



From knowledge to added value: A comparative, panel-data analysis of the innovation value chain in Irish and Swiss manufacturing firms

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ABSTRACT

The innovation value chain (IVC) divides the innovation process into three separate links or activities: knowledge gathering, knowledge transformation and knowledge exploitation. Here, we report a comparative panel data analysis of the IVC in Ireland and Switzerland. Both economies are small, very open and depend significantly on innovation to maintain competitive advantage. In recent years, however, R&D and innovation growth in Ireland has been markedly stronger than that in Switzerland. We investigate these differences through the 'lens' of the IVC. Significant similarities exist between some aspects of firms' innovation behaviour in each country: strong complementarities emerge between external knowledge sources and between firms' internal and external knowledge. And, in both countries, in-house R&D and links to customers prove important drivers of innovation. Innovation drives productivity growth in different ways in the two countries, however, through product change in Switzerland and through process change in Ireland. Other differences in the determinants of innovation performance linked to ownership and firms' institutional context emphasise the systemic nature of innovation and the legacy of past patterns of industrial development.

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1. Introduction

For small open economies such as Ireland and Switzerland, without significant natural resource endowments, innovation is an important element of sustained international competitiveness (Guellec and van Pottelsberghe, 2004). This is perhaps most obvious in manufacturing products where Europe's high-cost producers compete in increasingly globalised markets. Innovation itself, however – the introduction of a new product or process – is only part of a wider process through which firms gather or create knowledge, translate that knowledge into specific market offerings, and then seek to exploit these products or process in the market.² Here, we are interested in modelling this innovation value chain (IVC) in Ireland and Switzerland, beginning with firms' attempts to assemble the bundle of different types of knowledge necessary for innovation (Hansen and Birkinshaw, 2007; Roper et al., 2008). This

may involve firms' in-house R&D activities alongside, and either complementing or substituting for, external knowledge sources (Pittaway et al., 2004).³ Following firms' knowledge sourcing activity, the next link in the innovation value chain is the transformation of knowledge into physical innovations – new products or processes. This we model using the standard innovation production function approach (Geroski, 1990; Love and Roper, 1999) which relates innovation outputs (i.e. new products or processes) to knowledge inputs. In the spirit of models of open innovation, however, we allow firms' innovation outputs to reflect both internally generated knowledge – the result of in-house R&D – and different types of knowledge sourced from external partners. The final link in the IVC relates to the exploitation of firms' innovations, i.e. the generation of added value. This we model using an innovation augmented production function (Geroski et al., 1993).

Our empirical comparison relates to Ireland and Switzerland which despite common international trading environments have demonstrated very different economic growth rates and innovation

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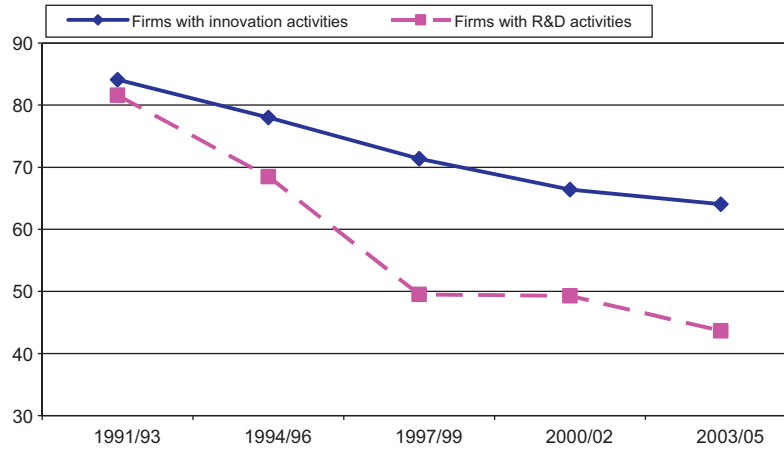
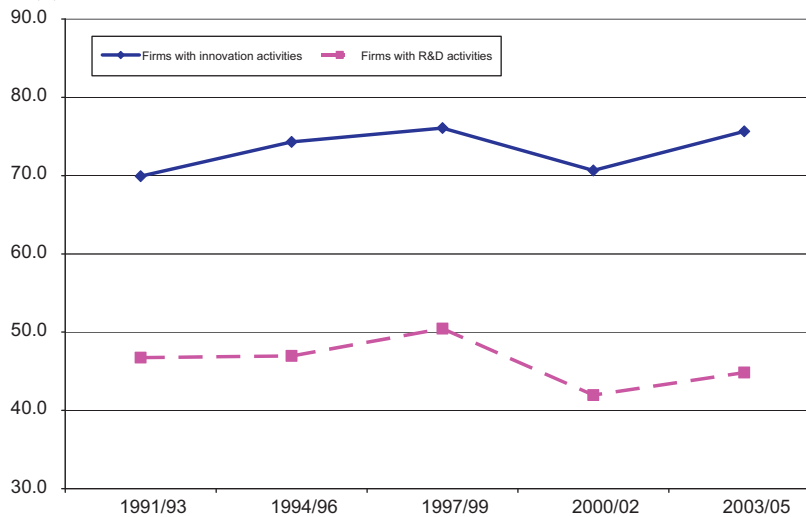
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² Other firms may then benefit of course as knowledge or productivity spill-overs may also then lead to improvements in the performance of other co-related or co-located firms (Beugelsdijck and Cornet, 2001; Klette et al., 2000).

³ Cassiman and Veugelers (2002), for example, find evidence of a complementary relationship between firms' internal R&D and firms' ability to benefit from external knowledge sources. Other studies, however, have identified a substitute relationship between internal knowledge investments and external knowledge sourcing (e.g. Schmidt, 2010).

(a) Switzerland**(b) Ireland**

Notes: Firms with innovation activities reflects firms with either product or process innovation activities. Firms with R&D are those firms with R&D based in the firm. **Sources:** Swiss Innovation Survey; Irish Innovation Panel

Fig. 1. Time series for innovation indicators. *Notes:* Firms with innovation activities reflects firms with either product or process innovation activities. Firms with R&D are those firms with R&D based in the firm. **Sources:** Swiss Innovation Survey; Irish Innovation Panel.

performance over recent years (Fig. 1).⁴ The Republic of Ireland – the so called ‘Celtic Tiger’ – achieved economic growth rates averaging around 9.7 per cent between 1995 and 2004 (Northern Ireland 3.0 per cent) compared to an average of 1.4 per cent GDP growth in Switzerland.⁵ Similarly, export growth averaged 9.9 per cent pa in the Republic of Ireland over the same period compared to an average of 1.9 per cent in Switzerland between 1995 and 2004. Conversely, over the period covered by our study (1994–2005) business R&D spending in Switzerland increased steadily reaching 2.1 per cent of GDP in 2004, with public R&D spending accounting for about 0.8 per cent of GDP. In the Republic of Ireland, R&D spending accounted for 1.25 per cent of GDP in 2004 (1.48 per cent of GNP)

with public R&D spending accounting for around 0.55 per cent of GDP (see Table 1).⁶

A priori these contrasts in economic and R&D performance suggest that we might anticipate stronger innovation impacts on economic performance in Ireland than in Switzerland. Or, in terms of the IVC model, that we would anticipate stronger linkages between knowledge gathering, transformation and exploitation in Ireland. Other factors may also be important, however. In particular, the Republic of Ireland’s EU membership may have created market opportunities, network opportunities and/or funding streams not available to firms in Switzerland. In our analysis these influences are reflected by allowing for the potential impact of government support for innovation on each element of firms’ innovation activity and by controlling for the degree of external ownership. We begin

⁴ Here we use the term Republic of Ireland to refer to the Irish nation state and Ireland to refer to the whole island of Ireland including both the Republic of Ireland and the UK region of Northern Ireland.

⁵ For the Swiss data see Swiss Statistics (www.bfs.admin.ch).

⁶ Irish GDP and exports data from www.cso.ie. R&D data from Research and Development Statistics in Ireland, 2006, Forfas, Dublin. GDP figures for Northern Ireland from UK National Statistics.

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