Research Policy 40 (2011) 1145–1156

Contents lists available at ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

Systems thinking, market failure, and the development of innovation policy: The case of Australia

Mark Dodgson[a,*], Alan Hughes[b], John Foster[c], Stan Metcalfe[d]

[a] School of Business, University of Queensland, Australia
[b] Centre for Business Research, Judge Business School, University of Cambridge, United Kingdom
[c] School of Economics, University of Queensland, Australia
[d] Manchester University, United Kingdom

ARTICLE INFO

Article history:
Received 22 January 2010
Received in revised form 18 May 2011
Accepted 18 May 2011
Available online 25 June 2011

Keywords:
Innovation policy
National Innovation Systems
Market failure
Systems thinking
Complex-evolutionary perspectives
Australia

ABSTRACT

Innovation policy is increasingly informed from the perspective of a national innovation system (NIS), but, despite the fact that research findings emphasize the importance of national differences in the framing conditions for innovation, policy prescriptions tend to be uniform. Justifications for innovation policy generally relate to notions of market failure that are applicable in all nations in all conditions. In this paper we develop a broad framework for NIS analysis, involving free market, coordination and complex-evolutionary system approaches. Within this framework we explore the evolving relationship between market failure and systems approaches to innovation policy in the case of Australia. Drawing on information and analysis collected for a major review of Australia's NIS, and the government's 10-year plan in response to it, we show how the free market trajectory of policy-making of past decades is being extended, complemented and refocused by new approaches to complex-evolutionary system thinking. These approaches are shown to emphasize the importance of systemic connectivity, evolving institutions and organizational capabilities. Nonetheless, despite the fact that there has been much progress in this direction in the Australian debate, the predominant logic behind policy choices still remains one of addressing market failure, and the primary focus of policy attention continues to be science and research rather than demand-led approaches. We discuss how the development and elaboration of notions of systems failure, rather than just market failure, can further improve policy-making in the future.

1. Introduction

One of the most striking features of innovation policy discussions in national governments and international policy organizations has been the adoption of the terminology of systems thinking and in particular the language of National Innovation Systems (NISs). Recent examples include innovation policy reviews in the UK and Australia (DTI, 2003; Sainsbury, 2007; Cutler, 2008) and the publication by the OECD of a series of country specific innovation policy reports which explicitly adopt an NIS framework (see, for example, OECD, 2005). This apparent capture of the innovation policy agenda by NIS thinking might be considered surprising in view of the criticisms to which it has been subjected at the same time as it became respectable in policy circles.

Questions have been raised, for example, about the contemporary relevance of national, rather than global, regional, sectoral and technological influences on innovation performance. Critical views have also been expressed about the theoretical status of the NIS approach and the extent of its explanatory powers (see e.g. Sharif, 2006), and the methods used to assess how innovation systems work and their performance (e.g. Edquist, 2005). There is also a tension in the NIS literature between studies that explore national differences and those that attempt to develop unified comparative indicators (Balzat and Hanusch, 2004). Moreover it has been argued that the policy debate focuses too much on the identification and pursuit of chimerical 'optimal' innovation systems when the underlying conceptual and empirical analyses reveal great variety and persistent differences in system characteristics (Edquist and Hommen, 2008: 3).

The problems with the NIS approach have not prevented it from influencing policy thinking through its capacity to produce a shared framework of analysis, by spanning academic and policy boundaries and providing a versatile tool for decision-making (Sharif, 2006). Comparative indicators and methodologies continue to be developed to study innovation systems (see e.g. Gault, 2007 and more generally OECD, 2005). Even so difficulties remain with a reliance on highly piecemeal and often misleading indicators of performance, such as US patenting, found in some analyses (see e.g. Smith, 2005; Freeman and Soete, 2009).

* Corresponding author.
E-mail address: mark.dodgson@uq.edu.au (M. Dodgson).

0048-7333/$ – see front matter © 2011 Elsevier B.V. All rights reserved.
doi:10.1016/j.respol.2011.05.015

A more fundamental critique is based on the view that applications of the NIS approach are often too static, descriptive and mechanical, and focus disproportionately on science and technology as opposed to other loci of innovation. Instead, it is argued that what is required is an approach that emphasizes the dynamic, emergent, and evolving nature of systems and the multiple and distributed sources of knowledge for innovation (Lundvall, 2007). Evidence collected on innovation systems leads readily to the view that we are dealing with a complex, evolving system and that successful economies are those which have robust, but adaptable, network connections that enable organizations to translate new knowledge into viable innovations and enhanced productive capacity (see, for example, Malerba, 2004; Edquist, 2005; Edquist and McKelvey, 2000; McKelvey and Holmen, 2006). The reduction of the NIS to an application of static economic theory, as pointed out by Lundvall (2007), leads to policy prescriptions based primarily on limited and constrained notions of market failure, which do not capture the dynamic complexity of the systemic combinations that emerge to address innovation problems in particular national contexts. When systems of innovation approaches are adopted, furthermore, their meaning for the design and implementation of policy are often unclear (Edquist and Hommen, 2008: 479).

In these circumstances the use of market failure justifications for policy intervention may reflect the fact that the tools and policies to deal with market failures are more readily described and understood than those related to the behaviour of innovation systems. Economists are trained in neo-classical economics rather than systems approaches to policy design. Analysis underlying market failure approaches boils down to some well known basic propositions concerning distinctive properties of information and ideas that lead the 'normal' neo-classically specified set of markets to malfunction. Knowledge is viewed as cumulative, reproducible at negligible cost, only partially excludable in use and an intangible asset. Although it is acknowledged that the generation of new knowledge involves fundamental uncertainty, researchers are viewed as engaged in a probabilistic process of finding new ideas that can then command monopoly rights when sold to innovators in an 'imperfectly competitive' market.

The standard conundrum is then posed: how can a market-based solution be found when social efficiency apparently requires free access to knowledge based on the characteristics of cumulativeness, non-excludability and costless reproduction?

The answer, it is claimed, is to be found in public expenditure on basic research, patent protection and subsidization for R&D (see e.g. Dasgupta and David, 1994). The latter, in turn, is justified on the basis of spillover leakages from the imperfect protection which patents yield. Finally, the inherent uncertainty and intangibility of knowledge is used as the basis for justifying a public subsidy for venture capital financing. This is deemed necessary to solve capital market failures in the supply of finance to "risky" new firms whose innovative and economic potential is rooted in the development and exploitation of new knowledge.

The clarity of market failure justifications contrast markedly with the rather nebulous innovation systems approaches. The rather narrow market-failure view of the domain of policy, however, can be offered to policy-makers for any economy at any time. It leaves unanswered key institutional design questions concerning the nature of public sector intervention in innovation support. System wide issues, concerning the particular way that resource coordination and allocation takes place and how they evolve in the specific historical, structural, institutional and changing conditions facing particular economies, do not have a place within the market failure framework. Much research into NIS and national variety – such the "varieties of capitalism" literature (Dore, 2000; Hall and Soskice, 2001; Berger and Dore, 1996), and those concerned with how social and political contexts influence the creation of and rationale for institutions (Boyer, 1996) – has emphasized important differences between countries. We find it remarkable therefore that innovation policy prescriptions have focused on a single 'one true way' based on market failure. This is compounded by a particular interpretation of US economic history that regrettably permeates the approach to innovation policy (Hughes, 2008). It focuses on a narrow range of factors deemed central to the US innovation system. These achieved dominance because of the enhanced economic performance of the US between 1995 and the global financial crisis of 2008. They have served to obliterate features of previously successful innovation systems producing superior economic performance in, for example, Germany and Japan in the not so distant past (see, e.g. Dertouzos et al., 1989). This prescription appears still to predominate in policy discussions – seen for example in the OECD's (2010) Innovation Strategy – despite the opportunity for serious reconsideration following the global financial crisis.

We do not reject the notion that markets can fail, it is clear that they can and do. But, by itself, market failure is too narrow a perspective to provide an adequate analytical or empirical basis for innovation policy. The central ideas of the market failure doctrine are rounded in the theory of a perfect competition and the fundamental welfare theorems that link this idea to the optimum allocation of resources in an economy. Market failure means that price signals are distorted and resources misallocated relatively to the *optimum optimorum* and the main types of distortion relate to the exercise of monopoly or monopsonistic power, the absence of future markets so that the signaling system is incomplete, asymmetric information so that the true situation cannot be assessed in terms of market signals, and externalities of which information spillovers are the principle exemplars. The problem that now arises is that these "failures" are an intrinsic consequence of the process of innovation itself and could only be eliminated if innovation ceased. Thus the model of perfect competition in a stationary state, a world in which innovation, or indeed any change of human knowing is absent, can serve only as a distorting mirror in which to reflect the innovation policy problem.

The limits of stationary analysis were well understood by Schumpeter, and indeed Knight, Marshall and Hayek, who all held a view of an innovation driven economy as competitive but not perfectly competitive, with Knight's concept of the economy as a "self-exciting system" being particularly apt. Instead they correctly understood that a knowledge driven economy cannot be stationary and that competition is therefore a process of disequilibrium dynamics not a state of equilibrium affairs. This is not to say for one moment that the framing institutions of the market are unimportant or that externalities and information failures abound or, for example, that barriers to entry and restrictions on business formation may be harmful to innovation. Important they are but their importance is not to be measured or identified as departures from perfectly competitive equilibria but in the role they play in the evolution and functioning of the innovation system in particular. This includes their interplay with the wide range of non-market processes that shape and drive economic and innovation systems.[1]

Thus we do not question the value of investments in science and R&D, nor the need to improve financial capital markets, but rather that basing support for them on the basis of purported 'market failures' is misleading and leads policy to focus on a limited set of levers aimed at mimicking optimal market outcomes by making marginal adjustments through tinkering with taxes and subsidies. Instead we believe that rather than beginning with market failure divergences from an ideal type of completely unrealistic perfect competition based on full information we should proceed from the realities that

[1] For a fuller discussion than space allows here see Dodgson et al. (2010), Foster (2010) and Mowery and Ziedonis (1998).