

Institution: Birkbeck, University of London
Unit of Assessment: 19 Business and Management
Title of case study: Improving government advice and guidance to firms on product and process innovation
<p>1. Summary of the impact</p> <p>Governments and international agencies have traditionally understood innovation to comprise the production and marketing of new products or processes that lead to economic growth and which emerge from corporate research and development (R&D) expenditure. The research underpinning this case has shown that innovation is a more complex process than was previously understood and takes different forms in different sectors. It has led the British Government and the OECD to measure, and to collect data on, innovation in new and more sophisticated ways; and to offer new guidance to firms on the factors that drive innovation and the most appropriate forms of innovation in different sectors.</p>
<p>2. Underpinning research</p> <p>The research underpinning the case study includes doctoral research carried out by Frenz between 2001-2006 at Birkbeck. The PhD and subsequent publications involve analyses of the European Community Innovation Survey (CIS). (3.1- 3.4). The research has taken a new approach to the analysis of innovation. Innovation policy is traditionally rooted in a linear, sequential view of the innovation process: research and development expenditures lead to new products or production processes and cause better economic outcomes. As a result of this approach the UK Government measures innovation by single indicators, such as research and development expenditures or patent applications. In similar vein, its most significant policy instrument to support innovation is tax credits to encourage research and development expenditure (3.5).</p> <p>The research applied exploratory data analysis techniques to tease out underlying '<i>latent</i>' variables that represent different modes of innovation strategy. Data analysis involved the production of a statistical programme. These strategies represent '<i>bundles</i>' of activities carried out in tandem to create new products, services or processes. An example of an innovation mode is 'process modernising', which means that a firm introduces a new production process coupled with buying in machinery, equipment or IT and supported by external, supplier contributions to the innovation mode. Analysis of data across different sectors from 18 countries revealed that innovation modes vary in their incidence and effectiveness from one country and sector to another. A mode of innovation that proves effective in pharmaceuticals may be less effective in electrical engineering. The research has shown that '<i>networked innovating</i>' – businesses with some in-house research activities that collaborate with other organisations including universities – is most persistently associated with higher levels of productivity.</p> <p>What flows from the research is that the measurement of innovation has to be sensitive to the importance of these sectoral variations in dominant innovation modes. It also follows that in measuring innovation for purposes of comparison or to deliver advice and guidance to firms, governments should use composite rather than single indicators and should use indicators that are sector-appropriate.</p>
<p>3. References to the research</p> <p>Research publications</p> <p>3.1 Archibugi, D, Filippetti, A and Frenz, M (2013) Economic crisis and innovation: is destruction prevailing over accumulation? Research Policy 42, 2: 303-314.</p> <p>3.2 Frenz, M and Prevezer, M (2012) What does CIS data tell us about technological regimes and</p>

Impact case study (REF3b)

persistence of innovation. **Industry and Innovation, 19, 4: 285-306.**

3.3 Frenz, M. and Ietto-Gillies, G. (2009) The impact on innovation performance of different sources of knowledge. Evidence from the UK Community Innovation Survey. **Research Policy 38, 7: 1,125-1,135.**

3.4 Frenz, M. and Ietto-Gillies, G. (2007) Does multinationality affect the propensity to innovate? An analysis of the third UK Community Innovation Survey. **International Review of Applied Economics, 21, 1: 99-117.**

3.5 Cox, H. and Frenz, M. (2002) Innovation and performance in British-based manufacturing industries: shaping the policy agenda. **Business Economist, 33, 2: 24-33.** Awarded "Citation of Excellence Top 50" in 2003 by the Emerald Management Reviews Awards.

Research grants

2013 UK Department for Business Innovation and Skills Grant to carry out work on Analysing the UK Innovation Survey 2011 (with R Lambert, D Archibugi and A Filippetti) (£39,140).

2011 UK Department for Business Innovation and Skills Grant to carry out work on Innovation Dynamics and the Innovation Infrastructure (£50,000).

2010 UK Department for Business Innovation and Skills Grant on Mixed modes of innovation and their Relative Impact on Performance. Work feeding into the OECD micro-data project Phase 2 (£20,000).

2008 UK Department for Innovation, University and Skills Grant: Exploring modes of non-technological innovation activities. Report and joint project lead on the OECD micro-data project – Phase 1) (£20,000).

2007 Economic and Social Science Research Council Research Placement Fellowship at the UK Department of Trade and Industry. Policy advice and research based upon quantified analysis of the UK innovation system 6.5 months part-time secondment to the DTI (£21,077).

4. Details of the impact

Frenz's research on modes of innovation and the most appropriate ways of measuring innovation achieved its impact through a secondment to the Department of Industry, Universities and Skills (DIUS) and through subsequent work for the Department of Business, Innovation and Skills (BIS) (5.1, 5.2). Work at DIUS, carried out in collaboration with Lambert, led to the production of a series of significant reports, published by BIS and OECD respectively. These reports mapped the different modes of innovation in different OECD countries and between sectors. Their findings were picked up by policymakers and, in turn, led to changes in the ways the British Government and OECD define and measure innovation; in the type of data they collect from firms; and in the advice they issue to firms (5.5).

Frenz and Lambert's 2008 report *Innovation Modes and Productivity in the UK* (5.3) is an Economics Paper prepared for DIUS. It was a background paper to the UK Department's Science and Innovation White Paper entitled '*Innovative Nations*' published on 13 March 2008. On the basis of this initial report, Lambert and Frenz carried out a follow-up study for BIS entitled 'Innovation Dynamics and the Role of the Infrastructure' for BIS (5.4). This uses more robust estimation techniques and its findings have been central to the current UK Government's Innovation Strategy document. Entitled '*Innovation and Research Strategy for Growth*' (5.7) it sums up the Frenz and Lambert research by saying: "The mix of inputs for innovation differs across sectors, so the risk profiles of innovation differ, the financing aspects of innovation differ, and the supply of skills and infrastructure needed differ. All are major issues for government; but it now seems clear that the mix of these conditions needs to take inter-industry variation more fully into account" (Smith and Estivals, 2011: pp.98-99). The research has, therefore, helped to increase policymakers' knowledge and understanding of different innovation practices and their positive impact on firm performance (5.6).

Impact case study (REF3b)

Frenz and Lambert have presented this work on a number of occasions at OECD meetings and their research findings are included in the OECD's Science, Technology, and Industry Outlook (2008); pages 235-238 of this OECD publication are a summary of Frenz and Lambert's 2008 report (5.8). At the same time Frenz and Lambert produced two reports specifically for the OECD. Frenz and Lambert (2012b) addressed innovation measurement and impact and their findings were picked up and cited in a forthcoming OECD report on Ireland by David Haugh.

Frenz and Lambert (2009) was translated into Russian (5.10) and published by Foresight Russia increasing the dissemination of the report beyond OECD countries. Statistics Netherlands published a report on measuring innovation that is based on Frenz and Lambert (2009) (5.9). Helena Connellan and Ian Hughes from Forfás, Ireland's Policy Advisory Board for Enterprise, Trade, Science, Technology and Innovation, included mixed modes in their policy work in 2010.

Frenz's impact has been manifested through her appointment as academic advisor to the Innovation Survey Project group of the Office for National Statistics and the UK Department for Business, Innovation and Skills (commenced 2010). In this role, she participates in regular meetings during which issues to do with data collection, including questionnaire design and sampling, are discussed and monitored.

In summary, over a period of years both the British government and the OECD have developed more sophisticated views of the process of innovation and of the ways in which it can be defined, measured and encouraged. The research of Frenz on innovation modes, varying by sector, has made a significant impact on policymakers and played an important role in generating this change.

5. Sources to corroborate the impact**Referees who can corroborate the impact:****5.1 Head of Economic Analysis and Statistics Division (EAS)**

Directorate for Science, Technology and Industry (DSTI) (over-arching organisation is OECD).

5.2 Former Economist at Department for Business, Innovation and Skills (now at National Centre for Universities and Business).

Reports for BIS

5.3 Lambert and Frenz Innovation (2008) *Innovation modes and Productivity in the UK*, Economics Paper prepared for the UK Department for Innovation, Universities and Skills (DIUS) which is a *background paper to the Science and Innovation White Paper 'Innovative Nations'* published DIUS on 13 March 2008. List of background papers is available at:

http://www.bis.gov.uk/assets/biscore/corporate/migratedD/ec_group/14-08-IN_on and at:

<http://webarchive.nationalarchives.gov.uk/+http://www.bis.gov.uk/Policies/innovation/white-paper>.

5.4 Frenz, M and Lambert, R (2012a) *Innovation Dynamics and the Role of the Infrastructure*, Department for Business, Innovation and Skills, Occasional Paper No. 3.

<http://www.bis.gov.uk/assets/biscore/economics-and-statistics/docs/b/12-1035-bis-occasional-paper-03>.

Reports for the OECD

5.5 Frenz, M. and Lambert, R. (2009) Exploring non-technological and mixed modes of innovation across countries, Chapter 2 in *Innovation in Firms: a Microeconomic Perspective*, Prepared for the Organisation for Economic Co-operation and Development, Paris: OECD publications, pp. 69-110. Can be accessed on-line at:

<http://www.oecdbookshop.org/oecd/display.asp?sf1=identifiers&st1=9789264056213>.

5.6 Frenz, M and Lambert, R (2012b) *Mixed Modes of Innovation: an Empiric Approach to Capturing Firms' Innovation Behaviour*, OECD Science, Technology and Industry Working Papers, 2012/06, OECD Publishing. http://www.oecd-ilibrary.org/science-and-technology/mixed-modes-of-innovation_5k8x6l0bp3bp-en.

BIS report citing Frenz and Lambert

5.7 Smith and Estivals (2011) *Innovation and Research Strategy for Growth*, paper published by the Department of Business, Innovation and Skills in direct association with the current Innovation Strategy of the UK. <http://www.bis.gov.uk/innovatingforgrowth>.

OECD report citing Frenz and Lambert

5.8 OECD (2008) *Science, Technology and Industry Outlook 2008*, Paris: OECD publications, includes pp. 235-238. Can be accessed on-line at: <http://www.oecdbookshop.org/oecd/display.asp?lang=EN&sf1=identifiers&st1=9789264049918>.

Statistics Netherlands building on Frenz and Lambert

5.9 Van der Veen, V. F. (2009) *Improving the understanding of innovation by using test techniques* Statistics Netherlands, Discussion paper 09021, The Hague/Heerlen, 2009. Can be accessed online at: <http://www.cbs.nl/NR/rdonlyres/94B5663B-E076-4947-9F07-A052AC27B245/0/200921x10pub.pdf>.

Russian Translation of Frenz and Lambert (2009)

5.10 Frenz and Lambert (2008) *Open and Closed Innovation: A Comparative Analysis of National Practices*, Foresight Russia, 2008 2(3): 16-31. Can be accessed online at: <http://foresight-journal.hse.ru/en/2008-2-3/26546984.html>.