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Innovation and growth: The Australian Productivity Commission's policy void?

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Abstract

Governments' economic policies need to be based on a coherent view of the role of innovation and productivity in sustaining growth. This article analyses advice on fostering innovation from Australia's main statutory economics adviser, the Productivity Commission. It argues that the Productivity Commission's comprehensive 2007 report, *Public Support for Science and Innovation*, contributed to a policy vacuum hampering government support for innovation for nearly a decade. First, within the Productivity Commission's understanding of innovation was a contradiction between its required policy targeting criteria and the impossibility of meeting these criteria. Second, the resulting stance on innovation policy was at odds with research and theory on the drivers of innovation and hence growth – particularly innovation systems theories and those based on evolutionary economics. The ensuing innovation policy vacuum suggests that the Productivity Commission placed the abstract ideological 'purity' of neoclassical economic theory above empirical exploration of how government can best support Australia's future economic development. Since late 2015, moves to fill this policy vacuum have included a Senate inquiry, a government department restructure, and the creation of a new Innovation and Science statutory advisory board. Whether these initiatives foster sustained innovation will depend on the extent to which they adopt approaches based on innovation systems or evolutionary economics, and transcend the static neoclassical mindset espoused by the Productivity Commission.

JEL Codes: O2, O3, O4

Keywords

Evolutionary economics, growth, innovation policy, innovation systems, macroeconomic policy, organisational learning, productivity, productivity commission, public policy, spillovers

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Introduction

The overarching policy goal espoused by Australian governments, of all stripes, is economic growth. Growth through innovation is the hallmark policy of Australia's Liberal/National Prime Minister Malcolm Turnbull, who came to power in September 2015 (Turnbull, 2016). It will be interesting to compare the 'strategic whole-of-government advice' of his new independent statutory board, Innovation and Science Australia, with that of the Productivity Commission (PC), which since 1998 has been the primary source of 'independent' economic advice to both Liberal and Labor governments, including on issues relating to growth. In 2007, the PC issued a major paper on innovation and growth, which is the subject of this article.

The notion that innovation drives economic growth is widespread and long-standing (Fagerberg, 2004; Organisation for Economic Cooperation and Development (OECD), 2007). There is no better case than that of innovation to understand the PC's view on what drives growth. A recent PC staff paper, *On Productivity: Concepts and Measurement* (Gordon et al., 2015), identified the relationships among innovation, productivity and growth thus:

> Economies that are close to their productive potential have to rely mainly on on-going technological and organisational change – producing new and improved products or more efficiently organising production – to drive growth in productivity. … While government can support innovation by creating an environment for efficient investment in education, infrastructure, and research and development (R&D), a productivity growth agenda must include what drives both firm-level productivity and productivity at the level of the economy.

This formulation accepts that, while innovating firms may lie at the core of economic advance, they need support from systems of human capital creation, R&D and suitable infrastructure provision. Such an understanding remained undeveloped, however, in the most extended analysis by the PC of the relationships among science, innovation, productivity and growth – its study of public support for Australia's National Innovation System (NIS) (PC, 2007).[1] While espousing an innovation systems lens, this study framed its policy recommendations in neoclassical terms (Dodgson et al., 2011). In this, it was among other policy makers who have 'moved attention away from institutions other than markets; reflecting a belief that market failures pose less long run risks than government failure' (Dodgson et al., 2011: 1150). The PC's leading role in this orientation was reflected in its analysis of public support for science and innovation.

It is argued here that by focusing on self-admittedly impossible targeting criteria, and not on what is known of innovation, the PC created a void at the heart of innovation policy which the new 2015 policy agenda will need to address. The argument begins with an exposition of the importance of system-strengthening approaches to innovation and an argument for accepting indeterminacy within policy frameworks, followed by a brief outline of relevant aspects of the PC's history. A literature review then outlines competing theoretical conceptualisations of innovation. The core of the article is an analysis of the PC's (2007) report on *Public Support for Science and Innovation*. A discussion section identifying what this report did not include is followed by a conclusion on the role

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of the PC in shaping Australian innovation policy, and an outline of need for an alternative, more pragmatic and plural vision.

Innovation and industry policy: Systems and uncertainty

Innovation policy is intended to improve the possibilities for firms to innovate and grow, typically by enhancing the framework conditions in which they operate. While innovation policy is a specific form of industry policy, the PC's style of neoclassical economics sees firm-focused industry policy as a misguided and illegitimate intervention into the marketplace. This article shows what appears to be its predetermination that innovation policy not directly bears on firm behaviours. Such a prescriptive preoccupation with generalised policy is however a distraction from the central focus of innovation policy – a pragmatic approach to addressing 'problems' within an economic system and supporting the required activities to underpin each type of innovation (Edquist, 2011).

An innovation system can be defined as including 'all important economic, social, political, organisational, institutional and other factors that influence the development, diffusion and use of innovations' (Edquist, 2004: 182). Activities identified as falling within the ambit of innovation systems policy are identified by Edquist (2011) as follows:

1. Provision of knowledge inputs to the innovation process, such as R&D and competence (human capital building);
2. Demand-side activities, such as creation of new product markets and articulation of quality requirements;
3. Development of system components such as creation of institutions and organisations and generation of organisational change; and networking to generate interactive learning and to integrate knowledge;
4. Support services for innovating firms, including incubation, financing and consultancy services.

According to this systems approach, the focus of policy should be the identification of system failures or problems that government can solve or ameliorate (Woolthuis et al., 2005). Smith identifies four broad types of failures as rationales for policy: (1) infrastructure provision and investment, (2) transition, (3) lock in and (4) institutional (Smith, 1998). This article argues that the 2007 PC report does not follow this approach of identifying and strengthening points of system weakness.

Innovation researchers accept that much important activity is uncertain as to outcome. Knight (1921) identified the difference between risk and uncertainty. Risk is the situation where probabilities can be assigned to future events and so a cost benefit analysis can be performed – the approach of neoclassical economic modelling. Uncertainty, by contrast, is the situation where future events are unknowable and so probabilities cannot be assigned. For example, the emergence of the vast mass of economic activity based on the Internet was unpredictable and thus lies outside the scope of neoclassical economics. An historical approach to Australian industry and innovation policy shows that a narrowly risk-based policy analysis, quantifying the probabilities of future events, will fail when

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faced with uncertainty. Innovation is the driver of economic uncertainty and so good innovation policy requires acceptance of the impossibility of precisely quantifying the future.

Australian industry policy has been characterised from the 19th century by a focus on commodity production for export, with concomitant imports of manufactures. Around World War II (WWII) a major effort to create an indigenous manufacturing industry occurred, with assistance to develop the required capabilities and high tariff barriers. From around 1950 to 1990, there was a long-running conflict within national economic policy advice circles, between industry development proponents and a Treasury based camp, with a more market-liberal orientation (Jones, 2016). This policy conflict seems to have been framed in terms of whether supporting manufacturing was a social good or bad. The traditional resource-based commodity industries were, however, placed outside this conflict. After 1980 tariffs were progressively reduced to an average of around 5% (PC, 2015). The two main foci of government industry/innovation policy intervention since the 1980s have been the commercialisation of public sector research and horizontal policy to address market failures.

The belief that the commercialisation of public research drives economic growth is derived from the logic of there being a direct link from public research to economic development which can be turbocharged by active government involvement. Neoclassical economic theory predicts that firms will under-invest in R&D (Arrow, 1962; Nelson, 1959). Therefore, it is a simple policy decision to 'put 2 and 2 together' (underinvestment in research and the knowledge that basic R&D has led to transformational innovations) to get a policy of accelerating the benefits of public expenditure on research through commercialisation. Unfortunately, however, there is little evidence of the direct benefits from the commercialisation of public research (Pisano, 2006), and countervailing evidence of possible negative impacts on the more important non-codifiable ways in which universities impact the economy (Mowery and Sampat, 2004).

Horizontal policy is based on the doctrine that policy targeted at specific firms or industries will create undesirable side-effects, limiting any positive impact. Such side effects may include the 'gaming' of the support programme by individual firms, limiting their competitive actions; programme capture by special interest groups; and international bidding wars for investment. While these are all real issues affecting targeted support, beneficial horizontal policies may include the promotion of R&D, human capital formation, trade and support for capability building.

Nevertheless, this conventional wisdom tends to miss the point. Good innovation policy may 'pick the race' rather than 'picking winners', focusing on activities and connections rather than individual actors. Additionally, objections to targeted policy all presume that its benefits will be low, although there is little empirical reason to accept this belief, despite the fact that it is widely shared by political parties and media commentators.

After 1990 Australian industry policy started to transform into 'innovation' policy. In particular, the NIS framework (Freeman, 1995; Lundvall, 1992; Nelson, 1993) provided a way of thinking about how to advance innovation in a practical policy relevant way. This led to the coexistence of two competing worldviews: the dominant equilibrium economics approach typical of the PC and the innovation systems approach. These policy positions talk in different languages. Standard neoclassical economics is

based on constrained equilibrium thinking and analysis, while innovation is by its nature equilibrium-destroying.

The PC: History, politics and structural context

After WWII in Australia, there was competition between two policy blocs: one in the Trade and Industry department supporting the active development of Australian industry and one based in Treasury strongly opposed to government intervention. The PC represents the political and ideological victory of those opposed to active industry policy.

The PC superseded earlier economic policy bodies. The Tariff Board, established in 1921 (PC, 2003), became the Industries Assistance Commission in 1974 and the Industry Commission in 1989. In 1996, the Industry Commission, Bureau of Industry Economics and the Economic Planning Advisory Commission were administratively amalgamated. In April 1998, the PC was created as an independent authority under the PC Act 1998. These events in the 1990s were linked to the introduction of the National Competition Policy (NCP) (Wishart, 2015).

The NCP was largely based on structure–conduct–performance (SCP) economics, in which 'conduct' is seen 'in terms of legally defined practices, "structure" only inferentially as a matter of acquisition and "performance" as a separate and bureaucratic assessment in which competition was assumed to be a societal good …' (Wishart, 2015: 3). The result, it will be argued, was that the PC was founded with a legal, administrative and conceptual basis that effectively excluded innovation.

From 1980s there was a move from consultative to expert bodies and a monopolisation of economic advice into the Treasury portfolio. The PC, as the 'independent' expert advisor, contained within the Treasury portfolio, rarely goes against standard Treasury orthodoxy. It can be seen as promulgating the policy orthodoxy of the major political parties, the central agencies, many Australian academic economists and journalists, and major industry groups (Jones, 2016).

The PC's view on industry assistance is shown in its annual *Trade and Assistance Review* (PC, 2015). Assistance is defined as a cost (Green and Toner, 2014), with little assessment of benefits (PC, 2015: 4). Describing industry assistance as a co-investment in economic development is defined as a 'misnomer' (PC, 2015: 2). Aspects of industry assistance are termed a 'tax' on all Australians. Yet, the fuel tax credits scheme, which provides over USD5 billion in benefits per year to the pastoral and mining industries with no incentives to innovation, is not seen as industry assistance (PC, 2015: 114).

Innovation and evolutionary theory and neoclassical economics

Although neoclassical economics is dominant globally, evolutionary economics has emerged in recent decades incorporating innovation. Neoclassical economics emerged from classical economics in the second half of the 19th century (Heilbroner, 1980; Mirowski, 1989). Its worldview is that economic phenomena occur in equilibrium as a succession of static optimal states. To make this static equilibrium analysis

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work, neoclassical theorists treat most sources of change, such as innovation, as exogenous variables, bracketing problems that invalidate assumptions of equilibrium and optimality.

Schumpeter (1934, 1939, 1943), however, placed innovation at the heart of his economic analysis. Arrow (1969) identified problems for neoclassical analysis associated with the nature of knowledge. Freeman (1974) and Rosenberg (1971) found that innovation was central to firm, sectoral and national economic dynamics. This work was complemented by analysis culminating in *An Evolutionary Theory of Economic Change* (Nelson and Winter, 1982). Evolutionary economics now provides a theoretical accompaniment to empirical studies of innovation and related phenomena, with a diverse and growing body of work (Fagerberg et al., 2004; Nelson and Winter, 2002).

Innovation cannot be contained within the standard neoclassical economic approach simply because each innovation changes the properties of an equilibrium situation, and ongoing innovation means there is no stable equilibrium (Metcalfe, 1998; Nelson and Winter, 1982). Industries as diverse as information technology, automobiles, fashion wear and health are characterised by incessant ongoing innovation. Economic growth is thus defined by both quantitative and qualitative change. Neoclassical economics, and the PC, tend to view change through a quantitative lens, effectively ignoring qualitative change. This goes to the heart of the PC's investigation into public support for innovation. If qualitative change is central, then analysis is needed of how it occurs.

The central importance of innovation is shown by the extent to which we now expect the nature of technology, our work and social interactions to transform through our lives (Freeman and Louca, 2001). As neoclassical growth theory developed in the 1950s, it was found that most economic growth could not be accounted for the standard factors of neoclassical theory (Abramovitz, 1956; Solow, 1956, 1957). This 'residual' was ascribed to spillovers from technological development (effectively innovation). Abramovitz (1956: 11) called the residual 'a measure of our ignorance'. Solow (1994: 48) himself noted that 'there is some truth' in the observation that the neoclassical growth model 'leaves the main factor in economic growth unexplained'. To an outsider, economic modelling that excludes what really drives growth would seem problematic.

More recently 'new growth theory' has sought to endogenise growth (Lucas and Robert, 1988; Romer, 1986, 1990) through investments in tangible assets, human capital and R&D. These new models do not use the understanding gained through in-depth research on how firms learn (Firth and Mellor, 2000) and are not robust (Solow, 1994). One of new growth theory's leading scholars has said this model 'is not well suited for studying innovation' (Grossman, 1996: 88).

As noted above, a 2015 PC staff paper has recognised that the 'generation and application of technological and organisational knowledge (innovation) are the main drivers of firm-level productivity growth' (Gordon et al., 2015: 3). It recognises that 'education, R&D, and creative activity are translated into new knowledge and ideas, and in turn into technological or organisational innovations', a process 'critical to productivity growth' (Gordon et al., 2015: 5). This statement reflects the innovation systems view. Yet, these PC researchers go on to argue that the existence and value of spillovers cannot be accepted without demonstration of positive social value, despite the

difficulty of obtaining suitable data. As recently as 2015, the divide between equilibrium economics and innovation thus appears to be deeply embedded in the PC's worldview. Such worldviews are very powerful, even overriding empirical evidence.

Verspagen summarises the difference between neoclassical and evolutionary economics worldviews thus. Neoclassical economics '[a]dheres to a worldview in which cause and effect are clearly separable, and growth is an ordered, steady state phenomenon', whereas, the evolutionary worldview is 'one of historical circumstances, complex causal mechanisms that change over time, and above all, turbulent growth patterns that appear far from steady state' (Verspagen, 2004: 488–489). A recent review of the research into the role of government in growth says that what 'we need to foster economic growth in developed economies is not a reduced state but a strategic state, which acts as a catalyst using selective and properly governed support to the market-driven innovation process' (Aghion and Roulet, 2014: 913).

The significant differences between neoclassical and evolutionary economics drive widely divergent innovation policy conclusions. These can be divided into three issues: equilibrium, system structure and learning.

The incompatibility of using equilibrium-based theory and reasoning for something that destroys equilibrium has been discussed. Neoclassical economics is based on 'integral systems' (Potts, 2000), while evolutionary economics uses a non-integral approach. In integral systems all actors are connected and interactions flow through all actors predictably, therefore system structure is irrelevant. In non-integral systems not all actors are connected and connections vary in functioning, making system structure of vital concern. In neoclassical economics, learning is assumed to occur through the transmission of codified information (Arrow, 1969). Thus, all actors can learn by paying attention to whatever is of interest.

Conversely, evolutionary economics sees firm learning as being a highly interactive social process (Kogut and Zander, 1996; Lam, 2002; Lundvall, 2002; Zollo and Winter, 2002). Thus, firm learning is driven by system structure, competitive dynamics and incentive structure.

The implications for innovation policy from these two theoretical approaches to economics are different. Neoclassical economics will suggest one size fits all policy, based on a constrained situation of stable behaviour, with the transmission of codified knowledge as central, hence a focus on the commercialisation of public research. Evolutionary economics recommends policy whose core is ongoing change and learning, where the structure and dynamics of the system are central. Evolutionary reasoning also suggests that policy should focus on finding system problems and then trying to restructure the system and its dynamics to improve ongoing firm learning. The focus, of course, is improving the innovative performance of firms to ensure ongoing economic health for the nation.

In a nutshell, neoclassical economics will tend to produce generic policies that do not address system characteristics and complex social learning, while evolutionary economics does the opposite. The advantage of neoclassical reasoning is that policy analysis and design can be relatively simple, as many of the specifics of the situation can be assumed through theory. The advantage of evolutionary reasoning is that it addresses actual issues and the real-world dynamics that underpin those issues.

PC 2007, public support for science and innovation

We turn now to an analysis of the PC's most extended exposition of the relationship between innovation and growth. The PC was asked to report on 'the economic impact of public support for science and innovation in Australia and, in particular, its impact on Australia's recent productivity performance'. The Terms of Reference included issues such as benchmarking, impediments to the innovation system, decision-making principles and programme design elements, and the broader social and environmental impacts: 'The analysis should cover all key elements of the innovation system, including R&D, taking into account interaction with private support for science and innovation, and paying regard to Australia's industrial structure' (PC, 2007: vi–vii).

The report found 'widespread and important economic, social and environmental benefits generated by Australia's … public funding support of science and innovation' (PC, 2007: xvi). It notes,

> [I]nnovation is critical to Australia's growth … Governments play a major role in shaping the innovation system through the design and governance of institutions, in supporting the education and training of scientists and engineers, and in funding high-value research that would not otherwise be undertaken by businesses. Governments also play a direct role through their own public sector research agencies and by financing R&D in universities and businesses. (p. xvii)

This statement expressed an acceptance of the central role of innovation in growth and acknowledges the role of government.

The 2007 report identified four rationales for public support for science and innovation. First, government may need to undertake R&D to do its job: for example, to address environmental degradation. Second, spillovers, where the innovator cannot capture the total value created, may create social value above any economic value to the innovator. Third, intangible factors, such as national identity, moral obligations and national prestige, may be in play. Finally, highly risky investments may require asymmetric tax treatment. For innovation, and thus economic growth, spillovers are by far the most important of these rationales. The report states, however, that the 'mere presence of spillovers, does not, in itself, justify public support' (PC, 2007: xviii).

On one hand, the report stated that specific targeting criteria (spillovers, additionality and positive social value) must be demonstrably met for good policy development, and, on the other hand, it suggests that setting, applying and meeting such criteria is effectively unattainable (PC, 2007: 351). Those who assume that good policy development is about finding solutions to real-world problems will be bemused by such apparent preference for theoretical perfection over real-world relevance.

The 2007 report contained specific findings on certain programmes and areas, as well as general policy conclusions. It found that changes to R&D tax can encourage spillovers; that while most public R&D is beneficial, some may 'crowd out' private R&D; that there should be complementary diffusion programmes to Collaborative Research Centres; and that Higher Education R&D funding had problems.

The Terms of Reference were framed using the innovation systems concept. The report used the phrase 'innovation system' 156 times and discussed the barriers to systems' operation (PC, 2007: 15–18). It identified as central concerns: 'poorly developed

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linkages, inappropriate standards, poor regulations, inadequate infrastructure, network failures, and high exit and entry costs that reduce competitive pressures' (PC, 2007: 94). This list limited the scope of systems analysis to framework conditions. Yet, the behaviour of firms is the central issue for innovation, and innovation research tends to base its results and recommendations on empirically observed behaviour. The PC assumed firm behaviours throughout the report's findings, rather than examining concrete evidence of what firms actually do.

The 2007 PC report found strong evidence of returns to public R&D of around 65%, with a margin of plus or minus 20% (PC, 2007: 621). But the actual rate of return for R&D investments was said to be almost impossible to calculate accurately, owing to the assumptions necessary and the structure of the models (PC, 2007: 376). The PC also found case study evidence of significant returns to public R&D. But, 'while collectively the evidence favours good returns from publicly funded support of science and innovation, the evidence cannot be used to decide optimal investment strategies by government' (PC, 2007: 187). The PC was thus reluctant to accept the reliability of its own and others' empirical evidence of large returns to public investment in science and innovation.

The 2007 report noted the evidence from innovation research that R&D is not typical of all innovation in all industries (PC, 2007: 8). This caveat further complicated the analysis of how public support affects private innovation, which in turn drives firm, sectoral, regional and national productivity and growth. Based on international comparisons, the report found that, once adjusted for industry structure, Australia converged to international norms for R&D (PC, 2007: 21), but the report was silent on whether Australia's industry structure and dynamics were appropriate.

This emphasis on complexity and uncertainty led the 2007 PC report to describe the relationship between innovation indicators and growth in these terms:

> [E]ven quite extensive sets of innovation indicators fail to provide strong explanatory power about the relative performance of rich countries. … If nothing else, this should suggest a sceptical regard for statements asserting the obviousness of changes to an innovation system required to produce additional wealth. (p. 51)

Instead, the PC (2007) report fell back on the neoclassical mantra of flexibility:

> … [a]rguably, the best policy response to structural pressures that will assume unknown forms is the encouragement of a high quality broad-based innovation system as part of a highly flexible economy, well functioning labour markets with high quality labour endowments, and excellent and adaptive institutions. Innovation policy is a central part of a flexible capability, but arguably does not need to be directed to goals of transforming particular segments of (manufacturing) industry. (p. 93)

The report did not define a 'high quality broad-based innovation system', nor exactly what makes an economy flexible nor what constitute 'excellent and adaptive institutions'.

The above quotation either sees innovations or technologies as generic, or it implies that public support should apply only to generic innovations, such as software, that cross many industry boundaries. However, many innovations are specific to an industry or technology. The quotation explicitly excludes manufacturing. Its logic would also rule out support for agriculture and resources industries, despite the previously discussed

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exemption of automotive fuel for the resources and agricultural industries as not constituting industry support. Nowhere in the 2007 report was there a clear statement of what the authors saw as the actual role of government in supporting innovating firms.

At the firm level, the key drivers of innovation systems are entrepreneurship, learning and internal capabilities. The 2007 report's treatment of entrepreneurship illustrates its avoidance of possible government assistance to firms in improving their internal operations. The PC (2007) dismissed expert submissions on issues around entrepreneurship as 'illfounded' (p. 315). It gave five justifications: gauging entrepreneurship is subjective, the higher education system teaches entrepreneurship, government action may crowd out private services, government has some support programmes, and businesses should approach industry and professional bodies for assistance in upgrading capabilities (PC, 2007: 307–308). These assertions, however, elided the issue of Australian entrepreneurship without empirical analysis or the arguing-out of theoretical justifications.

In Chapter 10 on business programmes, the PC (2007) found,

> Australia's current suite of business programs do not target the rationales for public support (additionality and spillovers) effectively and, as a consequence, involve substantial transfers from taxpayers to firms without attendant net benefits. (p. 371)

This left it unclear how to frame innovation systems rationales. In fact, targeting 'particular firms, sectors or activities' was ruled out as inappropriate (PC, 2007: 372). Given that the report was designed to shape policy on Australia's 'innovation system', the result was a large gap between stated intent and actual analysis and policy guidance.

The only theoretical alternative offered to the PC's (2007) preferred use of standard economics was a brief section on '[e]volutionary theories and the "innovation system" approach' (p. 94–96). The PC summary of 'the most important policy relevant features' of the evolutionary approach is concise but insightful:

1. The value of variety;
2. A consideration of the whole system;
3. An interest in the effectiveness of diffusion of ideas among firms;
4. The importance of innovation systems that support entrepreneurial invention and competition (p. 94).

These issues were neither dismissed nor discussed as key drivers of innovation. Perhaps this was because 'the evolutionary approach does not establish a welfare benchmark against which to gauge appropriate government policy' (PC, 2007: 95). Thus the evolutionary economics approach would see the PC's targeting criteria as essentially irrelevant. The issue of incompatibility between innovation research and standard economic theory was addressed thus:

> [T]he evolutionary approach places an emphasis on experimentation, variety, competitive approaches and continual change. However, complexity is not a compelling public policy end in itself, but rather only of policy interest to the extent that it improves the prospects for better living standards broadly defined. Once this is the ultimate objective, the apparent difference in the goals of conventional economists and evolutionary economists largely evaporate (even if the tools they employ are overlapping rather than common). (PC, 2007: 95)

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Having the same intention (improved living standards) does not mean compatibility between approaches. By ruling out complexity as a compelling policy rationale, the PC avoided dealing with the full intricacy of the economy, innovation and growth. That the real world is messy and standard economics clean and clear seems a poor rationale to avoid dealing with the real world. As a result the PC report did not provide policy advice informed by innovation research, substituting guidance based on abstract theory that could not by its very nature deal with innovation.

The PC report (2007: 95) quoted the leading innovation researcher Fagerberg (2004), who identifies two general government approaches to promoting innovation. The first is to enhance the creation of variety in the economy via changes in what is supported, thus increasing the range of possible inputs to innovation. The second is to focus on the ability of firms to absorb innovations. These two general policy directions were ignored in the report beyond this quotation. The report thus elided both innovation research and policy advice.

Overall, the PC report was a thorough and careful analysis of a particular way of looking at public support for science and innovation. Unfortunately it prescribed an unattainable approach to developing innovation policy and used an unexplained logic, theory or model to inform its analysis. It did not appear to be driven by the empirical situation of Australia's innovation system and created a policy void.

What was not in the PC innovation report?

The 2007 report provided no model of how innovation and economic growth are linked. Thus, there was no clear pathway between analysis and policy recommendations. When considering evolutionary theories and the innovation research, the PC used rhetorical disclaimers and invoked difficulties in obtaining categorically exact quantitative analysis, to avoid discussion of how public support can assist innovation within firms. Given that it is within firms that innovation actually occurs, and that Australian firms rank near the bottom of the OECD in terms of their linkages with public research, suppliers and other sources of cutting edge knowledge, the PC's approach forestalls any coherent or informed discussion of this topic. With no clear model of what is important and what not, and a near impossible hurdle to clear for targeting policy, there has been little guidance as to what government can do to advance Australia's economic position through innovation – except for public basic research.

Intriguingly the 2007 PC report used the term 'market failure' only in relation to capital markets, and once regarding signalling. This omission is interesting because market failure is the primary rationale for economic policy interventions in Australian government. Are there no market failures outside capital markets? There was an apparent avoidance of what market failure actually means in the complex systemic world of innovation. The evolutionary/innovation literature has an extensive discussion of problems with the market failure concept and has developed the alternative concept of systems failure (Dodgson et al., 2011; Smith, 1998; Woolthuis et al., 2005). By avoiding discussion of market or system failure, the PC circumvented explaining how innovation policy can be developed in the real world.

As discussed, the 2007 PC report acknowledged in passing, but did not engage with, the innovation or evolutionary economics literature. Innovation systems policy requires an understanding of the system as a whole, and the identification of a problem that can

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be addressed. Systemic issues such as the nature and intensity of entrepreneurship were identified in submissions to the 2007 report, but not taken up and discussed. It is unclear why the PC avoided embracing the large body of knowledge on innovation, or for that matter, benefit cost analysis techniques of non-monetary valuation.

The PC report did not clarify the conundrum that if its approach was followed, investment in activities that we know advance the economy would not occur, because its targeting criteria were effectively not possible to meet.

In summary, the PC (2007) report did not articulate how it perceived the link between government policy and innovation. The gap created by an absence relevant theory was not filled by empirical studies of innovation. A range of work on innovation and related phenomena were briefly reviewed and then dismissed or disregarded. Unattainable prerequisites, basing innovation support on impossibly precise quantifiable outcomes, created a policy void.

Conclusion

The influence of the 2007 PC innovation report lives on. When in December 2015 the Senate Economics References Committee tabled its brief report on *Australia's Innovation System* after receiving 195 submissions, its five recommendations were accompanied by dissenting statements from the Committee's Liberal/National Coalition members. These dissenting statements invoked the PC's longstanding advocacy of competition and market forces, rather than government intervention, as the key drivers of innovation. In particular, they cited the 2007 PC innovation report for their rejection of targeting as 'conceptually flawed' (Parliament of Australia, 2015). It is too early to determine whether the new Australian Government's National Innovation and Science Agenda (2016), with its four pillars ('culture and capital', university/industry collaboration, 'talent and skills' and 'government as exemplar'), marks a distinctive move away from the PC's view. The lack of actually innovating firms in the pillars indicates that perhaps the PC's view has not yet run its course in the 'ideas boom'.

Certainly in 2007, the PC produced a major and substantial report on public support for science and innovation. Within its own self-defined scope, this report was thorough, with clear reasoning and in-depth analysis of both the relevant literature and the available data. However, in two major respects, the PC report failed to provide useful advice on advancing Australia's future through public support for science and innovation. First, there was an inherent contradiction between the targeting criteria that the PC said were required for good policy and its repeated statement that such criteria were essentially impossible to meet. Second, the PC's analysis appeared to ignore or trivialise what we know of innovation, instead relying on generalised neoclassical reasoning. As recently as 2015, the PC viewed industry support as purely a cost, in their recent review of productivity theory and measurement (Gordon et al., 2015).[2]

The most remarkable aspect of the 2007 report was its silence on the evidence underpinning its findings on support for innovation. Rhetorical devices and shifts of logic were used to discount the approaches and conclusions of evolutionary economics and innovation scholars: for example, it was claimed that evolutionary and neoclassical economics approaches are 'qualitatively similar' approaches (pp. 95–96) – a questionable claim (Dodgson et al., 2011).

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An alternative explanation for how the PC report moved to its conclusions is that the reality of innovation was fitted to a pre-ordained mental model of how the economy works. Kunda's (1990) concept of motivated reasoning seems to apply, whereby evidence confirming existing beliefs is accepted and contrary evidence is disregarded, often with little logical or evidentiary justification. Another PC (2010) publication explains this process: '[p]ublic policy is influenced by a variety of stakeholders, analysts and decision makers who will tend to interpret evidence through a particular 'lens' based on their own values, perceptions and interests' (p. 1).

The position of the PC on Australian industry/innovation policy is part of a long-running debate, in which ascendancy has been achieved by the belief that government should not intervene to support industry, especially manufacturing. It is tempting then to read its 2007 innovation report as an attempt to keep alive the creed that supporting industry outside a few selected areas is both a waste of resources and a perversion of government activity. This is a worldview common in the central agencies, major political parties, and among some academic economists, think tanks and the media. An official 'independent' economic advisory body is ultimately a useful device for legitimating a certain interpretation of the world and for foreclosing on alternative analysis and advice.

Innovation creates major problems for standard neoclassical theory. Innovation systems-based policy requires the identification of problems with the intensity of certain types of innovation and the analysis of why these problems exist. It is necessary to work through systems failures, looking at the activities involved and to develop ways in which the public and private sectors can resolve them. This approach was not taken in the PC's (2007) report. There was no argument against innovation research, but rather a contention, unsupported by evidence, that the familiar neoclassical approach actually encompassed and provided a better approach despite not addressing innovation itself. If a firm followed the PC's prerequisites for innovation support, it would not innovate, because it is just all too hard to accurately quantify the costs and benefits.

Perhaps the main contribution of this article is to show that the PC's analysis of innovation policy in 2007 and since has not been framed using either a clear theoretical lens or an empirically based framework. Rather, by design or in effect, it has inhibited fruitful pragmatic discussion on alternative innovation policy approaches, in the interests of an unspoken belief system that makes it seem unrealistic to talk sensibly of innovation itself. The unfolding of the latest Australian government innovation initiatives in 2016 will show whether this void still lies at the heart of the government's 'independent' expert advice on innovation policy that might advance Australia's economic future.

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Notes

1. This report was a 'commissioned research' study, which involves less formal public consultation than a full public inquiry.
2. As indicated, the removal of significant volumes of direct support for mining and agriculture from this analysis was not clearly explained.

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