classes/econ521/orazem/Papers/Lazear_entrepreneurship.pdf
 MENGER C., *Recherches sur la méthode dans les sciences sociales et en économie politique en particulier*, Paris, Editions de l'EHESS, 2011/1883.
 MISES von L., *L'action humaine. Traité d'économie*, Institut Coppet, 1949.
 PENROSE E., *The theory of the growth of the firm*, Martino Fine Books, 2013/1959.
 SAY J.-B., *Traité d'économie politique*, Economica, 2006/1803.
 SCHULTZ T., Investment in Human Capital, *The American Economic Review*, 51(1), 1-17, 1961.
 SCHUMPETER J. A., *Théorie de l'évolution économique*, Dalloz, 1935/1911.
 SCHUMPETER J. A., *Capitalisme, Socialisme et Démocratie*, Payot, 1979/1942.
 SHANE S., *A General theory of Entrepreneurship. The Individual-Opportunity Nexus*, Edward Elgar, 2003.
 SIMON H., *Models of Man, Social Rational*, London, John Wiley and Sons, 1957.
 SMITH A., *The Theory of Moral sentiments*, Createspace of Independent Publishing Platform, 2013/1759.
 SMITH A., *The Wealth of Nations*, Createspace of Independent Publishing Platform, 2014/1776.
 WALRAS L., *Eléments d'économie politique pure*, Economica, 1988/1874.

**Jaime H. Sierra (Pontifica Universidad Javeriana-Bogota, Colombie),
 Institutional Financing Layout, Strategy and the choice of funding sources
 for innovation**

jhsierra@javeriana.edu.co

Any activity related to creating innovation, including its funding, involves strategic decision-making. Some scholars propose the existence of a virtuous cycle by which companies innovate to gain a better position over competitors, whereby additional profits achieved can be either devolved to company owners or dedicated to boost new research and development processes. As this does not usually happen, we propose a theoretical model to understand why and to suggest some possible solutions.

Long-term real investment and capital structure

Two financial cost-based theoretical views dominate the literature on capital structure and long-term real investment (innovation included). An optimal combination of internal liquidity and debt (Trade-Off Theory) and a preferential ranking of funding sources (Pecking Order Theory).

Furthermore, a “new pecking order” is suggested for innovative firms related to their size and stage of development: 1) insider capital, informal private equity and easy-term public financing (seed stage); 2) venture capital financing (start-up stage); 3) self-financing, bank and/or business credit; (early growth stage); 4) direct issue of bonds and public equity (sustained growth stage). This scheme fits project-based start-ups, but it is not appropriate for innovative established firms. Also, there is evidence that PO can be reversed due to several factors.

Problems: All managers reason along the same line; no role for potential funders, no differences among them; no divergence among funding possibilities. Relational dimension

(investors & project owners) ignored, role of other actors and importance of institutions overlooked. No attention to projects' differing characteristics.

Capital structure, corporate governance and strategy

Capital structure affects ownership and control structure (governance), hence strategy. Efforts to bring corporate governance and investment theory together explain presence of certain types of innovative industries only in given countries. Prototypical strategic decision-making where finance is influenced by context and culture suggests four patterns of corporate governance and industrial structure correspondence (Anglo-Saxon, German, Italian, Japanese) that cover the spectrum between bank-oriented and market-oriented systems (poles correspond to internal liquidity and debt/equity funding).

This highlights importance of demand-supply matching background and suggests national and sectoral differences (no specific capital structure associated to any SCGF) beyond cost-based financial approach.

Dimensions of innovation funding strategic decisions

Two descriptive propositions about companies:

a- Innovative firms may be either project-based (e.g., spinout in start-up phase) or portfolio-based (e.g., established firm with project pipeline);

b- Innovative firms may use either internal funds only, external funds exclusively or a combination of both, raised for a specific project or for a project portfolio.

Main characteristics of innovative projects: degree of innovation, degree of uncertainty and risk, development placement (in-house vs outsourced), usage setting (internal use vs external commercialisation), end result (process vs product). Plus sectoral innovation models' differences.

This makes assessment, selection, and management difficult and have implications on actors' considerations and decisions. Project characteristics and setting need to be accounted for and funding decisions should be thought of from two perspectives: that of project owners and that of potential financiers (Graphs 1 & 2).

Relational dimension and conditions for effective interaction

Aspects central to matching possibilities: *i*) matching environment and mechanisms that grant funds supply and demand meeting (where and how project owners and funders can find information/establish contact?); *ii*) conditions under which parties interact and reach an agreement (how and under which conditions project owners and external financiers relate – own reasons come into play).

Once initial contact taken, interaction revolves around conditions for a formal contractual relation. Strategic decision-making will shape relationship.

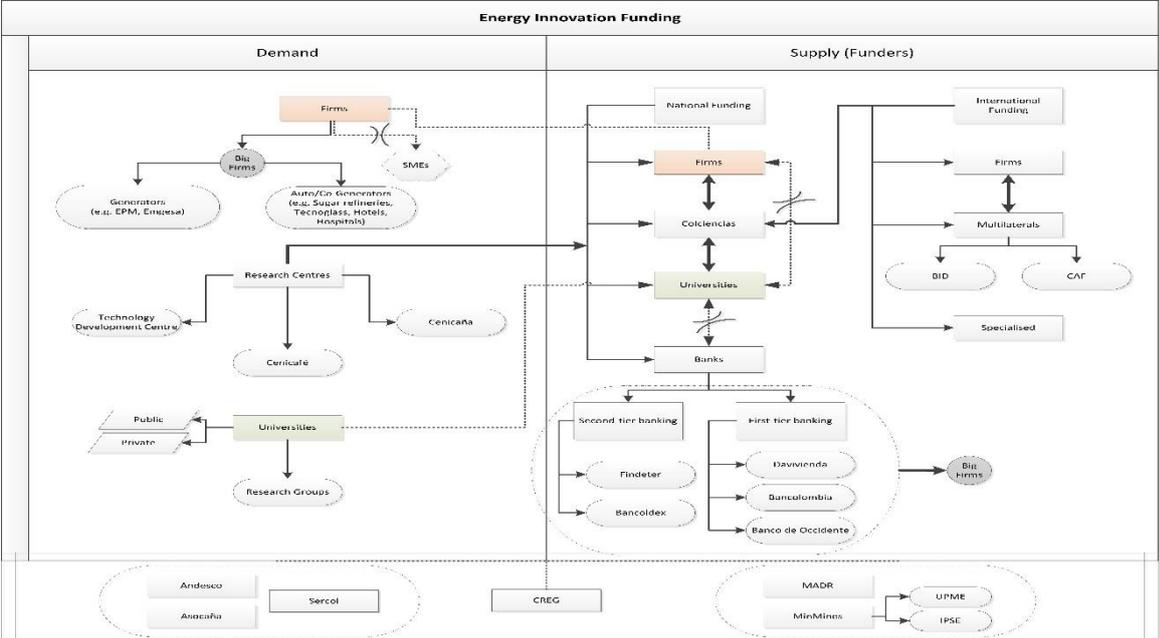
“... the relation between investment in productive resources and economic performance depends on *who makes investment decisions in corporate enterprises, what types of investments they make, and how returns from investments are distributed.*” (O'Sullivan, 1998 & 2000). Thence, resource allocation to innovation ideally characterised as developmental (resources must be committed to irreversible investments with uncertain returns), organisational (returns are generated through the integration of human and physical resources), and strategic (resources are allocated to overcome market and technological conditions that other firms take as given) (O'Sullivan, 2000).

Innovation supported through corporate governance via three conditions: *financial commitment to counter investor’s short-termism; organisational integration to facilitate in-house learning and to contain knowledge spillovers; insider control to strengthen strategic decision-making.* So funders would rather deeply understand projects and make decisions as projects evolve to guarantee better organisational control of critical inputs to innovation (knowledge and money).

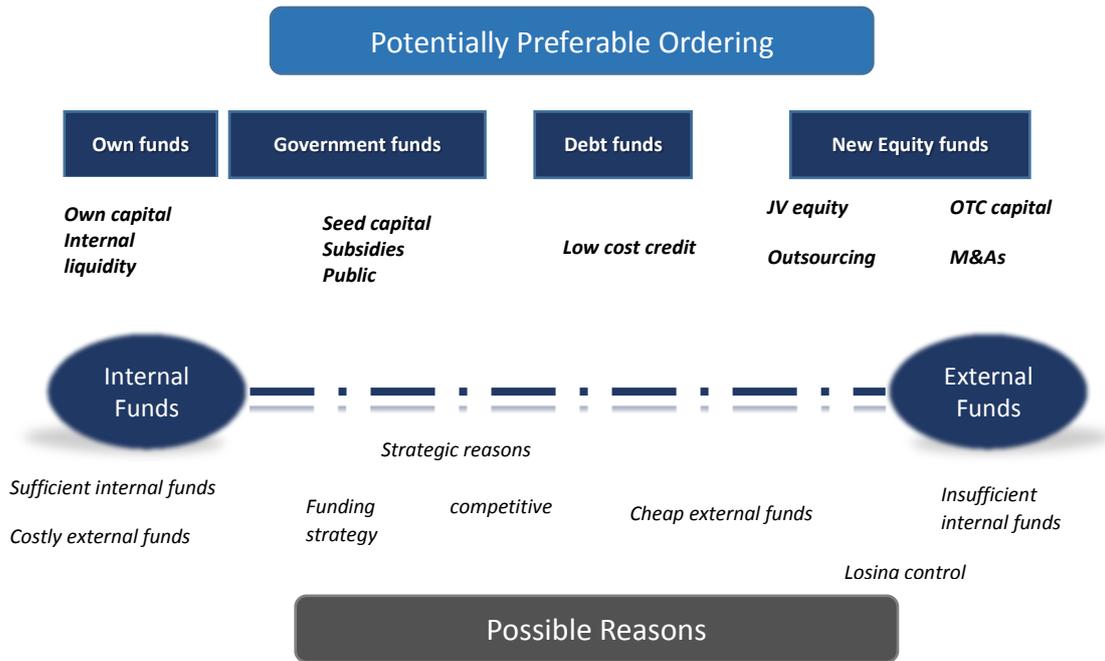
Firm heterogeneity (e.g., seed-phase firms/start-ups vs established companies; different types of funders) very important for capital structure since “*the relationship between traditional financial variables and capital structure might be contingent upon the firm’s strategy*” (O’Brien, 2003). Outcomes of relation/interaction depend on role of players’ characteristics, project characteristics, and innovative/financial strategy pursued by actors (Hallen and Eisenhardt, 2012). Only boundaries of interaction are availability and readiness of players in a given setting (e.g., institutions).

Emerging economy example: energy sector in Colombia

Generalities: Low investment in STI (0.3% of GDP). Government investment, however limited, greater than private investment. Scarcity of pre-seed and seed funding. Fragmented STI system funding (Colciencias budget reduced, oil royalties discussed, few other public funding bodies not well coordinated) Virtual absence of venture capital. Second/First tier bank funding available for bigger established companies. Very weak stock market (IPOs and bond placement very rare). Only four Angel funding networks. Innovative established companies prefer internal funding! (innovation surveys). Assessment of public funding use unknown.

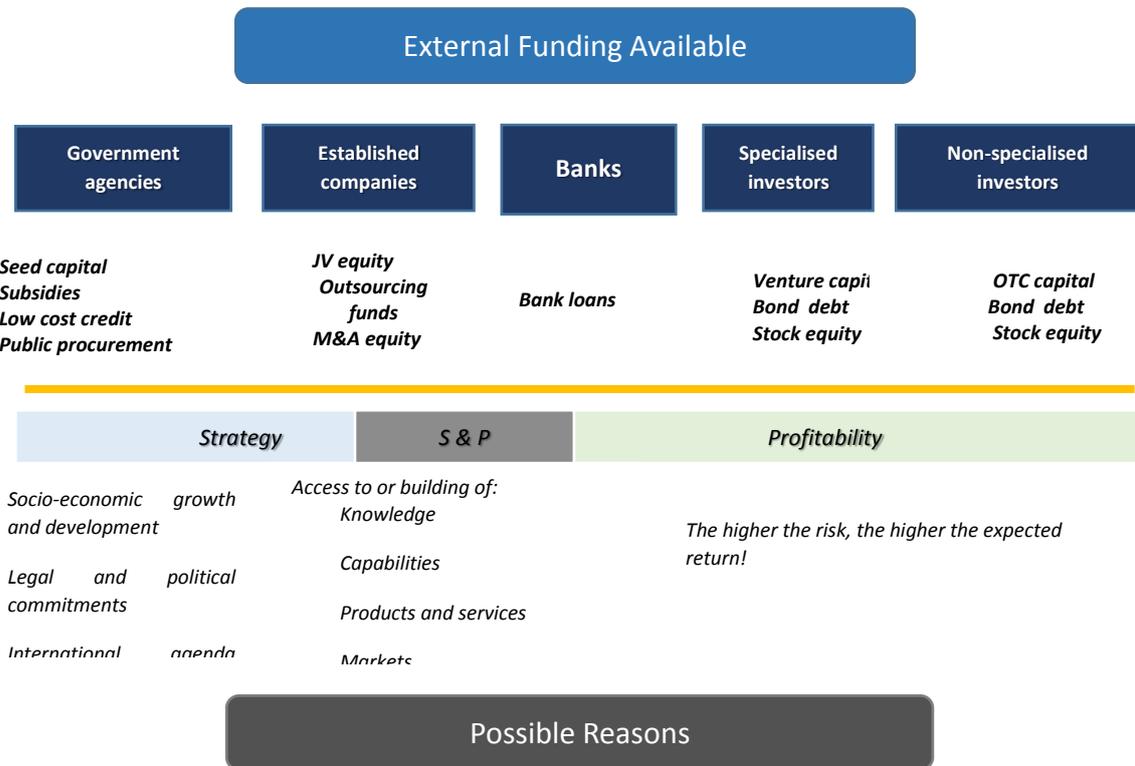


Graph 1 – Project owners’ perspective



Source: Author's own elaboration

Graph 2 – Potential external funders' perspective



Source: Author's own elaboration

Thierry Burger Helmchen (University of Strasbourg, France), Resource redeployment and real option thinking for managing innovation processes

burger@unistra.fr

In this article we propose a survey of the literature about the financial and strategic use of real option thinking during the innovation process. During the last decade, considerable theoretical progress has been made by strategy and innovation management researchers using real options (Trigeorgis and Reuer, 2017). This stream of work began by conceptualizing a large number of organizational phenomena in the form of options, representing various investments and activities such as R&D decisions or technological choice (e.g. Kogut and Kulatilaka, 1994; McGrath, 1997); international investments (Belderbos et al., 2014; Kogut, 1989); venture capital and entrepreneurship (Tong et al., 2008), in the form of a taxonomy of real options corresponding to options for growth, waiting, change, abandonment, etc. (Trigeorgis, 1996).

Most recently real option theory came again to the forefront of innovation management and finance pushed by the emergence of the resource redeployment debates in strategic management (Andrés et al., 2017; Folta et al., 2016). Our survey of the use of real option integrates those recent debates and highlights how the strategic management of innovations is impacted.

Resource redeployment options and innovation options use the tools of economics, finance, operational research to determine the optimal functioning of these options, the determinants of their value, and their sensitivity to variations. Other works have followed a more intuitive approach and have formulated more flexible (or even less rigorous from a mathematical point of view) assumptions about the existence of the options. Thus, recent conceptual works have sought to link real options with other theoretical approaches, such as game theory (Smit and Trigeorgis, 2009), organizational learning (McGrath and Nerkar, 2004), theory of resource-based firm (Kogut and Kulatilaka, 2004) to examine the issues typically addressed by firm theories and strategic management literature as the development of a competitive advantage. As a result of this work, several authors have identified and discussed possible pitfalls when it is desired to transpose the options (in a very financial approach) to an analysis within organizations that are characterized by a specific rationality and resources in which many competing processes and interests intermingled (Adner and Levinthal, 2004; Bowman and Hurry, 1993; Bowman and Moskowitz, 2001; Damaraju et al., 2015).

Since the beginning of the 1990s, there has been a gap between theoretical work and empirical work on real options. Despite recent advances in the representation of options, which should facilitate their detection and therefore their practical evaluation, the empirical works do not catch up the conceptual works in their pace and scope. That's why in this article we discuss pitfalls and challenges associated with empirical tests of real option theory in different areas of strategic management and especially during the innovation process. This discussion allows us to explain why the theoretical and empirical results are sometimes remote and why this fracture is not reduced. Some of the difficulties also stem from theoretical problems that have not yet been overcome or from the use that is made of them in strategic management or in finance. There is therefore a lively debate about the assumptions that need to be verified for an option to be evaluated and the appropriate modeling method (Wang and Lim, 2008). These issues may be essential in some strategic management problems and of secondary importance in others (Li and Chi, 2013). Specific problems with the data needed to evaluate real options, such as obtaining data on

individual investments within a portfolio of innovation a company are limiting the empirical use (Cuervo-Cazurra and Annique Un, 2010).

Yet empirical work with robust tests is needed for at least two reasons. First, empirical work is needed to investigate the descriptive validity of real options for many strategic management issues, which will help to revive theoretical development later. Secondly, real options can develop as a normative theory linking the issues of corporate finance and strategy, by injecting strategic considerations (successive investments, investment, managerial discretion in the choice of investments, behavior in the face of uncertainty) in the traditional approach to investment choice in finance. These aspirations, coupled with the moderate use made of real options by firms (Rigby, 2001) suggest that a development of empirical work would be a catalyst for practical use in the coming years (by e.g. the works on business unit reconfiguration and innovation Karim, 2009; Karim and Williams, 2012, 2012).

In this work, we classify the empirical approaches of the real options used by many authors in innovation management. Our efforts focus on the presentation of the state of employment that is made of this theory in innovation management, deliberately omitting the theoretical development and sometimes empirical works in other areas of literature. We begin with a discussion of work that has studied the timing and structure of business investment using real option theory. Then we examine the work that relates to the link between the performance of companies and the options. This second group of works is, in terms of published articles, more consequent than the first group. This can be explained by the fact that this second group is often spanning works in finance or management control. In conclusion to this inventory, we propose possible ways of development to overcome the obstacles appeared in the empirical research on the real options in order, at first, to prove their descriptive validity, and, in a second time, to answer the normative aspirations that would make real options the missing link between innovation management and corporate finance.

References

- Adner, R. and Levinthal, D.A. (2004), "Real options and real tradeoffs.", *Academy of Management Review*, Vol. 29 No. 1, pp. 120–126.
- Andrés, P. de, Fuente, G. de la and Velasco, P. (2017), "Diversification, relatedness and growth options value: Beyond a linear relationship", *Innovation and Sustainability*, Vol. 50 No. 6, pp. 840–861.
- Belderbos, R., Tong, T.W. and Wu, S. (2014), "Multinationality and downside risk: The roles of option portfolio and organization", *Strategic Management Journal*, Vol. 35 No. 1, pp. 88–106.
- Bowman, E.H. and Hurry, D. (1993), "Strategy through the option lens: an integrated view of resource investments and the incremental-choice process.", *Academy of Management Review*, Vol. 18 No. 4, pp. 760–782.
- Bowman, E.H. and Moskowitz, G.T. (2001), "Real Options Analysis and Strategic Decision Making.", *Organization Science*, Vol. 12 No. 6, pp. 772–777.
- Cuervo-Cazurra, A. and Annique Un, C. (2010), "Why some firms never invest in formal R&D", *Strategic Management Journal*, Vol. 31 No. 7, pp. 759–779.
- Damaraju, N.L., Barney, J.B. and Makhija, A.K. (2015), "Real options in divestment alternatives", *Strategic Management Journal*, Vol. 36 No. 5, pp. 728–744.
- Folta, T., Helfat, C. and Karim, S. (Eds.). (2016), *Resource Redeployment and Corporate Strategy*,

Emerald Group Publishing Limited.

Karim, S. (2009), "Business Unit Reorganization and Innovation in New Product Markets", *Management Science*, Vol. 55 No. 7, pp. 1237–1254.

Karim, S. and Williams, C. (2012), "Structural knowledge: how executive experience with structural composition affects intrafirm mobility and unit reconfiguration", *Strategic Management Journal*, Vol. 33 No. 6, pp. 681–709.

Kogut, B. (1989), "A note on global strategies.", *Strategic Management Journal*, Vol. 10 No. 4, pp. 383–389.

Kogut, B. and Kulatilaka, N. (1994), "Options thinking and platform investments: Investing in opportunity.", *California Management Review*, Vol. 36 No. 2, pp. 52–71.

Kogut, B. and Kulatilaka, N. (2004), "Real options pricing and organizations: the contingent risks of extended theoretical domains.", *Academy of Management Review*, Vol. 29 No. 1, pp. 102–110.

Li, Y. and Chi, T. (2013), "Venture capitalists' decision to withdraw: The role of portfolio configuration from a real options lens", *Strategic Management Journal*, Vol. 34 No. 11, pp. 1351–1366.

McGrath, R.G. (1997), "A real options logic for initiating technology positioning investments.",

Academy of Management Review, Vol. 22 No. 4, pp. 974–996.

McGrath, R.G. and Nerkar, A. (2004), "Real options reasoning and a new look at the R&D investment strategies of pharmaceutical firms.", *Strategic Management Journal*, Vol. 25 No. 1, pp. 1–21.

Rigby, D.K. (2001), "Management tools and techniques: a survey.", *California Management Review*, Vol. 43 No. 2, pp. 139–160.

Smit, H.T.J. and Trigeorgis, L. (2009), "Valuing Infrastructure Investment: An option games approach",

California Management Review, Vol. 51 No. 2, pp. 79–100.

Tong, T., Reuer, J.J. and Peng, M. (2008), "International joint ventures and the value of growth options.", *Academy of Management Journal*, Vol. 51 No. 5, pp. 1014–1029.

Trigeorgis, L. (1996), *Real Options: Managerial Flexibility and Strategy in Resource Allocation*, MIT Press.

Trigeorgis, L. and Reuer, J.J. (2017), "Real options theory in strategic management", *Strategic Management Journal*, Vol. 38 No. 1, pp. 42–63.

Wang, H. and Lim, S.S. (2008), "Real options and real value: the role of employee incentives to make specific knowledge investments", *Strategic Management Journal*, Vol. 29 No. 7, pp. 701–721.

Session 4: Corporate Venturer and entrepreneur: a specific relationship for innovation

Chair: Vivien Pertusot, BPI France

Emmanuelle Dubocage (Paris Est Créteil University, France), The Governance of venture backed companies: theoretical and empirical Evidence

Emmanuelle.dubocage@u-pec.fr

Objectives

In 2014, the well-known company Uber raised more than \$2 billion from venture capitalists (VCs). In the context of the digital revolution, venture capital (VC) is more than ever at the core of the promotion of innovation. In the academic literature, the relationship between VCs and the chief executive officers (CEOs) of venture-backed companies is often considered emblematic of agency relationships, as defined by Jensen and Meckling (1976), in a context of asymmetric information (AI), as confirmed by bibliometric analysis (Landström and Mason, 2012; Da Rin et al., 2013).

Our objective is precisely to question the relevance of this theoretical frame for analyzing the governance of venture-backed companies and to challenge this theoretical positioning with an alternative view. Our contribution consists of an original analysis of investor-investee relationships based on cooperation in the uncertain context of the future of the venture-backed company, mutual dependency and the sharing of information between VCs and CEOs.

Literature review

The first part of the article shows what the governance of venture-backed companies is according to agency theory (AT) in a context of AI. At first glance, there are some good reasons to use AT in VC research. Indeed, when ownership and control are separated, principals develop governance structures to reduce agency costs and align agents' incentives (Grossman and Hart, 1986, Zingales 1995). More precisely, for some scholars, with regard to VC, "*Financial contracting meets the real world*" (Kaplan and Strömberg, 2003) or, more recently, "*Venture Capital Meets Contract Theory: Risky Claims or Formal Control?*" (Cestone, 2014). Nevertheless, this theoretical framework is not completely satisfactory, as some critical articles reveal (Rabeharisoa, 1996; La porta et al., 1998; Christensen, 1999; Judge et al., 2010; Bonini et al., 2012). To deepen this critical approach and in line with our previous work, we propose an alternative view challenging the dominant theory of the relationship between VCs and CEOs. First, we propose to consider that VCs and CEOs evolve in a context of radical uncertainty (Knight, 1921). Second, one key factor elicited in AT must be included in the analysis of the relationships between venture capitalists and CEOs: the trust between investors and entrepreneurs (Steier and Greenwood, 1995; Sapienza and Kosgard, 1996; Timmons and Bygrave, 1986). Finally, AT's exclusive focus on the dyadic relationship in a context of asymmetric information seems simplistic and calls for an account of multilateral relationships and network effects on corporate governance (Suchman, 2000 ; Freeman,

2010 ; Bellavitis et al., 2014 ; Hochberg et al., 2015).

Methodology

This qualitative, exploratory research was conducted in two stages of inquiry: semi-structured interviews with VCs and CEOs and the exploitation of secondary data (stage 1) followed by online surveys addressed to investors and investees (stage 2).

The purpose of the first stage was to decode the process of governance. At the end 2015, we have conducted a series of 8 semi-structured, 2-hour interviews with French venture capitalists. Most academic articles focus on the VCs perspective of VCs. By contrast, this paper reveals the entrepreneurs' side of the story. Indeed, we have conducted a series of 8 semi-structured, 2-hour interviews with the CEOs of venture-backed companies. In addition to these primary data, we use several secondary data sources (shareholder agreements, business plans...) The analysis of these initial data leads us to conduct a second stage of inquiry to understand how these different components combine to shape an alternative view. In this second stage, we construct an original questionnaire-based dataset by surveying 100 VCs and 70 CEOs. Each survey proposes to the respondents a choice between two scenarios related to the corporate governance of venture-backed companies.

Results

Following Bonini et al. (2012), we consider that corporate governance cannot rely on a single interpretative framework such as agency theory but must be integrated with predictions from alternative views. Our main contribution is to downplay the relevance of AT in an AI context to understand the governance of venture-backed companies and to propose an alternative view based on cooperation in a context of radical uncertainty with shared information, network and trust. Our empirical results provide little evidence that governance has a disciplinary dimension (Charreaux and Wirtz, 2006). We consider that, in the very specific case of venture-backed companies, this theory hides several dimensions of corporate governance. We speak in favor of a moderate view of AT because, naturally, the objective is not to reject AT completely but instead to downplay it, given that we provide evidence that AT is a powerful theory but not very suitable, or at least not sufficiently comprehensive, for venture-backed companies. We do not consider that the contract is useless, nevertheless our empirical material shows that its role is different from that predicted by AT. The shareholder agreement does not provide a panacea but acts as safeguard. What links both sides in the deal is not contractual obligation but mutual commitment between investors and investees, formed in the business plan. This mutual commitment does far beyond contractual obligation.

In the academic literature, the alternative to disciplinary governance is cognitive governance, developed approximately 30 years after the publication of the article by Jensen and Meckling (1976). Charreaux and Wirtz (2006) distinguish between what they call "disciplinary governance", which is based on AT, and cognitive governance (CG), which is in line with the resource-based view (Penrose, 1959; Barney, 1991; Wernerfelt, 1984). This conception of governance illuminates our empirical results regarding the governance of venture-backed companies.

Contributions and Implications

Challenging AT in the VC setting has been performed before, and the indication is that its explanatory value seems to decrease with the distance from the U.S. Several scholars show that AT fails to capture the variety of international corporate governance practices due to differences in legal systems, law enforcement, and cultural issues (Denis and Mc Connel, 2003; Judge et al., 2010; La porta et al., 1998; Zattoni and Cuomo, 2008). Thus, AT seems to be a contextually dependent theory. According to scholars, the dominant theory is relevant for the American VC market but not for the European market because of different regulation and standards and different levels of institutionalization on both sides of the Atlantic and because the development of VC has been historically offered to companies by captive funds in Europe and by independent funds in the U.S. (Denis and Mc Connel, 2003; Judge et al., 2010; La porta et al., 1998; Zattoni and Cuomo, 2008). Our data analysis confirm that, for French VCs compared to their U.S. counterparts, differences related to involvement and monitoring exist. As underlined above, we provide insights that attest to cooperative relationships more than conflictual relationships in the French context.

Hélène Perrin Boulonne, Blandine Laperche (University of Littoral Côte d'Opale, France), The entrepreneur-venture capitalist duo in the territorial system of innovation: the case of the French Competitiveness clusters of Lyon Grenoble Chambéry axis

helenepboulonne@gmail.com, blandine.laperche@univ-littoral.fr

Objectives

The development of innovation and start-ups is today considered as key elements of smart regional innovation policies (Glaeser and al. 2010, Foray 2013, 2015). In this article, we focus on the relationship between the entrepreneur and the venture capital at the regional level, and especially in the context of clusters. While the literature mainly studies the contribution of venture capital in cluster's emergence and development, we consider that the relationship between venture capital, entrepreneur and clusters is more complex and can be studied as a two-way relationship. Moreover, the relationship between the entrepreneur and the venture capitalist is most often studied in the literature as an agency relation, based on a set of constraints and incentives (Elitzur, Gavius 2009, Da Rin et al. 2013). However, this analysis omits the production of resources that arise from this relation. To fill in this gap, we propose, referring to the evolutionist and resource-based theories, to analyse this relation not only as an agency relation but taking account of the resources (especially in terms of knowledge) built through this partnership.

We thus make the following hypothesis: (1) the cluster promotes the meeting of entrepreneurs and venture capitalist through various devices, and the presence of venture capital in the clusters make possible the transformation of innovative projects into start-ups. (2) the duo entrepreneur venture capitalist allows the production of new knowledge and skills that enrich the "territorial knowledge capital".

Literature review and theoretical framework

The first part focuses on a literature review on the relationship between entrepreneurs, venture capitalists and the territory. The relation entrepreneur-VC is mainly study as a market characterized by asymmetric information (Cable, Shane 1997, Hege, Bergemann 1998, Tian 2011, Burchardt and al. 2016). Studies that focus on the relationship between entrepreneurs and territory put forward characteristics that attract entrepreneurs (Glaeser and al. 2010, Chatterji and al. 2013) or the contribution of the entrepreneur to territorial economic development (Mason and Brown 2014, Stam and Boshma 2015). In the cluster literature, venture capital appears as having a very positive influence on regional development, even if it is not an absolutely necessary condition (Florida, Kenney 1988, Saxenian 1994, Carayannis, Campbell 2009, Wray 2012, Drover and al. 2017). The contribution of VCs and entrepreneurs in terms of resources production is rarely discussed, or if so it concerns only the contribution in terms of governance (Aoki 1999, Cuming and al. 2010, Bruton and al. 2010). We propose to study the dialectical relationship between the territory, the entrepreneur and the venture capitalist. In this purpose, we mobilize three main concepts: the regional system of innovation, the territorial knowledge capital and the duo entrepreneur venture capitalist. The regional system of innovation (RSI) serves as a framework for studying the duo entrepreneur venture capitalist and its contribution to territorial knowledge capital. The regional system of innovation (Cooke 2001) can be defined as: all actors, public and private, interacting in a given territory to foster the development of innovation and companies located in the same territory. The “territorial knowledge capital” designates « the knowledge base produced, possessed and used by the set of local enterprises and institutions in a process of value creation and according a well-defined territorial project » (Laperche, Perrin-Boullonne 2017). We define, as a new contribution the « entrepreneur-venture capitalist duo » as: « the pooling of resources and skills in a relationship of trust and cooperation in the pursuit of a common goal that is the success of the firm. It is made up of all the interactions, the networking and the mutual learning between venture capitalists and entrepreneurs ».

Methodology of the empirical work

The second part of the paper studies the particular case of the French competitiveness clusters (“*pôles de compétitivité*”) of the Lyon Grenoble Chambéry axis. This territory has the particularity of concentrating an important R&D activity in diversified sectors, as well as a local venture capital activity. It serves as a field of analysis to analyse the role of the entrepreneur-VC duo and its contribution to the territorial knowledge capital. We use a mixed methodology with on the one hand the building and quantitative analysis of a database of all the start-ups of the clusters, and on the other hand a qualitative analysis based on interviews with venture capitalists and start-ups. We have compiled a database based on business directories of the clusters. The list of member firms has been cross-checked with business register data to identify firms created between 2012 and 2016. We have a database of 172 start-ups. In order to determine whether these companies are involved in an innovation process, we used the database of firms involved in research activities compiled by the French Ministry of Higher Education and Research. In order to determine whether the companies were financed by venture capitalists, we conducted research on information produced by start-ups, venture capitalist and the local financial press archives. Finally, a panel of 15 venture capitalists and 15 start-ups have been interviewed through a semi directive questionnaire.

Results

The data observed on clusters of the Lyon Grenoble Chambéry axis allow us to validate the first hypothesis: Venture capital financing is aimed primarily at firms in an innovation process ; all type of venture capital actors are very present among start-ups in the clusters, and therefore in regional innovation systems, a large part of the venture capitalists financing start-ups in the regional system of innovations, have a local anchorage.

The second hypothesis is also verified. The entrepreneur-VC duo contributes to the economic development of the clusters by the success / performance of the start-ups. The entrepreneur-VC duo contributes to the enrichment of the territorial knowledge capital, according to two distinct processes: (i) by production and dissemination of knowledge (transformation of R&D into products and services), (ii) by joint actions carried out by entrepreneur and venture capitalist whose objective is to improve the functioning of the entrepreneur-VC duo. Those processes result from a contractual and non-contractual relationship between the entrepreneur and the venture capitalist.

Discussion

Start-ups and all type of venture capitalists are mainly present in the French competitiveness clusters, seen as a regional system of innovation. The relation is two-way, clusters attract new innovative firms and venture capitalist, and the presence of venture capitalist contributes to transform innovation into start-ups.

In a context where the objective assigned by the last phase of evaluation of *the pole de compétitivité* (2013-2018) is “*faire des poles des usines à produits d’avenir*”, namely to transform collaborative R&D efforts into innovative products processes and services (DGE 2017), the ongoing results means that the presence of the duo entrepreneur-venture capital in the clusters may be a means to achieve this goal.

SHORT BIOGRAPHICALNOTES

Daniele Archibugi is a Research Director at the Italian National Research Council (CNR-IRPPS) in Rome, and Professor of Innovation, Governance and Public Policy at the University of London, Birkbeck College. He has graduated at Sapienza University of Rome and taken his D. Phil. at the Universities of Sussex. He works on the economics and policy of science, technology and on the political theory of international relations. His research focuses on how innovation is related to economic, social and political global developments. He has taught at the Universities of Cambridge, London School of Economics, Harvard, and Rome LUISS. He has been appointed Honorary Professor of the University of Sussex and Honorary Member of the French Research Network on Innovation. Among his works in the field of innovation, he has co-authored, with Andrea Filippetti, *The Handbook of Global Science, Technology and Innovation* (Oxford, 2015).

Sergio Arzeni is President, INSME a Rome-based International Network for SMEs promoted by the OECD and the Italian Ministry of Economic Development; Former Director of the OECD (Organization for Economic Cooperation and Development) in Paris responsible for Entrepreneurship, Small and Medium-sized Enterprises (SMEs), Local Economic and Employment Development and Tourism, and Member of the Strategic Committee of the Banque Publique d'Investissement (BPI France) in Paris; Before joining the OECD as a Senior Economist, he served as a policy analyst both in the European Commission in Brussels, in the Italian Parliament and the Italian Trade Unions (CISL) national economic research department in Rome, was member of the Council for Southern Italy of the National Research Center (CNR) and was Co-founder of the Italy-Japan friendship Association. He holds First Class Honors Degree in Political Science from the University of Rome and specialized in Industrial Economics at the International University Institute of Luxembourg and in International Economic Relations at the Brookings Institution in Washington D.C., USA. e-mail: Sergio.Arzeni@icloud.com

Sophie Boutillier is Associate Professor and senior researcher in economics at University of Littoral Côte d'Opale. She has a Ph.D in both Economics and Sociology (University of Paris-Nanterre). She is a member of CLERSE (CNRS-UMR 8019, University of Lille) and Vice President of the Research Network of Innovation. She manages the master Management of innovation, and she is specialized in the theory of the entrepreneur, labor economics and economics of innovation. She has recently published [*The Entrepreneur. The Economic Function of Free Enterprise*](#), co-authored with Dimitri Uzunidis (Wiley, 2016).

Thierry Burger-Helmchen, is professor in Management Science. He is researcher at BETA-UMR 7522 CNRS (A+AERES). He is the author of more than 30 articles in peer-reviewed journals and he published several books (textbooks and research books) on economics and management. His research topics are innovation and creativity management. He teaches Strategy of SMEs and Managerial Economics at the University of Strasbourg.

Mauricio Camargo is full professor on Management of Technology and Innovation at the Ecole Nationale en Génie des Systèmes Industriels of Nancy (The Industrial Engineering School of the University of Lorraine -France), and researcher at the ERPI Laboratory (Research team on Innovative processes). BSc. On Chemical Engineering Universidad Nacional de Colombia. PhD on Automatics of Industrial and Human systems from the Université de Valenciennes et de Hainaut Cambresis in France. His main research interests

are; New Product Development, decision-making in innovation processes and technology strategy.

Serenella Caravella is Ph.D. Student at the Department of Economics of Roma Tre University. She is currently spending a visiting period at Lund University. Her research interests range from Public Policy Evaluation, Environmental Economics to Industrial Economics. She was formerly a research fellow at Centro Studi Confindustria. She holds a Master's degree in Political Science from University of Florence.

Giovanni Cerulli is researcher at the Research Institute on Sustainable Economic Growth, National Research Council of Italy, Unit of Rome. His fields of research are Applied econometrics, Econometrics of program evaluation, Economics of R&D and Innovation, Agent-based simulation, Industrial organization, Economic methodology and Social economics. He is Editor-in-Chief of the International Journal of Computational Economics and Econometrics, Associate Editor of the World Review of Science, Technology and Sustainable Development and coordinator of GRAPE – Research Group on the Analysis of Economic Policies.

Michele Cincera is Professor of Industrial economics at the Solvay Brussels School of Economics and Management – Université Libre de Bruxelles. Since 2012, he is the Director of the International Centre of Innovation, Technology and Education Studies (iCite). In 2009-2010, he was visiting the EC-JRC-IPTS as a senior scientist. His research interests embrace the quantitative assessment at the micro-level of innovative and entrepreneurial activities, their determinants and socio-economic impacts as well as the analysis of National Innovation Systems and policies supporting science, research and innovation.

Davide Consoli, Ph.D., is Senior Research Fellow at the National Council of Scientific Research (CSIC) in Spain and holds a courtesy affiliation at the Manchester Business School in England. An economist by training, Dr. Consoli is interested in issues at the intersection of economics of innovation and technology policy. His research focuses on the development of new technology and the generation and diffusion of knowledge. His published work examines skill obsolescence and replenishment; the dynamics of scientific networks; the diffusion of medical innovations; the economics of pharmaceutical production in developing countries; and, more recently, the emergence of environmental innovations.

Claudio Cozza is researcher in Applied Economics at AREA Science Park (a PRO based in Trieste, Italy) where he is currently involved in the OIS-AIR (Open Innovation System of the Adriatic-Ionian Region) project, and in the monitoring and evaluation of the Croatian National Innovation System. He holds a Degree and a Ph.D. in industrial economics. His research interests include Foreign Direct Investment, Regional Development and the Economics of Science, Technology and Innovation (mostly R&D internationalization, innovation systems and policies). He has been researcher at the European Commission JRC; at ISTAT, the Italian Bureau of Statistics; and has conducted research and teaching activity in several Italian Universities. Over the last years, he has been WP leader for “State of the art of Research and Innovation in the Health sector across European regions”, in the REGHEALTH-RI project, funded by the Horizon 2020 Programme; and WP leader for “Mapping Innovation Systems and Policies in the Adriatic area”, in the PACINNO project, funded by the IPA Adriatic Programme.

Francesco Crespi is Associate Professor of Corporate and Innovation Policy at the Department of Economics of “Roma Tre” University and Research Associate at BRICK-Collegio Carlo Alberto. He holds a PhD in Economics and Master degree in Economics. . He was formerly economist at the Italian Department of the Treasury and Marie Curie Fellow at the Institute of Innovation Research, University of Manchester. He has been involved in many national and international research projects and consultant for public and private institutions. His research interests focus on the analysis of the economics of innovation and technology policy. He is author of several publications in international scientific journals.

Emmanuelle Dubocage is full professor in Corporate Finance at the UPEC (IAE Gustave Eiffel). She is a member of the research laboratory [IRG](#). Her research focuses on the issue of innovation financing and more specifically on venture capital. She has published several articles in international academic journals and in research books on this topic (website : http://www.emmanuelle-dubocage.fr/Emmanuelle_Dubocage/EmmanuelleDubocage.html).

Andrea Filippetti is Researcher at the National Research Council of Italy (CNR), Visiting Fellow at the London School of Economics and Political Science, Department of Geography and Environment and at the Birkbeck Centre for Innovation Management Research, University of London. He has been Fulbright-Schuman Post Doc at Harvard University, Center for European Studies, Marie Curie Fellow at the London School of Economics and Political Science, Department of Geography and Environment, and Visiting Fellow at Columbia University, Department of Political Science. He is interested in the institutions and political economy of decentralization, innovation, the globalization of intellectual property rights, technological change and productivity growth. He has recently published with Daniele Archibugi [the Handbook of Global Science, Technology, and Innovation](#), with Wiley-Blackwell.

Blandine Laperche is professor of economics of innovation at University of Littoral Côte d’Opale (France), and member of CLERSE (UMR- CNRS 8019). She is President of the [Research Network on Innovation](#) and editor in chief of [Innovations](#), *Revue d’Economie et de Management de l’Innovation/Journal of Innovation Economics and Management*. Her research interests embrace the innovation strategies of firms, the building of their knowledge capital within global networks and the role of intellectual property rights. She also studies the impacts of circular economy, and especially industrial ecology, on regional development. She has recently published [Enterprise Knowledge Capital](#), with Wiley (2017).

Nadine Levratto is a French economist, Research Professor at the French National Council for Scientific Research (CNRS), lecturer at the universities of Paris Nanterre and Paris 1 Panthéon Sorbonne, and Research Fellow of the Centre d’Economie du Travail et de l’Emploi (Noisy-le-Grand, France). Her main fields of interest are focused on firm growth, corporate bankruptcy, SMEs; Industrial Dynamics; Growth, Innovation and Economic Geography. Her research has been published in more than 50 scholarly articles in ranked academic journals. She has also published several books and participate as a speaker or organizer to about one hundred conferences. She is also a member of the board of several academic journals. As an expert, she has consulted with the European Commission, OECD, French ministries and local administrations as well as, numerous private banks and consultants. She is also the President of the Observatory on Practices of Entrepreneurs and Enterprises ([OPEE](#)), a non-profit organisation, promoting a Small business assessment tool.

Sandro Montresor - MA in Economics 1996 (University of Manchester, UK) and Ph.D in Economic Structures and Behaviours 1998 (University of Bologna, IT) - is full professor of Economic Policy at the University Kore of Enna (IT) from October 2014. He has previously been assistant and associate professor at the University of Bologna (2000-2014), and senior research grant holder at JRC-European Commission (2011-2013, on-leave). His main research interests are in economics of innovation (e.g. drivers and effects of innovations, and eco-innovations in particular), industrial organization (e.g. firm exit-entry), and regional economics (e.g. agglomeration economies and knowledge spillovers). On these issues he has published on leading international journals - e.g. Research Policy, Small Business Economics, and Economic Geography – led national and international research projects and supervised PhD theses. He is associated editor of Industry and Innovation and editors’ coordinator of the Journal of Economic and Institutional Analysis – *Economia Politica*

Laure Morel is full Professor of Innovation at the Ecole Nationale en Génie des Systèmes et de l’Innovation of Nancy (School of engineering which is part of the Lorraine University). She is at the head of ERPI, laboratory. Her research interests span the field of new product development using living lab methodologies and metrology of innovation and Technological Risk management. Her late researches have directed increased attention toward the evaluation of the innovative potential of small firms. The aim is to propose data collection approaches and data treatment models allowing a real comparison between companies considering their innovation management. Dr. Morel is on the Directorate board of the International Association for Management of Technology (IAMOT) and of the Research Network on Innovation (RNI).

Gianluca Orsatti. With a M.A. in Economics and Complexity (Collegio Carlo Alberto) and a M.Sc. in Environmental Economics (University of Roma TRE), Gianluca Orsatti is currently a PhD candidate in Economics of Innovation, Complexity and Knowledge at the University of Turin (expected April 2018). He was visiting PhD student at the GREThA and at INGENIO during 2016 and 2017. His main research interests relate to economics of innovation, green economy and eco-innovation, economics of knowledge and economics of patents.

Hélène Perrin-Boulonne is a PhD student at ULCO (France) and runs her own business that she created. Her research focuses on financing new innovative firms at the local level, and in particular the question of venture capitalist and entrepreneurs in clusters. She was previously executive manager of the French Association of Business Angels. She has also been an economist at the Paris Chamber of Commerce and at OSEO (French public bank for SMEs) and also a statistician at the OECD.

François Perruchas is an engineer in industrial systems from the University of Angers (France) and holds a Master’s degree in Innovation and Technology Management from the UTC (Université de Technologie de Compiègne, France). Since 2004, he has worked at INGENIO (CSIC-UPV) in charge of the Institute’s knowledge management applications, assisting researchers to develop technical data solutions and developing the institutions online presence. He participates in several European and national projects about innovation, open data platforms, data methodologies for social sciences and application design for consumer recommendations. He is also a PhD candidate and the project manager developing the integration of the INGENIO’s web site, intranet, and other online applications, based on Drupal 7 and other Open Source solutions.

Vivien Pertusot is a Strategic Analysis Manager at Bpifrance Le Lab, the French public investment bank's think tank. He works on issues related to digital transformation, especially for SMEs and midcaps. He currently leads a project to publish a handbook on digital transformation for SMEs. He joined the Lab in 2017. He was previously heading the Brussels office of the French Institute of International Relations (Ifri). His most recent publication is the co-authoring of "History of misunderstanding: CEOs of SMEs and midcaps facing digital" (Bpifrance, January 2018 for the English version).

Bianca Potì is an associated researcher at the National Research Council- IRCrES, Institute of research on growth and sustainability. Her scientific interests are economics of research and innovation, research institutions and policy. She had a specialization in Management of Economy and Firm at Olivetti Institute and a B.A. in Economic and Monetary Policy at University La Sapienza, Roma. She was a professor of Industrial Economics at the faculty of Economics (University of Cassino) and of Economics of Innovation at the faculty of Sociology (University La Sapienza, Roma). She had the scientific responsibility of national and European projects. In 2005-2007 she was the coordinator of a FIRB Programme financed by the national Ministry of Research. In 2016-2017, she was the coordinator for the national Evaluation Agency of the commission on the third mission of Italian Universities. She is member of the Doctoral programme in applied research in social sciences at the University La Sapienza, Roma. She delivers many presentations in international conferences and publishes in international journals.

Francesco Quatraro is associate professor at the Department of Economics and Statistics Cogneetti de Martiis (University of Turin), and affiliate at the BRICK, Collegio Carlo Alberto. He is the Director of the PhD Programme in Innovation for the Circular Economy at the University of Torino. He is affiliated to the ICxT Innovation Center at the University of Torino, where he is the head of the Smart City and Circular Economy Hub. He is co-editor of the journal Spatial Economic Analysis (Regional Studies Association). He has been Maitre de Conference at the GREDEG, CNRS and University of Nice Sophia Antipolis; visiting scholar at the Columbia University of New York and at the CRIC, Victoria University of Manchester. His research interests include Economics of Innovation, Green Economy and Eco-Innovation, Economic Geography, Industrial Economics, Economics of Knowledge Production and Distribution, ICTs and Development Economics.

Anabela Santos is Research Fellow in the International Centre for Innovation, Technology and Education Studies (iCite) of the Solvay Brussels School of Economics and Management at Université Libre de Bruxelles (ULB) in Belgium. From 2014, she is a team member of UMPP – Unidade de Monitorização de Políticas Públicas / Public Policy Monitoring Unit of University of Évora in Portugal. She has been involved in several research studies and projects about public policy impact assessment, innovation and access to finance for SMEs. She was also financial advisor for small and medium-sized enterprises in Portugal over 9 years.

Jaime Sierra is Associate Professor at the Business Department, School of Business and Economics - Pontificia Universidad Javeriana (Bog). PhD in Business and Management, The University of Manchester (UK); Master in Economics of the Internationalisation of Business and Finance, Università di Roma "Tor Vergata", Rome (Ita); Master in Economics, Pontificia Universidad Javeriana. Consultant in different projects for entities such as: CAF, IADB, WLO, Colciencias, ISA, Bancoldex, Ministry of Industry of Italy. Member of the Board of Directors of Fundación Escritores.

Dimitri Uzunidis is professor of political economics and industrial economics at technical University of Crete (Greece) & University of Littoral (France) and a member of CLERSE (CNRS-UMR 8019). He is honorary President of the Research Network of Innovation and President of the International Society Jean Baptiste Say. He is also the director of publication of *Innovations, Revue d'Economie et de Management de l'Innovation/ Journal of Innovation Economics and Management*. His main topics of research deal with entrepreneurship, innovation and international relations. He notably recently [*Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship*](#) (co-authored with Elias Carayannis, Springer, 2013).

Antonio Vezzani is a Research Fellow at the Joint Research Centre of the European Commission and member of its Scientific Committee. His initial research interests included the complementarity between different types of innovations, intangible assets and firms' performances. Moreover, he enlarged his research towards the analysis and the implications for national and regional innovation systems of: *i*) the technological profiles and internationalization strategies of multinational corporations; *ii*) the use of intellectual property rights to proxy knowledge dynamics; *iii*) the emergence of new technologies.

Publication opportunities:



1. A Special issue on Financing Innovation in a Turbulent World, *Innovations. Journal of Innovation Economics and Management*

- **Deadline for paper submission: July 15, 2018**

2. A special issue on Le financement de l'innovation dans un contexte d'incertitude grandissante, *Innovations. Revue d'Economie et de management de l'Innovation*

- **Deadline for paper submission: July 15, 2018**
- **Website of the journal *Innovations*: <http://innovations.cairn.info/en/>**
- **Website for paper submission: <http://www.editorialmanager.com/innovations/default.aspx>**

3. A Special issue on *Financing Novelty, European Journal of Innovation Management*

- **Deadline for paper submission: July 15, 2018**