



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

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1. Small firm internationalization, innovation, and growth

Boerman M A, Roelfsma H (2015). Small firm internationalization, innovation, and growth. *International Economics and Economic Policy*. 13:283-296.

- This paper studies the effects of national export promotion programs (EPP) on innovation and growth. The results of this applied econometric research suggest a stimulating effect of EPPs on internationalisation, innovation and firm growth.
- Using a structural model with instrumental variables, the authors show that internationalisation has a positive impact on innovation for small firms with less than 20 employees.

The literature indicates that innovative SMEs are more likely to be internationally active immediately after birth. These so-called 'born globals' rely on previous entrepreneurial experience, networks and other knowledge-intensive resources. This paper assesses whether it is worthwhile for policy makers to encourage internationalisation of SMEs to boost innovation and firm growth. After simultaneously evaluating the impact of internationalisation and innovation, it is found that internationalisation has a direct effect on the growth of firms and indirectly boosts the performance of the enterprise through enhanced innovation activity. Hence, internationalisation has a positive causal relationship with SME performance. The performance indicators used are change in employment and in sales. The estimation technique also allows to differentiate between the importance of performance indicators. Relative to employment growth, internationalisation has a much larger effect on sales growth, suggesting that an increase in internationalisation boosts firm growth rates. This finding suggests that innovation activity does not occur in isolation.

2. To be born is not enough: the key role of innovative start-ups

Colombelli A, Krafft J, Vivarelli M (2016). To be born is not enough: the key role of innovative start-ups. *Small Business Economics*. 47:277-291.

- This study provides evidence for higher survival rates of start-ups which are simultaneously product and process innovators. Sole risky product innovations are shown to lower chances of survival for young companies.
- Innovative start-ups, as opposed to simply start-ups, contribute to technological upgrading, productivity growth and job creation.
- Combining two data sources from the French Statistical Office, the empirical analysis is based on a sample of 1090 young companies between the years 2000 and 2007.

In the past, policy makers focused on increasing the number of new born companies in order to increase economic growth and job creation. The Schumpeterian rationale of new entrants displacing obsolete and less efficient firms during the process known as "creative destruction" has however been refined during the last decades. The empirical evidence shows very low chances of

survival of newborn firms. This suggests that making a success of a start-up enterprise is a complex task. To shed light on what are the success factors, the authors test for differences in survival rates which can be attributed to innovation activity. By comparing the group of innovators, including both product and process innovators, with non-innovators, the results show that to be born is not enough. And to solely be a product innovator is not either. The multivariate analysis reveals that the high risk attached to product innovations absorbs the innovation premium and that cost-reducing process innovation on the other hand increases the likelihood of survival – with or without product innovation. The paper concludes with a summary of key environmental or contextual factors favouring firm survival. These are knowledge spill-overs from universities, administrative support in case of university spin-offs, personal and social characteristics and the access to venture capital.

3. Regulation, institutions, and productivity: new macroeconomic evidence from OECD countries

Égert B (2016). Regulation, institutions, and productivity: new macroeconomic evidence from OECD countries. *American Economic Review: Papers & Proceedings*, 106(5):109-113.

- The paper investigates the impact of product and labour market regulation on multifactor productivity (MFP), accounting for the role of the institutional framework and R&D spending.
- Product market regulation is found to hinder productivity, while a positive effect holds for employment regulation, measured both as active policies and Employment Protection Legislation (EPL).
- Business R&D is found to positively affect MFP, while public spending on R&D has zero or negative impact.
- However, investment in public basic research is positively related to MFP and the relationship is stronger than that with business R&D.
- Interactions between different policies, regulations and institutional settings do exist.

This study investigates the impact of product and labour market regulation on productivity (MFP) for a sample of 34 OECD countries spanning a 30 years period. Interactions between different policies, including public and private R&D spending, and institutions are assessed. Results for product market regulation are consistent with previous empirical evidence, indicating a negative relationship with MFP. However, findings for labour market legislation suggest that employment regulation does not hinder productivity. Rather a positive effect is found for both active labour market policies and EPL. Interactions between different policies exist. For instance the relationship between MFP and EPL turns negative when the level of product market regulation is low, while it becomes positive when the product market regulation is high. Despite being a partially puzzling result, this suggests that joint reforms and policies should be considered. Also EPL is likely to preserve high-skill jobs which are fundamental for productivity growth. Finally business R&D is positively related to MFP, while a negative or non significant effect is found for total government R&D expenditure. However, when considering only public investment in basic research a positive impact on productivity is found, larger than for business R&D. Overall, a high quality institutional setting and a more business friendly environment amplify the positive impact of R&D spending on MFP.

4. Barriers to innovation and firm productivity

Coad A, Pellegrino G, Savona M (2016). Barriers to innovation and firm productivity. *Economics of innovation and New Technology*, 25(3):321-334.

- This paper assesses the relationship between barriers to innovation and labour productivity for a sample of UK firms.
- The role of specific barriers to innovation is investigated, namely: access to finance, knowledge base, market structure, information asymmetries, lack of demand and innovation-specific regulation.

- Results suggest that a lack of qualified personnel and both cost and availability of finance are negatively correlated with firm productivity across the whole distribution of firm productivity.
- Information asymmetries and regulation barriers have no significant role, the latter being slightly negatively relevant only for firms in the top 10% of the distribution of labour productivity.
- The larger the size of the firm, the less constraining are the innovation barriers considered.

The study is situated in the literature on the determinants of firm labour productivity by considering the role of innovation-related barriers in hindering economic performance. Rather than estimating the average contribution of such barriers, the paper investigates how the relationship varies with the level of labour productivity. Theoretically, access to finance constraints may be more stringent for low-productivity firms, while lack of adequate human capital or market demand are likely to be relevant for the best performing companies. By adopting a quantile regression and a propensity-score matching approach, the authors run a set of estimates for a UK sample of 28.500 firm-year observations, using qualitative survey data to identify the barriers to innovation. Findings reveal that while some barriers - namely lack of qualified personnel, cost and availability of finance - matter for every firm, innovation-related regulation is slightly negatively correlated with labour productivity for high-productivity companies.

5. Do KIBS make manufacturing more innovative? An empirical investigation of four European countries

Ciriaci D, Montresor S, Palma D (2015). Do KIBS make manufacturing more innovative? An empirical investigation of four European countries. *Technological Forecasting & Social Change*, 95: 135-151.

- The study analyses the impact of vertical integration of Knowledge Intensive Business Services (KIBS) on innovation in manufacturing.
- The integration of KIBS into manufacturing production may enhance tacit and codified transfer of knowledge, improve innovation performance in addition to productivity growth.
- Results suggest that the flow of knowledge through integration of KIBS improves innovation performance of manufacturing sectors in four of the main EU countries (Germany, Italy, United Kingdom, France).

KIBS exert a fundamental role in enhancing productivity and innovation performance of "client" sectors, most notably manufacturing. This is especially true for activities which are subject to intermediate outsourcing. Innovation-friendly knowledge transfers take place through both tacit and codified flows of knowledge during the production process. Both might be embodied and disembodied in the products (such as software). The paper estimates the innovation impact of vertical integration of KIBS in 18 manufacturing sectors for Germany, Italy, United Kingdom and France for a period spanning from 1995 to 2005. It should be noted that these countries experienced different trends. Germany and Italy increased vertical integration along all KIBS activities (R&D, computer and related, other business activities), while France and the UK are going in the opposite direction. Using patent applications and quality as innovation measure, the authors find that KIBS contribute to innovative output in a positive and significant manner. When the quality of patents is considered, R&D related KIBS are the only significant service which positively affects innovation. The evidence provides support for R&D policies targeting cooperation and technology transfers between manufacturing and knowledge intensive business services.

6. Innovation Strategies and Firm Growth

Bianchini S, Pellegrino G, Tamagni F (2016). *Innovation Strategies and Firm Growth*. LEM Working Papers, Scuola Superiore Sant'Anna, Pisa, Italy.

- This research paper investigates the relationship between different forms of innovation and sales growth of firms.
- Given the complex nature of innovation, different indicators are tested, including inputs (internal and external R&D) and outputs (process and product innovation).

- Internal R&D is positively associated with sales growth, while no effect is found for external knowledge as well as for output innovation.
- If high growth firms are considered, all innovation activities, excluding process innovation, display a positive effect on sales growth.

The study investigates the impact of innovation activities on firm performance measured as sales growth. As opposed to many empirical studies, this analysis acknowledges the complex nature behind innovation activities. Rather than considering only R&D expenditure, different indicators are used, accounting both for inputs - internal and external R&D, embodied and disembodied technology - and outputs - process and product innovation. The authors exploit a rich panel database of Spanish companies, covering 5,064 firms over the period 2004-2011, for a total of 26,300 firm-year observations. Results show that internal R&D is on average the most important innovation factor for sales growth, while no significant relationship emerges for the other variables. However, quantile regressions allow to go beyond the average impact and to assess the impact of innovative activities along the distribution of sales growth. The evidence reveals that all innovation factors, excluding process innovation, matter for sales growth. This result suggests that complementarities between different innovation activities are in place - as confirmed by robustness checks. Overall, by acknowledging the multidimensionality of innovation, the paper reconciles the empirical and theoretical literature. The latter predicts a strong link between innovation activity and firm growth, a finding which is rarely supported by empirical evidence.

7. Additionality or crowding-out? An overall evaluation of public R&D subsidy on private R&D expenditure

Marino M, Lhuillery S, Parrotta P, Sala D (2016). Additionality or crowding-out? An overall evaluation of public R&D subsidy on private R&D expenditure. *Research policy* 45 (9):1715-1730.

- The impact of R&D subsidies at firm level is evaluated by distinguishing between firms who are already recipients of tax credits and those which are not.
- Using a propensity score matching approach, the analysis assesses whether additionality or crowding out takes place, accounting also for the size of public support.
- Results reveal evidence of lacking additionality and substitution between private and public funds.
- Crowding out is found mainly for firms receiving medium to high levels of public subsidies, whilst also benefitting from an R&D tax credit regime. Additionality is only found for very low and very high levels (>€10M) of public support

The rationale for public support for private R&D expenditure relies on the theoretical argument of market failures associated with investment in innovative and technological activities. Public funding should compensate for low levels of private investment, which give rise to positive externalities, bringing R&D expenditure back to an optimal social level. This study investigates the impact of public subsidies on a sample of French firms from 1993 to 2009. It assesses whether additionality or crowding out effects prevail. In addition, as France is one of the countries with a generous tax credit scheme, the analysis allows for an evaluation of the impact of R&D subsidies which distinguishes between firms who already benefited from a tax credit scheme¹ and those who did not. Using a propensity score matching procedure, the authors find evidence of crowding out. Firms substitute their own resources for public support. Such an outcome becomes more pronounced as the size of public subsidies increases and for firms which are already under the tax credit scheme, with the exception of very low and very high (>10M) levels of support. This suggests that there is room for re-designing the public R&D subsidy policy, focusing on small- and medium-size firms and on top beneficiary recipient firms. The evidence also suggests that the tax credit regime (before the 2008 reform) tends to lower the effectiveness of public R&D funding.

¹ France introduced a relevant change in the tax credit legislation in 2008, moving from an incremental to a volume tax credit scheme. However the paper uses data from 1993 to 2009.

8. The academic firm: a new design and redesign proposition for entrepreneurship in innovation-driven knowledge economy

Campbell D F, Carayannis E (2016). The academic firm: a new design and redesign proposition for entrepreneurship in innovation-driven knowledge economy. *Journal of Innovation and Entrepreneurship* 5:12.

- This paper proposes a new design for entrepreneurship in an innovation-driven knowledge economy. Whereas the commercial firm maximises profit, the academic firm maximises knowledge and innovation.
- The academic firm is characterised by creative development and complementarity of competences, network-style formation of linkages across organisations and cross-employment.
- Academic firms can follow the logic of linear innovation as well as non-linear innovation.

In the linear innovation model, basic research at higher education institutions progressively diffuses to society and firms and generates economic activity translating basic research into applications and economic activity as well as commercial use. The concept of non-linear innovation on the other hand is more horizontal in terms of knowledge production and application; this approach favors mutual interactions of universities and firms which benefits all involved parties working on equal and fair grounds. This might imply firms engaging simultaneously in different technological life cycles at various stages of technological maturity and cross-employment of employees with academic institutions. Cross-employment serves to organise, optimise and excel research and innovation in the academic firm and allows for 'parallel careers' in different organisations and sectors with various rationales and innovation cultures. Knowledge workers develop tacit knowledge, gain practical experiences and develop complementary and new competences. Cross-employment also fosters the creation of networks between organisations. The concept itself is hybrid and can involve the entire firm or only a particular organisational unit, process or principle and can overlap with commercial, profit-driven firms.

9. The role of universities in the location of innovative start-ups

Calcagnini G, Favaretto I, Giombini G, Perugini F, Rombaldoni R (2016). The role of universities in the location of innovative start-ups. *Journal of Technological Transfer*. 41:670-693.

- This paper investigates whether Italian innovative start-ups take into account knowledge and technology spillovers when making their locational choice.
- By means of a spatial estimation model it is found that university spillovers, particularly those associated with human capital, are positively correlated with the creation of innovative start-ups.
- The evidence supports policies in favour of regional productive systems as well as universities to enhance knowledge and technology transfer.

After the recent introduction of a new legal framework, the Italian Start-Up Regulation, incentives to raise start-up activity were put in place. This paper investigates whether innovative start-ups are attracted to productive universities in order to take advantage of knowledge spillovers. Tacit knowledge, or human capital, is approximated by the number of graduates. The paper also investigates whether graduates from different academic fields, such as the natural sciences, the social sciences and the humanities, are favoured in this geographical selection process. Further it is studied whether so-called third-mission activities of academic institutions are important determinants for the locational choice of an innovative start-up. These activities initiated by universities and encouraged via policy initiatives may encompass patents, collaboration agreements and spin-offs so as to translate academic results to the market. Control variables include environmental characteristics, social capital and local and financial market conditions. Whilst the results by field and for third missions are either inconclusive or do not exhibit statistical significance, except for the social sciences, human capital is shown to influence the location decision of start-ups. The more graduates, the nearer firms locate.