



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

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1. Innovation and Growth: The Schumpeterian Perspective

Aghion P, Akcigit U (2015). *Innovation and Growth: The Schumpeterian Perspective*. Draft Survey for discussion – COEURE Coordination Action.

- The paper suggests some directions for a new growth package for EU Member States and in particular countries in the Euro area:
 1. Structural reforms starting with the liberalization of product and labour markets: an important role can be played by structural funds provided the targeting and governance of these funds is suitably modified
 2. Industrial investments (vertical targeting)
 3. More flexible macroeconomic policies at EU level (budgetary and monetary)

In their paper Aghion and Akcigit (2015) explain how theoretical models of growth and innovation can deliver testable predictions and also policy recommendations. The emphasis is on the Schumpeterian approach where each innovation induces positive knowledge spillovers on subsequent research but also destroys rents from previous innovations. The paper suggests some directions for a new growth package for EU and in particular countries in the Euro area:

1) Structural reforms and the role of structural funds

Aghion and Akcigit (2015) argue that structural reforms, in particular product and labour market liberalization and higher education reform, can play a crucial role in fostering long run growth in Europe. They assess the potential increase in growth potential from having all Eurozone countries converge fully or partly to the best standards with regard to product or labour market liberalization, and also with regard to higher education. The authors look at the effect of structural policies using cross-country panel regressions across 21 European countries. Short- and long-run growth effects of converging towards the performance levels of target countries were examined. The target groups include those countries which are found to be the best performers in terms of education, product and labour market regulations: UK, Ireland and Denmark (European target group), USA and Canada (non-european target group). Interestingly, the paper found the same target groups both for the higher education and the labour and product market regulation. The authors found that converging towards the best practice in terms of product and labour market liberalization generates a growth gain of between 0.3 and 0.4 already in the short run. Converging towards the best practice in terms of higher education enrollment generates a growth gain which is initially smaller (if UK, Ireland and Denmark are the reference countries), but grows up to 0.6 by 2050. Altogether, a full percentage point in growth can be gained through structural convergence towards those three countries.

Next, the authors argue that Structural funds should be partly reoriented towards facilitating the implementation of structural reforms. The authors argue in favour of a different approach with regard to the goals, targeting and governance of Structural Funds. The goals of the Structural Funds should become transformative, i.e. they should help achieve structural reforms in labour markets, product markets and education. The allocation of funds should generally be made on an

individual basis: i.e. they should mainly target schools, employment agencies, individual workers, not so much countries. The funds should help finance transition costs. The allocation of funds should be to well-specified deliverables (provision of better tutorship in education, improvements in the organization of employment agencies, transition to portable pensions rights across two or more countries, setting up of diploma equivalence for service jobs etc.) and should be also conditional upon the country or region not having put in place a general policy that contradicts the purpose of the fund allocation. Regarding the governance of Structural Funds, the allocation of funds should be made by European agencies on the model of the European Research Council: bottom up approach with peer evaluation ex ante and ex post.

2) Industrial policy in the EU

The authors of the paper argue that growth in the EU also requires adequate vertical targeting, both by EU Member States and at EU level. While horizontal targeting should be given priority: i.e. basic and applied research, higher education, labour mobility, also well governed vertical targeting by member states and at EU level can help further foster growth within the EU. At EU level, infrastructure investments in transportation, energy, and broadband network can greatly contribute to increasing product market competition in local markets. Proper vertical targeting at EU level can help enhance horizontal policies in member states. Another justification for privileging vertical targeting at EU level, the authors find, is that targeting at EU level is more likely to preserve product market competition when the targeted activities involve important fixed costs. The authors argue that subsidizing activities with high fixed costs at local level (i.e. at the level of one particular country) often boils down to subsidizing one particular firm, which in turn defeats the purpose of reconciling industrial policy with the need to enhance product market competition. This consideration becomes less binding when vertical targeting is done at EU level, since at EU level it is easier to find more than one potential recipient of vertical subsidies, including for activities involving high fixed costs.

According to the authors, EU policy with regard to vertical targeting should go beyond EU level investments: it also concerns the attitude of the European Commission with regard to sectoral policies by EU Member States. According to the authors, these are currently perceived by European authorities as a threat to European integration which in turn explains the fussy checks by European competition authorities of all devices supporting industrial activities. The authors quote a work on state aid in Europe, Japan and the United States by Pierre-André Buigues and Khalid Sekkat which identifies false arguments against industrial policy and finds a general tendency in Europe towards lowering state aid (Germany being an exception, although mainly since the past ten years with the integration of the Eastern states). This, the authors argue, suggests that the Commission has been remarkably effective in limiting the scope of state aid. Aghion and Akcigit (2015) recommend the Commission to become less a priori biased against the use of state aid while at the same time setting new and clear guidelines for the allocation and governance of that aid.

3) More flexible macroeconomic policies at EU level

The authors argued that more countercyclical macroeconomic policies can help (credit-constrained) firms maintain R&D and other types of innovation-enhancing investments over the business cycle. One implication of this for European growth policy design, is that all the debt and deficit targets, both in the short and in the long term, should be corrected for cyclical variations, i.e. they should always be stated in structural terms.

2. Intellectual property box regimes: effective tax rates and tax policy considerations

Evers L, Miller H, Spengel C (2015). Intellectual property box regimes: effective tax rates and tax policy considerations. *Int Tax Public Finance* 22:502-530.

- In 2014, 12 European countries were operating Intellectual Property (IP) Box regimes that provide substantially reduced rates of corporate tax for income derived from IP
- The treatment of expenses relating to IP income is particularly important in determining the effective tax burden.
- Regimes that allow expenses to be deducted at the ordinary corporate income tax rate, as opposed to the lower IP Box tax rate, may result in negative effective average tax rates and can thereby provide a subsidy to unprofitable projects.

- While some regimes attempt to link the tax benefit to real activities, others have designed a policy targeted at the income streams associated with IP.
- A key concern is the role that IP Boxes may play in increased tax competition between European countries.

This paper demonstrates that IP Box regimes can result in large reductions in effective average tax rates. This effect stems not only from the low IP Box rates but also from the treatment of related expenses. Policies that do not require the recapture of previous R&D expenses are particularly generous. Such regimes result in a reduction in the tax liability of a marginal project. They may even be associated with negative effective average tax rates. The authors argue that there is not a clear justification for this effective subsidy, which may arise as an accident of the policy design rather than from an active design decision. IP Boxes work to incentivise investment in innovative activities and make countries more attractive locations for the financial returns to intellectual property. The designs of the policies vary in many ways and are likely to be important for the precise effects of the policy. Overall, the study finds that the likely effect on real activities is uncertain because firms have substantial scope to separate income from underlying activities. In contrast to the increasing popularity of IP Box regimes, in November 2010, Ireland removed an exemption for royalty income that had been in place since 1973, due to the finding of a government commission that “the relief has not had the desired impact on innovation and R&D activity and that (...) it was not a particularly well-targeted measure providing good value for money.”

The sequential nature of IP Boxes in Europe suggests that governments are taking steps to preserve their relative attractiveness for internationally mobile activities. As more countries adopt IP Boxes, the benefits to any one country are likely to be reduced and the costs to those countries not operating such regimes increased. The paper finds that there may be value in European countries coordinating to prevent preferential rates. The European Commission has challenged the specific design of the UK regime based on their assessment that it meets two of the criteria used to identify a harmful tax practice as set out in the code of conduct for business taxation. The paper suggests that other countries’ policies may also be challenged on the grounds of not requiring domestic real economic activity.

3. Strategic Public/Private Partnership in Science, Technology and Innovation

Cervantes M, Watanabet T (2014). *Strategic Public/Private Partnership in Science, Technology and Innovation*. OECD.

- The report examines the role of strategic P/PPs as an instrument of STI policy and identifies the critical factors for their success
- P/PPs in STI are increasingly used to promote STI and are becoming more “strategic”; beyond the goal of linking science to industry
- The drivers behind the rise of strategic P/PPs include the need for business to reduce risk and uncertainty in cutting edge technologies and for governments to achieve more from research investments at times of budgetary constraints.
- The following key issues were found crucial for the success of strategic P/PPs:
 1. Co-ordination across different ministries and individual STI policy instruments can:
 - shape interdepartmental innovation governance; and
 - help align P/PP goals and instruments based on priorities.
 2. Inclusive governance of partnerships
 - New modes of governance that share the leadership and oversight between representatives from industry, public research and government can help maintain commitment from stakeholders.
 3. Adaptability of partnerships should be ensured to reflect changes in framework conditions, policy landscape or policy priorities and:
 - set the phase of commitment
 - help mitigate the bureaucracy in management
 4. Financial sustainability is important for the success of P/PPs. It is important financing can
 - incentivise participants to achieve the goals;

- develop clearer measures of outcomes to justify investment;
- stimulate adaptive efficiency which targets the enhancement of technological superiority and the sustainable economic growth, rather than allocative efficiency of existing resources.
- 5. Evaluation of P/PPs in STI is difficult but important. Some tools that can improve relevance and impact include:
 - Regular monitoring;
 - Ensuring evaluation techniques match policy objectives;
 - Using multiple methods to increase the reliability of evaluation;
 - Longer-time horizons;
 - Assessing the social, technological and economic impacts, including human capital.

P/PPs in STI are increasingly used to promote science, technology and innovation. Public-private partnerships (P/PPs) in STI have become a particularly important tool in the policy mix of ministries and innovation agencies in OECD and non-member economies such as China, Russia and Malaysia. Broadly defined as collaborative research and innovation efforts that are carried out jointly, co-financed by public and private partners, and which may or may not be institutionalised in a designated entity, public-private partnerships in STI are distinct from contract research and development or public procurement of innovation. Relative to tax credits or subsidies, P/PPs are perceived as a flexible and adaptive instrument to foster collaboration in science, technology and innovation. P/PPs in STI are becoming more "strategic" (beyond the goal of linking science to industry) e.g. the function of the partnership is strategic, such as maintaining or achieving leadership at the technological frontier (e.g. the United States' National Additive Manufacturing Innovation Institute). For other countries, the "strategic" function of the P/PP is to address the lack of core technological competences and long-standing problems involving the use and application of general purpose technologies for innovation (e.g. biotechnologies in health and ICTs in industry and services). In some countries, maintaining a comparative advantage in certain areas of innovation (e.g. Israel's track record in generating high tech start-ups) is considered strategic from a functional perspective.

There are several drivers behind the rise of strategic P/PPs in STI that go beyond the desire to link public and private research, or to orient public research closer to application fields, or to address deficiencies in financial markets that prevent firms from capitalising on public research. From the public side, the most important driver is the shift in STI policies towards addressing social, environmental and economic challenges. Many of the grand challenges exist in areas that lie in the public sphere or at the intersection of the public-private sectors. Examples include the delivery of healthcare; social services for ageing populations; sustainable transport, environmental pollution, etc. In this context, strategic P/PP in STI offers a way to harness the creative capabilities of the private sector to achieve productivity gains and service improvements. For business, the strategic P/PPs grant firms access to the tacit knowledge as well as research infrastructures in public research, helping to reduce technological and financial risks upstream (e.g. in the development of new materials for example).

4. The role of home country demand in the internationalization of new ventures

Murmann J P, Ozdemir S Z, Sardana D (2015). The role of home country demand in the internationalization of new ventures. *Research Policy* 44(6):1207-1225.

- Young firms in small economies must compensate for small local demand through internationalization.
- The paper provides comparative data on partnership patterns of firms in small and large economies.
- It shows that small economy firms are at least 3 times more likely to form international partnerships than large economy ones.
- It explains that this difference is primarily due to differences in the size of local demand.

International new ventures (INVs) have been documented to exist all around the world, but the literature is silent on the frequency of such companies in different countries. The paper contends

that the propensity of new ventures to internationalize by forming international partnerships is higher in small-domestic demand countries because they have a greater motivation given their limited local demand. After discussing the methodological challenges in testing this hypothesis, the paper does such a test by studying alliances in the health segment of the biotech industry in relatively small-domestic demand countries (Australia, Israel, and Taiwan) and by comparing the results with five large-domestic demand countries (UK, Germany, France, US, and Japan). It finds that young firms in the countries with smaller domestic demand are at least 3 times more likely to enter into international partnerships than their counterparts in countries with larger domestic demand. The paper further demonstrates that this difference can primarily be explained by the difference in the size of domestic healthcare markets rather than other underlying opportunity structure related factors.

5. How do firms develop capabilities for scientific disclosure?

Simeth M, Lhuillery S (2015). How do firms develop capabilities for scientific disclosure?. *Research Policy* 44 (7):1283-1295.

- The study investigates how firms achieve capabilities for scientific disclosure.
- R&D teams with higher proportions of PhD-trained, young, and foreign-trained researchers achieve more scientific publications.
- Basic research has only a moderate impact on scientific disclosure capabilities.
- Patent-based appropriation is partially based on different resources than scientific publication activities.

Many profit-oriented companies publish research outcomes in scientific literature. However, very few studies have focused on the capabilities that enable firms to engage in scientific disclosure with consequent potential benefits for the firm. The paper suggests that specific investments are required in order to engage in scientific disclosure activities, since the disclosure process requires distinctive capabilities. The paper empirically analyses the relationship between the composition of industrial research labs' personnel, basic research and scientific disclosure capabilities. The econometric analysis provides evidence that scientific disclosure requires specific human resource allocations, which supports the view that scientific disclosure is not just a by-product of standard R&D activities.

6. Knowledge stocks, knowledge flows and innovation: Evidence from matched patents and innovation panel data Original

Roper S, Hewitt-Dundas N (2015). Knowledge stocks, knowledge flows and innovation: Evidence from matched patents and innovation panel data. *Research Policy* 44(7):1327-1340

- The study is based on an econometric analysis of a matched dataset comprising innovation panel data and plants' patent histories.
- Existing knowledge stocks – measured by patents – have weak negative rather than positive impacts on firms' innovation outputs, reflecting potential core-rigidities or negative path dependencies.
- Knowledge flows derived from R&D investment and external search dominate the effect of existing knowledge stocks on innovation performance.
- Results emphasize the importance of firms' current knowledge search strategies for innovation.
- Results re-emphasize the potential issues which arise when using patents as a measure of innovation.

Successful innovation depends on knowledge – technological, strategic and market related. This paper explores the role and interaction of firms' existing knowledge stocks and current knowledge flows in shaping innovation success. The paper contributes to the understanding of the determinants of firms' innovation outputs and provides new information on the relationship between knowledge stocks, as measured by patents, and innovation output indicators. The analysis is based on innovation panel data relating to plants' internal knowledge creation, external knowledge search and innovation outputs. Firm-level patent data is matched with this plant-level innovation panel data to provide a measure of firms' knowledge stock. Two substantive conclusions follow. First, existing knowledge stocks have weak negative rather than positive impacts on firms' innovation outputs, reflecting potential core-rigidities or negative path dependencies rather than the accumulation of competitive advantages. Second, knowledge flows derived from internal investment and external search dominate the effect of existing knowledge stocks on innovation performance. Both results emphasize the importance of firms' knowledge search strategies. The results also re-emphasize the potential issues which arise when using patents as a measure of innovation.

7. Determinants of university–firm R&D collaboration and its impact on innovation: A perspective from a low-tech industry

Maietta O W (2015). Determinants of university–firm R&D collaboration and its impact on innovation: A perspective from a low-tech industry. *Research Policy* 44(7): 1341-1359

- The paper examines how local university activities affect firm innovation inputs and outputs.
- Geographical proximity from a firm to a local university only affects product innovation.
- Degree programmes in areas of expertise useful for local firms favour their R&D collaborations.
- Local university's ISI-Scopus journal production negatively impacts firm product innovation.

The main aim of the paper is to examine the drivers of university–firm R&D collaboration while at the same time assessing the determinants of innovation in a low-tech industry. This includes analysing firm R&D collaborations with partners different from universities. The paper relies on a unique data-set where firm data were sourced from the Capitalia survey, covering the 1995–2006 years, and the university data were gathered from a number of sources. Result from a multivariate probit model reiterate that university–firm R&D collaboration affects process innovation. Evidence of a more novel kind suggests that product innovation is positively affected by geographical proximity to a university but is negatively affected by the amount of its codified knowledge production. Degree programmes in fields useful for local firms favour R&D collaborations. Academic policies that aim to commercialise research output negatively impact both product and process innovations of local firms.

8. Composition of inventor teams and technological progress – The role of collaboration between academia and industry

Dornbusch F, Neuhäusler P (2015). Composition of inventor teams and technological progress – The role of collaboration between academia and industry. *Research Policy* 44(7): 1360-1375

- The paper measures influence of person-to-person (direct) academic involvement on innovation performance in teams.
- Applies a unique dataset of German academic and control groups of corporate patents (SME/MNE).
- Finds that science (compared to corporate inventions) provides substantial contributions to technological progress.
- Finds that direct links to academic inventors raise innovative performance of corporate teams.

It is generally claimed that universities provide the scientific basis for future technological progress. Still, empirical evidence of the impact of direct links between universities and firms remains weak and is often inconsistent. This paper aims at contributing to the literature by analyzing how direct academic involvement affects the output of inventive activities of research teams with different organizational backgrounds. By applying a unique dataset of German academic and corporate patents, the paper finds that boundary-spanning knowledge production with academic inventors raises the innovative performance of SMEs and MNEs. Finally, in line with previous research, the results generally indicate a limiting effect of geographical proximity, while teams with academic involvement appear to be less affected.

9. The double-edged sword of industry collaboration: Evidence from engineering academics in the UK

Banal-Estañol A, Jofre-Bonet M, Lawson C (2015). The double-edged sword of industry collaboration: Evidence from engineering academics in the UK. *Research Policy* 44(6):1160-1175.

- The paper uses a 20-year panel dataset of all engineering academics at 40 UK universities.
- It builds a measure of collaboration based on the fraction of public research grants that include industry partners.
- The relationship between collaboration degree and publication rates is curvilinear.

This paper studies the impact of university-industry collaboration on academic research output. It analyzes the channels through which the degree of industry collaboration may be affecting research output. The authors exploit a longitudinal dataset on all the researchers in all the engineering departments of 40 major universities in the UK for the last 20 years. They use a measure of collaboration based on the fraction of public research grants that include industry partners. The empirical findings of the paper corroborate that the relationship between collaboration degree and publication rates is curvilinear, and shed some light on the selection mechanisms at work. The results are robust to several econometric methods, measures of research output, and subsamples of academics.

10. Toward an assessment of impacts from US technology and innovation policies

Bozema B, Link A N (2015). Toward an assessment of impacts from US technology and innovation policies. *Science and Public Policy* 42 (3): 369-376

- The policies that shaped the post productivity slowdown legislative response in the US had a measurable impact on the relative level of industrial investments in R&D,
- The relative levels of industrial investments in R&D from 1980 onwards were significantly higher than before, *ceteris paribus*.
- However, that impact has waned.

Five important policy initiatives were promulgated in response to the slowdown in US productivity in the early 1970s, and then again in the late 1970s and early 1980s. These initiatives included the Bayh–Dole Act of 1980, the Stevenson–Wydler Act of 1980, the Research and Experimentation Tax Credit Act of 1981, the Small Business Innovation and Development Act of 1982, and the National Cooperative Research Act of 1984. Scholars and policy-makers have long debated the direction and magnitude of impacts from these policies but empirical evidence remains modest, especially evidence of their aggregate effects. In this paper the assessment of these policies is based on quantifying their collective impact on industrial investments in R&D in the post-productivity

slowdown period. The findings support the conclusion that the relative levels of industrial investments in R&D from 1980 onwards were significantly higher than before, *ceteris paribus*.

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