**Institution: The University of Manchester**

**Unit of Assessment: 18 (Economics and Econometrics)**

**Title of case study: Innovation and Economic Growth**

## 1. Summary of the impact

Work undertaken at the University of Manchester (UoM) forms a central plank of the UK Department for Business Innovation and Skills (BIS) 'Economics Paper 15' (EP15), and provides key support to the growth agenda championed by the Coalition Government (2010-date); with the 'Innovation and Research Strategy for Growth' (IRSG) published on 8th December 2011. More explicitly, IRSG prioritises business research and development (R&D) in areas where the UK excels, whilst also seeking to develop a wider UK innovation ecosystem that includes universities alongside key knowledge producers. Impact can be observed in recent developments in R&D investment support, and in the strengthening of stronger programmes and policies to support innovation. The research also features strongly in European Union (EU) research, and within the context of shaping the Australian innovation agenda.

## 2. Underpinning research

This case is founded upon the influential research of Professor J. Stanley Metcalfe (CBE) on innovation as a driver of economic growth, refined over the last twenty years. The research was undertaken whilst Metcalfe was Professor of Economics and Stanley Jevons Professor of Political Economy (1990-2009) at UoM, and emerges from tasks undertaken (1984-1992) as a member of both the science and innovation advisory committees (ACARD, subsequently ACOST). These were the pre-cursors of the current Council for Science and Technology, and the Monopolies and Mergers Commission (1991-97).

At this time, innovation policy was largely framed within the neo-classical economic framework of equilibrium and optimizing agents, and centred upon the use of market incentive mechanisms to induce innovation by profit maximising firms to overcome market failures. However, it was becoming recognised that such policies were unlikely to succeed due to market failures caused by the economic peculiarities of knowledge, and its ongoing production. Through work undertaken within the aforementioned committees, Metcalfe realised how ideas grounded within evolutionary economics – as expounded in the seminal 1982 text by Nelson and Winter "An Evolutionary Theory of Economic Change" – can be successfully applied to the study of innovation policy. Both firms and governments are viewed from a behavioural perspective, with a focus placed on learning processes and adaptive behaviour. Metcalfe presented these ideas in a seminal paper [F] and associated book chapter [E], with three key insights from this work being:

- **Innovation consists of two types of process**: those that determine the range of innovations (*variety*) introduced in the economy; and those that alter the relative economic importance of the competing alternatives (*selection*).
- **These processes are sustained and supported by innovation systems**; the infrastructure and institutions that facilitate innovation within and across firms.
- **An evolutionary perspective leads to the necessity of two types of policy instrument**, for government's wishing to promote innovation:
  - Policies aimed at reducing the cost of (or increasing pay-off from) research, such as tax incentives, R&D subsidies and patent protection.
  - Policies aimed at improving the innovation infrastructure in order to enhance linkages between the internal efforts of firms, and public R&D carried out within the national science base.

Through subsequent engagements with senior economics staff at the DTI, and via interactions with colleagues in the ESRC Centre for Research on Innovation and Competition (CRIC, 1997-), Metcalfe further developed these ideas in a series of book chapters and articles [A][B][C][D] that led to a fundamental decomposition of innovation systems into '**innovation ecologies**'. These ecologies comprise the set of individuals (usually within organisations) who are repositories and generators of new knowledge, alongside the 'system making' connections between the components that ensure the flow of information whether in general or directed at a specific purpose. These 'innovation ecologies', including firms, universities and knowledge brokers, are the building blocks from which innovation systems are built with appropriate system making

connections including markets for technology licenses, professional networks, collaborative partnerships, *et cetera* [A]. Two **key roles for government** are highlighted:

- Governments must ensure the *existence* of innovation ecologies.
- Governments must facilitate the formation and *strengthening of the connections* that create innovation systems from these ecologies; this includes intervening to address system failures due to weak/non-existent linkages [C] and actively promoting the diffusion of knowledge [D].

In line with this work, Metcalfe also sought to employ arguments from evolutionary economics to demonstrate the importance of innovation as a driver of economic growth [B]. This finding, combined with his earlier work, strengthened the argument that Government policies aimed at promoting innovation systems provide an important vehicle for promoting economic growth.

**3. References to the research** (all references available upon request - AUR)

Two foundational papers [E][F] are followed by four papers that are utilised directly within the BIS 'Innovation and Research Strategy for Growth' [A][B][C][D].


[A] (2007) Metcalfe, J. S. "Innovation Systems, Innovation Policy and Restless Capitalism" in Malerba, F. & Brusoni. S. (eds.) *Perspectives on Innovation* (CUP: Cambridge) (AUR)

[B] (2006) Metcalfe, J.S. Foster, J. & Ramlogan, R. "Adaptive Economic Growth" Cambridge Journal of Economics 30(1) 7-32 (RAE 2008) doi:10.1093/cje/bei055

[C] (2005) Metcalfe, J. S. "Systems Failure and the Case for Innovation Policy" in Llerena, P. & Matt, M. (eds.) Innovation Policy in a Knowledge-based Economy: Theory and Practice (Springer Verlag: Berlin) (AUR)

[D] (2003) Metcalfe, J. S. "Knowledge of Growth and the Growth of Knowledge" in Metcalfe, J. S. & Cantnor, U. (eds.) *Change, Transformation and Development* (Physica-Verlag: Berlin) (AUR)

[E] (1995) Metcalfe, J. S. "The Economic Foundations of Technology Policy: Equilibrium and Evolutionary Perspectives" in Stoneman, P. (ed.) *Handbook of the Economics of Innovation and Technological Change* (Blackwell: Oxford) (886 citations: Google Scholar) (AUR)

[F] (1994) Metcalfe, J. S. "Evolutionary Economics and Technology Policy" The Economic Journal 104(425): 931-944 www.jstor.org/stable/2234988 (266 citations: Google Scholar)


**4. Details of the impact**

**Pathways**: Building upon the advisory roles described, Metcalfe secured a number of high level appointments that helped shape his research on innovation, as well as permitting a propagation of these ideas within the former Department of Trade and Industry (DTI). These appointments included chairing a meeting in 1999 of outside experts which reviewed a DTI report on UK innovation policy, and membership of the panel of economists chaired by Vicky Pryce (Chief Economic Adviser and Director General, Economics, DTI) which informed the 2003 DTI Innovation Review (DTI Economics Paper #7 'Competing in the Global Economy'). The influence of Metcalfe's work on DTI thinking is summarized by a former DTI Director of Technology, Economics, Statistics and Evaluation, who notes that:

> *"Evolutionary economics provides an invaluable and fertile means for thinking about the nature and process of innovation while the NIS* [National innovation system] *has formed the main intellectual framework for UK technology and innovation policy making since the turn of the century…Stan Metcalfe has been the leading economist in the Schumpeterian tradition in the UK for many years and a major interpreter of the work of Nelson & Winter. He has been the most important economic source of these ideas for DTI/BIS economists and other officials."* [1]

These appointments and the influence of his ideas led to Metcalfe's membership of a panel of six economists, chaired by Keith Smith, that produced the economics paper (EP15) that is the basis of the Government's 'Innovation and Research Strategy for Growth' (IRSG), announced on 8th December 2011 [2].

**IRSG**: Professor Metcalfe was one of only six academics cited and thanked by name for their input.

The chair and report co-author (on secondment to BIS) summarises Metcalfe's contribution to EP15, recognising that *"Stan's thinking played an important role*… [with] *the over-arching objective of the Economics paper… to create a coherent framework within which to formulate innovation policy in order to promote economic growth. This framework relied heavily on the concept of 'innovation systems', a concept developed in Stan's seminal application of ideas from evolutionary economics to the study of innovations* [E][F]. Smith went on to highlight that Metcalfe's work as a whole [see, Section 3]: *"played a very important role in the identification of all four… priorities for innovation policy as a driver for economic growth"* identified by EP15 [3]: The need to:

- Strengthen the sharing and dissemination of knowledge within the innovation system.
- Maintain and develop a full scale knowledge infrastructure.
- Incentivise businesses across the economy to undertake the tangible and intangible investments that drive innovation.
- Improve and transform the innovative capacity of the public sector in order for it to realize its potential as a major driver of innovation.

In sum, EP15 provided key support for IRSG, the objective of which is *"supporting business R&D in areas in which the UK excels, within the context of developing the wider UK innovation eco-system including universities and other organisations"* (http://bis.gov.uk/innovatingforgrowth). Moreover, IRSG is built around the key role of government in both supporting innovation ecologies and the linkages between them:

> *The Government is improving incentives for companies to innovate especially SMEs. In addition to our successful changes to the SME* [small and medium enterprises] *R&D Tax Credit we will invest an additional £75 million to support small business innovation including additional funding for Smart, grants that support SME research and development. We will implement a new innovation voucher programme enabling small businesses to engage with universities and the wider knowledge base*. (BIS Website)

The importance of both innovation *per se*, alongside this specific strategy to *promote* innovation, is evidenced by the budgets involved. As of 2011, the annual Government budget for science and research programmes is £4.6 billion, with £150 million each year supporting university-business interaction. The impact of IRSG is further evidenced in the BIS 'Annual Innovation Report' (2012) that documents progress made on a number of fronts in the implementation of IRSG during 2012 [2]. This progress involves the provision of support for innovation ecologies, and the linkages between them, including additional funding of £200 million for the UK Research Partnership Investment Fund (UKRIF), to add to £100 million provided in the 2012 Budget to enable universities to enter long-term strategic research partnerships with the private sector.

Beyond these immediate policy impacts, IRSG, and through it Metcalfe's work, have played a key role in shaping public debate on economic growth. As the IRSG chair clarifies, ministers have embraced this topic as they seek to shape *"the ideas into new approaches to technology strategy, industrial policy and long-term growth… Stan Metcalfe can legitimately claim to be a central intellectual progenitor of these developments, and it is therefore fair to say that his impact on contemporary policy thinking and policy practice has been very substantial indeed"* [3].

**Overseas Work**: Metcalfe's research has had impact in Europe and Australia. His ideas were presented in a European context at the 2009 UNESCO forum 'Innovation for Development: Converting Knowledge to Value', and subsequent report [4]. He worked closely with the EU K4G (Knowledge for Growth) Expert Group that emerged out of the Lisbon Agenda (2000-2010). The concluding conference in 2009 'S&T Policy in Times of Crisis: Prospects for the Knowledge-based Economy', noted that his work with Professor Paul David on 'Universities and R&D organisations in the ERA' and their contribution to Europe's 'innovation performance' was *"fundamental to the discussions at the conference"* [5]. This work was subsequently published in the committee's final report [6]. As the EC Research & Innovation DG confirm:

> *Metcalfe's work on innovation systems continues to influence EC thinking, as the successor of Commissioner Potocnik, Máire Geoghegan-Quinn based her approach on his*

> *Schumpeterian/ evolutionary approach… Metcalfe's approach remains at the heart of the Europe 2020 target that proposes three per cent of the EU's GDP (public and private) should be invested in R&D/innovation, and particularly in the requirement to 'strengthen… every link in the innovation chain, from 'blue sky' research to commercialisation'. Moreover, his research has been useful in addressing the EC's medium term goals as his message on the ecology of innovation was well understood in the EUROPA 2020 document of President Barroso and by Cm. Geoghegan-Quinn."* [7][8]

Metcalfe's contribution to innovation policy in Australia arose through a number of engagements. He became a member of the Creative Industries and Innovation Centre of Excellence at Queensland University of Technology upon its creation in 2005, and was a key contributor to series of 'Innovation Fora' in 2006. These associations, along with his acknowledged expertise, led to his being one of four international experts consulted as part of the 2008 'Review of the National Innovation System' set up by Kim Carr, the Minister for Innovation Industry, Science and Technology. The resulting report, 'Venturous Australia', set out a national innovation agenda [9], to which the Government responded in its White Paper (and 10 year innovation plan) "Powering Ideas: An Innovation Agenda for the 21st Century", and implemented in its 2009 Federal budget. As confirmed by the Government's innovation policy branch, Metcalfe's contribution:

> "*…had a profound impact on the members of the Panel and led to a better understanding of the role for Government in facilitating innovation… In particular, three points made by Stan Metcalfe have remained central to our innovation policy… The central importance of competition policy to keep the system open – innovation policy as a complement to competition policy… There is more to firm performance than efficiency and effectiveness of products in meeting needs…* [and] *the question… 'What is the best systemic mix of organisational forms to promote innovation and the creation of wealth from knowledge?*

It is further noted that "*the Labor Government has continued to support innovation and sees it as essential for productivity"* [10]. This is clearly evidenced in the '2012 National Research Investment Plan' which quotes "Powering Ideas…" in its first line, and (tallying with Metcalfe's K4G work) serves as the basis for the 'Excellence in Innovation for Australia' (EIA) consultation and pilot programme around the impact of university-based research [9].

**5. Sources to corroborate the impact** (all claims referenced in the text)


[1] Testimonial from (former) Director of Technology, Economics, Statistics & Evaluation, DTI (and Chair of the OECD Committee on Science & technology Policy) (9th January 2012)
[2] (2011) BIS 'Innovation and Research Strategy for Growth: Econ. Paper 15' (December); (2011) BIS 'Innovation and Research Strategy for Growth' (December); (2012) BIS 'Annual Innovation Report 2012, Innovation, Research and Growth' (November)
[3] Testimonial from Senior Research Fellow, Tanaka Business School, Imperial College London (on secondment to BIS team) (29th April 2013)
[4] (2009) UNESCO forum 'Innovation for Development: Converting Knowledge to Value – Summary Report' (28th – 30th January, Paris)
[5] (2009) K4G 'S&T Policy in Times of Crisis: Prospects for the Knowledge-based Economy' (25th June, Brussels)
[6] (2009) K4G 'Prospects for Science, Technology and Innovation: Selected papers from Research Commissioner Janez Potočnik's Expert Group' (November)
[7] Testimonial from C2 Policy Officer, EC Research & Innovation DG (4th June 2013)
[8] (2012) EC 'Europe 2020 – Smart Growth' (October)
[9] (2008) Cutler, T. 'Venturesome Australia: Building Strength in Innovation' (Canberra: Dept. Innovation, Industry, Science and Research)(August); (2012) 'National Research Investment Plan' (DIISRTE: Canberra)
[10] Testimonial from Innovation Policy Branch Manager, Australian Govt. (13th May 2013)