

Mixed mode and organizational innovations in the performance of firms.
An analysis of Innovation Survey and Annual Business Inquiry data

*Marion Frenz
Department of Management
Birkbeck, University of London
Malet Street
London WC1E 7HX
m.frenz@bbk.ac.uk*

*Ray Lambert**
*Science and Innovation Analysis Unit
Department for Innovation, Universities and Skills
Kingsgate House
66-74 Victoria Street
London SW1E 6SW
ray.lambert@dius.gsi.gov.uk*

Abstract submitted to the conference in ‘Advancing the Study of Innovation and Globalization in Organizations’ to be held on the 29-30May 2009 in Nurnberg, Germany.

* The views in the paper do not necessarily reflect those of the Department.

Mixed mode and organizational innovations in the performance of firms. An analysis of Innovation Survey and Annual Business Inquiry data

Abstract

The aim of this paper is to examine the important role – vis-à-vis traditional forms of science and technology related activities – which organisational and managerial changes and network capabilities play in determining business performance and the functioning of national systems of innovation.

The context of the study is the following. Innovation is an interactive process. It relies on information and knowledge – some of which is directly concerned with the generation of new/codified scientific knowledge or technological capabilities, for example, activities carried out in R&D labs. As part of the interactive innovation process, such knowledge is generated in specific locations and diffused. The diffusion process involves the transfer of knowledge across units and subsidiaries of the same firm. It also – and increasingly so – involves the transfer of knowledge across different firms, industries and national frontiers (Hagedoorn, 1995, 2002). The importance of linkages in the innovation process has given rise to the notion of systems of innovation (Freeman, 1995, 2002; Lundvall, 1992; Nelson, 1992, 1993).

The process of transferring scientific and technological knowledge requires a different type of knowledge which is linked to new forms of organisational structures – network capabilities – and managerial competencies. Moreover, other factors, such as the advances in ICTs and increased importance in services contribute to the relevance of managerial capabilities. The distinction between these two types of knowledge – science and technology on the one hand and managerial/organisational on the other hand – has led to the following typology of innovation modes: the *Science, Technology and Innovation mode* (STI) and the *Doing, Using and Interacting mode* (DUI) (Jensen et al, 2007). Both, activities linked to STI and DUI are associated with increased performance (Jensen et al., 2007; Geroski et al., 1993).

This paper adopts a novel way of measuring mixed modes of innovation by factor analysing innovation survey data. It is an extension of a wider OECD project (Frenz and Lambert, 2009) which uncovered indicators of mixed modes of innovation for nine countries: Austria, Brazil, Canada, Denmark, France, New Zealand, Norway,

South Korea and the United Kingdom. Modes of innovation relate to the following four categories; (i) ‘new-to-market innovations’ based on own and diffused technologies; (ii) ‘marketing based followers’; (iii) ‘process modernising’ based on embedded technologies and training; and (iv) ‘wider innovating’ more dependent on organisational and marketing innovations. The first part of the paper summarises the main results of that international project.

The second part of the paper extends the model to more recent evidence, for the UK only at this stage. Data are derived from matching two sources: the fourth and fifth UK Community Innovation Surveys (CIS) with the latest waves of the Annual Business Inquiry (ABI 2005 and 2006). Analysing the linked observations, the paper contrasts the relevance of science and technology related innovations with ‘softer’ capabilities to do with organisational and business processes, managerial knowledge and collaborative activities. Two different measures of productivity performance derived from the ABI are considered, based on turnover and value added per capita.

The paper uses regression techniques predicting levels and change in productivity based on the four modes of innovation introduced above. Modes of innovation are measured by factor scores. Further independent variables include cooperation activities, and different types of skills. In the regressions we control for organisational characteristics (group belonging), international or national market, capital expenditures, size, sector and UK region.

Over and above the four modes the paper considers collaboration activities and employees skills in science, technology and engineering versus managerial and other skills. Preliminary results suggest that organizationally intensive innovation, supported by non technological skills, is more strongly associated with value added productivity than with output based productivity, while the reverse is the case for more technologically intensive modes. In principle, this pattern is consistent with theoretical expectations, as organizational change is likely to be directed relatively to efficiency and technological change to new market opportunities.

References

- Freeman, C. (1995) The 'National System of Innovation' in historical perspective, *Cambridge Journal of Economics*, 19 (1): 5-24.
- Freeman, C. (2002) Continental, national and sub-national innovation systems: complementarity and economic growth, *Research Policy*, 31 (2): 191-211.
- Frenz, M and Lambert, R. (2009) *Exploring non-technological and mixed modes of innovation across countries*, OECD publication (forthcoming).
- Geroski, P.A., Machin, S. and van Reenen, J. (1993) 'The profitability of innovating firms' *Rand Journal of Economics*, 24: 198-211.
- Hagedoorn, J. (1995) Strategic technology partnering during the 1980s: Trends, networks, and corporate patterns in non-core technologies, *Research Policy*, 24: 207-231.
- Hagedoorn, J. (2002) Inter-firm R&D partnerships: an overview of major trends and patterns since 1960, *Research Policy*, 31 (4): 477-492.
- Jensen, M.B., Johnson, B., Lorenz, E. and Lundvall, B.-A. (2007) 'Forms of knowledge and modes of innovation', *Research Policy*, in press.
- Lundvall, B.-Å. (1992) *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*, London and New York: Pinter.
- Nelson, R. R. (1992) National innovation systems: a retrospective of a study, *Industrial and Corporate Change*, 1 (2): 347-374.
- Nelson, R. R. (1993) *National Innovation Systems: A Comparative Study*, Oxford: Oxford University Press.
- UK Department for Innovation, University and Skills (2005) *Fourth Community Innovation Survey*.
- UK Department for Innovation, University and Skills (2007) *Fifth Community Innovation Survey*.
- UK Office for National Statistics (2005) *Annual Business Enquiry*.
- UK Office for National Statistics (2006) *Annual Business Enquiry*.