



MONTHLY REVIEW OF ACADEMIC LITERATURE ON RESEARCH AND INNOVATION AS SOURCES OF GROWTH

Contact: DG RTD, Directorate A, A4, Diana Ognyanova, Tel. 69750, diana.ognyanova@ec.europa.eu

1. Innovation and firm growth: Does firm age play a role?

Coad A, Segarra A, Teruel M (2016). Innovation and firm growth: Does firm age play a role? *Research Policy* 45(2):387-400.

- The paper explores the relationship between innovation and firm growth for firms of different ages.
- Young firms engage in riskier R&D, although over time the returns to R&D become more predictable.
- Innovation by younger firms is more likely to be associated with employment growth.

This paper explores the relationship between innovation and firm growth for firms of different ages. The authors hypothesize that young firms undertake riskier innovation activities which may have greater performance benefits (if successful), or greater losses (if unsuccessful). Using an extensive Spanish Community Innovation Survey sample for the period 2004–2012, the authors apply panel quantile regressions to study the effect of R&D activities on firm growth (i.e. sales growth, productivity growth and employment growth). The results show that young firms face larger performance benefits from R&D at the upper quantiles of the growth rate distribution, but face larger decline at the lower quantiles. R&D investment by young firms therefore appears to be significantly riskier than R&D investment by more mature firms. With regards to policy implications, it seems that young firms have particular innovation challenges, and that they engage in riskier R&D, although over time the returns to R&D become more predictable. Furthermore, innovation by younger firms is more likely to be associated with employment growth. To deal with this, policy makers can make R&D support conditional on firm age - focused more strongly on young firms, with older firms being less eligible for this support.

2. Learning-by-failing. An empirical exercise on CIS data

Leoncini R (2016). Learning-by-failing. An empirical exercise on CIS data. *Research Policy* 45(2): 376-386.

- The paper explores the role of failure of innovation projects in spurring innovative activity.
- Failure of innovation projects negatively depends on R&D and direct external learning.
- Failure of innovation increases the probability of new to market innovative products.
- Still ongoing innovation (rather than abandoned) has a positive but smaller impact.

Failure to innovate has been only recently recognized as one of the key elements in determining successful firms' innovative performance. However, as the existing literature focuses only on the determinants of firms' failure, it neglects the role of failure in spurring innovative activity. In this paper, the relationship between innovative performance and failure to innovate is empirically tested, through a two step econometric model, on the 2008 CIS Innovation survey dataset. The main results of the paper are, first, that failure is negatively correlated to the firms' experience (proxied by R&D), and to the acquisition of direct external knowledge (through productive links in

product and process innovation). Indirect learning from the failures of similar firms is moderated by firms engagement in R&D and in searching for external knowledge. The second step reveals that failure in turn has a positive impact on performance in term of percentage of turnover from new to the market innovative products. Finally, an additional test is performed on still ongoing innovation (rather than abandoned), and the results show a minor impact on innovation activity.

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

Colombo M G, D'Adda D, Pirelli L H (2016). The participation of new technology-based firms in EU-funded R&D partnerships: The role of venture capital. *Research Policy* 45(2):361-375.

- The paper examines how the participation of new technology-based firms (NTBFs) in EU-funded R&D partnerships is affected by venture capital.
- VC backing has a positive impact on participation; the impact differs depending on the type of investor.
- Bank-affiliated and governmental VC exhibit the strongest positive effects.

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

4. Incentives and barriers for R&D-based SMEs to participate in European research programs: An empirical assessment for the Netherlands

Faber J, van Dijk J, van Rijnsoever F (2016). Incentives and barriers for R&D-based SMEs to participate in European research programs: An empirical assessment for the Netherlands. *Science and Public Policy*: 1-15.

- This study investigates the motives of R&D-based SMEs for (non)participation in European collaboration research programs.
- It finds that European collaborative research programs attract the participation of rather limited numbers of especially science-based SMEs having prior experience with international collaboration.
- The decision of the SMEs is based on the long-term incentive of knowledge production for future innovations via knowledge sharing and the short-term trade-off made between the expected benefits of cost sharing (including obtaining EU subsidies) and the costs of resources involved in that participation.
- The incentive of gaining access to complementary intangible resources and the barriers raised by the perceived cognitive, social, and cultural distances, and the complexity and duration of the application procedure were not found to play an important role in the decisions.

As participation by small and medium-sized enterprises (SMEs) in European collaboration research programs is less than has been striven for, this study investigates the motives of R&D-based SMEs for (non)participation in these programs. Based on the resource-based view, the authors formulate a set of hypotheses about incentives and barriers that influence the likelihood of participation by

SMEs. These hypotheses are empirically tested using a survey of 247 Dutch R&D-based SMEs. As the participation in European collaborative research programs is only one of the options that SMEs have to collaborate with other organizations on R&D via knowledge sharing in order to generate potential innovative concepts for the future, the decision of SMEs to do so is found to be strongly dependent on the tradeoff they make between the expected benefits of cost sharing and the expected short-term costs of participation. As a result, European collaborative research programs attract the participation of rather limited numbers of especially science-based SMEs based on minimizing their transaction costs for performing joint R&D via knowledge sharing instead of gaining a competitive advantage with the joint development of actual innovations and thereby contributing to the development of high-tech industries within the EU.

5. Venture capital investments and the technological performance of portfolio firms

Lahr H, Mina A (2016). Venture capital investments and the technological performance of portfolio firms. *Research Policy* 45(1):303-318.

- The study analyses the relationship between VC investment selection and the patenting performance of portfolio companies.
- The effect of VC on firm patenting is insignificant or negative.
- The effects of patents on the likelihood of investment are positive and significant.
- Venture capitalists follow patent signals to invest in companies with commercially viable know-how.
- They are more likely to rationalise, rather than increase, the patenting output of portfolio firms.

The study explores the relationship between venture capitalists' selection of investment targets and the effects of these investments on the patenting performance of portfolio companies? The authors set out a modelling and estimation framework designed to discover whether venture capital (VC) increases the patenting performance of firms or whether this effect is a consequence of prior investment selection based on firms' patent output. The study is based on simultaneous models predicting the likelihood that firms attract VC financing, the likelihood that they patent, and the number of patents applied for and granted. Accounting for the endogeneity of investment, the study finds that the effect of VC on patenting is insignificant or negative, in contrast to the results generated by simpler models with independent equations. The findings show that venture capitalists follow patent signals to invest in companies with commercially viable know-how and suggest that they are more likely to rationalise, rather than increase, the patenting output of portfolio firms.

6. Connecting demand and supply: The role of intermediation in public procurement of innovation

Edler J, Yeow J (2016). Connecting demand and supply: The role of intermediation in public procurement of innovation. *Research Policy* 45(2):414-426.

- This article conceptualises and analyses intermediation between supply and demand using the example of public procurement of innovation.
- Demand for innovation poses specific intermediation needs.
- Demand intermediation is conceptualised according to functions and roles.
- Public procurement can be supported through tailored intermediation.

Intermediation in innovation serves to establish or improve the link between different actors with complementary skill sets or interests in order to support the generation and diffusion of innovation. This article conceptualises and analyses intermediation between supply and demand using the example of public procurement of innovation. It defines specific intermediation needs and functions in different procurement situations and outlines the pre-condition for effective intermediation. As the paper looks at the demand for innovation it adopts a broad understanding of innovation, defined as a product, service or process that is novel to the buying organisation. The paper presents an in-depth analysis of two very different procurement processes in two cases in a

complex public sector setting, the English NHS, case of a public buying organisation triggering the generation of an innovation, and another in which an organisation sought to respond to an innovation offered in the marketplace. In both cases, the solution bought necessitated strong adaptation processes with considerable learning costs within the buying organisation. The paper shows how intelligent and tailored intermediation can tackle some of the well-known procedural and capability failures in the process of public procurement of innovation. In terms of policy implications, the article makes the claim for an increased effort to build up effective intermediation across procurement systems to support agencies in concrete procurement and, in doing so, to build up capacity for more intelligent public buying.

7. Retaining winners: Can policy boost high-growth entrepreneurship?

Autio E, Rannikko H (2016). Retaining winners: Can policy boost high-growth entrepreneurship? *Research Policy* 45(1):42-55.

- The study evaluates the growth impact delivered by a high-growth entrepreneurship policy initiative (NIY programme of Tekes).
- The initiative had more than doubled the growth rate of participating firms.
- One Euro of public funding to the initiative had generated 1.11 Euro of surplus sales growth (beyond trend growth) by 2013, expected to raise to 1.23 Euro by 2015.
- The authors contribute to public sponsorship theory with the notion of capacity-boosting activities to complement previously discussed buffering and bridging activities

The study analysed the growth impact delivered by a high-growth entrepreneurship policy initiative (NIY Programme of Tekes, the first Finnish entrepreneurship policy initiative that explicitly seeks to facilitate the growth of new, entrepreneurial firms) over a six-year period. Using an eight-year panel that started two years before the initiative was launched and propensity score matching to control selection bias, the authors found that the initiative had more than doubled the growth rates of treated firms. The initiative had delivered a strong impact also on value-for-money basis. In addition to producing robust evidence on the growth impact delivered by a high-growth entrepreneurship initiative, the authors contribute to public sponsorship theory with the notion of capacity-boosting activities to complement previously discussed buffering and bridging activities.

8. Knowledge, Proximity and R&D Exodus

Livanis G, Lamin A (2016). Knowledge, Proximity and R&D Exodus. *Research Policy* 45(1):8-26.

- This paper explores how the presence of other firms affects the technological leaders and laggards.
- The study finds that technological leaders are concerned more with other leaders rather than laggards.
- Technological laggards benefit more from neighboring leaders than laggards.
- Foreign firms have a particularly detrimental effect on technological leading firms, as these lose out in the contest for talent.

The paper explores not only how technological leaders and laggards react to agglomeration, but also within an agglomeration it looks at how the presence of other leaders, laggards and foreign firms affects these firms. Contextualized in an emerging market with weak intellectual property rights protection, the authors examine whether the concerns about knowledge spillovers and competition for talent prompt firms to close their R&D facilities or remain open. Using 5798 observations of R&D laboratories in India during 2003–2011, the authors find that while technologically leading firms are more likely to close their R&D facilities as the presence of other domestic labs increases, laggards are less likely to do so. These findings suggest that concerns over knowledge spillovers are present, especially on the part of technologically leading firms. Moreover, leaders are more concerned by the presence of other leaders rather than laggards. Technologically lagging firms, by contrast, are less likely to close R&D facilities in the face of these concerns and will prefer staying near leaders over laggards. Finally, the paper finds evidence of

foreign firms crowding out domestic technological leaders but not laggards in the competition for talent.

9. Bridging science and technology through academic–industry partnerships

Chai S, Shih W (2016). Bridging science and technology through academic–industry partnerships. *Research Policy* 45(1):148-158.

- The paper examines an agency that funds partnerships between universities and private firms.
- It assesses the effect of funding on firm innovative performance and behavior.
- Funding increases publications for SMEs and firms in larger projects.
- Funding increases granted patents for young firms and those in larger projects.
- Funding increases academic collaboration for SME, younger firms and firms in big projects.

Partnerships that foster the translation of scientific advances emerging from academic research organizations into commercialized products are a policy tool that has attracted increased interest. This paper examines empirical data from the Danish National Advanced Technology Foundation, an agency that funds partnerships between universities and private companies. The study assesses the effect on participating firms' innovative performance, comparing patent count, publication count and proportion of cross-institutional publications between funded and unfunded firms. Specifically, the authors measure the impact on each of these variables based on three dimensions – small and medium-sized enterprises (SME), younger firms, and size of the collaboration firms participated in – to establish boundary conditions. The results suggest that receiving funding affects firms' innovative behavior differently depending on the type of firm, where (1) peer-reviewed publications increased significantly more for SMEs and larger projects, (2) granted patents increased significantly up to 4 years after funding for young firms and those in larger projects, and (3) proportion of cross-institutional publications increased significantly more 3 years after funding for all

10. How smart is specialisation? An analysis of specialisation patterns in knowledge production

Heimeriks G, Balland P-A (2015). How smart is specialisation? An analysis of specialisation patterns in knowledge production. *Science and Public Policy* 42(5):1-13.

- The study explores how the specialisation patterns of cities differ across scientific fields
- Systematic differences exist across scientific fields, but remarkable similarities across cities within each field.
- Biotechnology shows a turbulent pattern with comparative advantages that are short lasting, and with few related topics. Astrophysics, and in later years Nanotechnology, show a pattern of stable rankings, comparative advantages that last longer, and many related topics potentially available for research locations. Organic Chemistry has an intermediate position.
- Fields of knowledge production have fundamentally different characteristics that require different smart specialisation strategies taking into account the differences in accumulation and relatedness.

This study explores how the specialisation patterns of cities differ among scientific fields, by looking at the patterns of knowledge production in Astrophysics, Biotechnology, Nanotechnology and Organic Chemistry in the period 1996–2012. The question underlying this study was whether the rise and fall of research locations can be attributed to their specialisation pattern of scientific knowledge production. The authors account for these specialisation patterns by assuming that each topic of research requires local capabilities (e.g. skills, infrastructures and supporting institutions), and that a research location can only contribute to topics for which it has all the requisite capabilities. The specialisation patterns of cities offer opportunities for further improvements in related topics, and discourage the creation of knowledge on topics unrelated to the local knowledge base. Two patterns of specialisation are identified. The first represents a turbulent pattern:

concentration of research activities is low, knowledge-producing organisations are small in terms of output, stability in the ranking is low and comparative advantages are short lasting. Relatedness among topics is low, and as a consequence locations that specialise in certain topics face high levels of uncertainty in exploring new topics. The second pattern is stable: concentration of research activities is higher than in the first group, research locations are larger, stability in the ranking is greater, and comparative advantages last longer. Relatedness among topics is high, and locations that specialise in certain topics can easily branch into related topics of research. As such, task uncertainty is low. The study finds systematic differences across scientific fields, but remarkable similarities across cities within each field. Biotechnology shows a turbulent pattern with comparative advantages that are short lasting, and with few related topics that are available for research locations. Astrophysics, and in later years Nanotechnology, show a pattern of stable rankings, comparative advantages that last longer, and many related topics potentially available for research locations. Organic Chemistry has an intermediate position. Thus, fields of knowledge production have fundamentally different characteristics that require different smart specialisation strategies taking into account the differences in accumulation and relatedness.

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