A Question of Balance

Submission to the
ACIP
Review of
Patentable Subject Matter

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"There is no procedure by which persons who may be adversely affected by the patent may offer any relevant information they may possess to show the impropriety of the application. There is no provision for proof that the invention has actually been made or that it accomplishes anything, and no provision for skilled technical appraisal of the place which the invention occupies in the developing technology of which it is a part. Still less is there opportunity to raise questions as to the economic effect of granting or denying the patent application or of enlarging or reducing the scope of the grant. *The process comes perilously close to letting anyone have a monopoly, the size and shape of which he is allowed to formulate for himself*, provided only that it does not overlap an activity already carried on or a monopoly already granted to someone else."

Edwards 1949: 219-220, emphasis added

This comment was made in 1949 in respect of the US patent system.
Except for the comment that a granted patent monopoly
should not overlap another patent monopoly,
the comment applies equally to the patent system in Australia today.
The one difference in the Australian system is a post-acceptance opposition process.

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Because the patent system may do substantial harm as well as possible good, balance between the innovation inducement effect and the competition reduction effect has always been important. It has less often been recognised that the patent system attracts the kind of 'gaming' behaviour that has been rife in tax policy (Section 1).

The current review of patentable subject matter provides the opportunity to return the patent system to the narrow realm in which it belongs—where there is likely to be a benefit to the public. This would be consistent with current empirical evidence—that patents are important in inducing innovation only where technology is highly codified or where the initial investment is very large compared to market size (Section 2).

Establishing the boundaries of actual patent policy is challenging, but it can be assumed that the government's intent is that the overall system not be welfare-reducing. This means that there must be a reasonable consideration in exchange for the monopoly—patent monopolies should not be lightly granted. There has never been any government decision to extend the boundaries of patentable subject matter to new fields such as software, discoveries or methods of medical treatment. These major competition and innovation policy decisions have been made within the patent administration system (Section 3).

There is clearly a major gap between patent policy and the actual outcomes as delivered by the patent administration system. These gaps are explored in Section 4, where a series of legal decisions and legal doctrines are considered from an economic viewpoint. The gulf between policy and practice suggests the need for:

- serious attention to 'gaming' behaviour, including 'anti-avoidance' provisions and penalties for undermining the patent system;
- a need to redress the way in which the patent playing field is so substantially sloped in favour of the patent applicant that many uninventive 'inventions' are being granted patents;
- a need for a multi-faceted team to address the gaps between patent policy and practice to design a robust system that will operate to enhance national economic well-being and be resistant to 'gaming' behaviour. Besides addressing 'gaming' behaviour and the bias against the public interest, this could include:
  - substantially increasing the inventiveness threshold;
  - requiring claims clarity from the point of application/grant; and
  - compensating losers, possibly by limiting the monopoly grant to the prevention of copying;
- a need for regular evaluation of the patent system overall, and of legal decisions that impact on patent policy in particular; and
- a need for the collection of proper economic data on the impact of the patent system, including:
  - provision of advice to the patent office whenever a monopoly right is exercised;
  - collection of data through the National Innovation Survey to identify the impact of patents on innocent innovators, and estimate the proportion of innovations induced by the patent system.

Acronyms

ABS	Australian Bureau of Statistics
ACIP	Advisory Council on Intellectual Property
ALRC	Australian Law Reform Commission
APLF	Association of Patent Law Firms
AUSFTA	Australia-United States Free Trade Agreement
BIE	Bureau of Industry Economics (now absorbed into Productivity Commission)
BPAI	(USPTO) Board of Patent Appeals and Interferences
CAFC	(US) Court of Appeals for the Federal Circuit
CIS	(European) Community Innovation Survey
CMS	Carnegie-Mellon survey
EPC	European Patent Convention
EPO	European Patent Organisation
FTC	(US) Federal Trade Commission
GDP	Gross Domestic Product
IP	'intellectual property'
IPAC	Industrial Property Advisory Committee
IPCRC	Intellectual Property and Competition Review Committee
IPRIA	Intellectual Property Research Institute of Australia (University of Melbourne)
NOIE	National Office for the Information Economy (now Office for the Information Economy)
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
RIM	Research In Motion (the company making Blackberries)
TBA	Technical Board of Appeal (part of EPO)
TRIPS	(Agreement on) Trade-Related Aspects of Intellectual Property Rights
USTR	United States Trade Representative
USPTO	United States Patent and Trademark Office
WTO	World Trade Organization

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1 Policy Principles

1.1 A question of balance

Patents are an economic policy instrument. Consideration of the design of patent policy therefore needs to be based on sound economic analysis, including selection of an appropriate theoretical model of innovation, and solid empirical evidence as to the impact of patent policy. The issue of what is a patentable invention—the subject of this enquiry—lies at the heart of patent policy.

Australia is a signatory to the World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)—indeed Australia was a 'friend of intellectual property' in the Uruguay Round. Article 7 of TRIPS provides a clear statement of objectives:

> "The protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations."
>
> TRIPS, Article 7 (http://www.cptech.org/ip/health/cl/cl-art7.html, accessed 9 September 2008)

As this clear objective statement indicates, the issue of balance is central in designing a patent policy that enhances rather than reduces economic welfare. Patent policy has a central contradiction at its heart—it is designed to increase innovation by inhibiting the diffusion of innovation. It is therefore understandable that there is strong agreement on the need for balance in the patent system. Indeed this need for balance is possibly the only aspect of patent policy about which there is general agreement. The one other area of general agreement is that patents are a blunt instrument.

This need for balancing the trade-offs involved in the design of patent policy is clear in both the ACIP issues paper on patentable subject matter (hereafter 'the issues paper', ACIP 2008), and in the review of intellectual property under the Competition Principles Agreement (hereafter 'the Ergas review', IPCRC 2000). The recently released Green Paper on the National Innovation System (hereafter 'the Cutler review') also offers some useful perspectives on balance, emphasising as it does the cumulative nature of innovation, and the need for intellectual property to become 'an important front of micro-economic reform' (Cutler et al. 2008: 85)

1.2 Clarity in patent policy objectives

Going beyond this general agreement to its operationalisation is easier said than done, and it is here that the widespread agreement on balance breaks down. Finding the appropriate balance between 'odious monopoly' and an incentive to innovate depends critically on how the patent system works in practice. It also depends on the relative priorities given to competition as a driving force in a healthy and innovative economy, and patent monopolies as a specific incentive to innovate.

These priorities are quite unclear. The Australian *Patents Act 1990* includes no statement as to its purpose. Indeed the Ergas review had to go back nearly 20 years to find a ministerial statement about the purpose of patent legislation:

> "The main purpose of a patent system is to stimulate industrial invention and innovation by granting limited monopoly rights to inventors and by increasing public availability of information on new technology. Patent procedures must achieve a balance among competing interests while remaining administratively workable."
>
> IPCRC 2000: 136[1]

Australia is not alone in failing to include any clear statement of objectives in its patent statute. The European Patent Convention (EPC) states no purpose except to 'to strengthen co-operation between the States of Europe in respect of the protection of inventions.'[2]

From other sources one can establish that Australia places a high priority on competition, and on encouraging innovation. The Australian Commonwealth government has agreed competition principles with the State governments and these are embodied in the Competition Principles Agreement and the National Competition Policy.[3] The objective is the removal of anti-competitive elements of existing and proposed regulation. Similarly there is a strong commitment to innovation. The website of the review of Australia's national innovation system states:

> "The establishment of the review recognises the vital role innovation plays in boosting productivity and international competitiveness, and re-iterates the Rudd Government's commitment to fostering innovation across the economy."
>
> http://www.innovation.gov.au/innovationreview/Pages/home.aspx[4]

Finally, it is useful to remember that the Rudd Government places a high priority on evidence-based policy. Item three in the Rudd Government's seven point vision for the Australian public service is 'evidence-based policy' (Rudd 2008b). Basing patent policy on evidence would lead to some radical changes.

1.3 What is a patentable invention?

ACIP has been asked to make recommendations about patentable subject matter to the Government. The Government has asked that this review specifically consider

> "the appropriateness and adequacy of the 'manner of manufacture' test as the threshold requirement for patentable subject matter under Australian law, and the historical requirement that an invention must not be 'generally inconvenient'"
>
> ACIP 2008: 5

It is clear from the issues paper that ACIP is taking a broad approach to this question. This is to be commended.

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[1] The Hon David Thompson Minister for Science and Technology, April 1981 *Second Reading Speech, Patents Amendment Bill 1981*.

[2] Preamble, European Patent Convention (http://www.european-patent-office.org/legal/epc/e/ ma1.html, last accessed 7 December 2007). Articles 52 and 53 specify that it is inventions which can be patented and define subject matter limits to what can and cannot be patented; and Articles 54, 55 and 57 set criteria relating to novelty, inventiveness, and usefulness.

[3] The agreements are oversighted by the National Competition Council (http://www.ncc.gov.au, accessed 14 August 2008).

[4] Accessed 9 September 2008.

This broad assessment of what constitutes patentable subject matter can be addressed at two levels. First, and most important, is the policy question of what inventions are, or should be, eligible for a legislatively-backed monopoly. This submission is largely oriented to this question. Section 2 of this submission assembles the economic evidence on innovation to address the question of what should be patentable. Section 3 considers what is actually being patented in Australia today. The divergence between the answer to what should be patentable (Section 2) and what is being patented (Section 3) points to a considerable gap. This gap is due to the second issue—the implementation of policy.

Many of the issues raised in the ACIP paper go beyond the question of what patent policy should be and address this second question—how can agreed policy best be implemented?

Partly because patent policy is delivered through law it has escaped the normal processes of scrutiny and evaluation to which grant and tax-expenditure programs are subject. In addition, administration through the law has meant that policy changes are made in a radically different manner to the normal policy-making process. Instead of scrutiny by policy experts, and consideration by elected government, policy changes occur through new 'legal doctrines'. These policy changes frequently emerge from argument between two private parties, with little or no consideration of the impact on public policy.

Patent policy is public policy. The objective of patent policy is to improve national well-being. So if patent policy is being administered in a manner that does not align with these goals, this raises important questions of why there is such a gap between the policy objective and the administration of the patent system. Section 4 raises a number of queries about possible reasons for this gap, and possible solutions to these problems.

But if we are to get patent policy right, then we really need to tackle the issue of 'what is a patentable invention' in two stages. First we need a robust, evidence-based exploration of the circumstances in which grant of a legislatively-backed monopoly will give rise to national benefits. Having agreed on the goals of public policy, we then need to draw together expertise from economic, innovation, business studies, competition policy and legal areas to work together to design a system that will robustly deliver the agreed policy goals.

This ACIP review effectively seeks to tackle the two stages together. I believe this to be a mistake. Until the gaps between policy goals and policy administration are fully explored, recommendations for improvement may back-fire. Certainly it is urgent that patent administration be radically improved to attempt to make it welfare-enhancing. But because innovation is so important to national economic well-being, it is important that the changes be the right ones. Like tax policy, patent policy has been substantially 'gamed' by a small number of players who stand to gain substantial financial advantage (see Section 4.1). Tax policy has been subjected to considerable scrutiny and analysis over many decades to determine the causes and possible solutions to similar problems (Braithwaite 2005). Unfortunately patent policy has not been subjected to the same rigorous analysis, though it is known that in almost every jurisdiction the goals of patent policy have been undermined by legal semantics ('clever drafting').

1.4 Over-arching principles

The Rudd Government has a strong commitment to building a modern, competitive economy. The third building block in achieving this goal, is 'a regulatory system that encourages competition and innovation' (Rudd 2008a). There is a large literature on the

importance of competition as a driving force in innovation, and the role of market competition is providing an effective and efficient means of allocating resources. Less often recognised is the importance of imitation as a key element in market competition. In discussing the question of balance in the US patent system the US Federal Trade Commission (FTC) quoted from a Supreme Court case:

> "a careful balance between the need to promote innovation and the recognition that imitation and refinement through imitation are both necessary to invention itself and *the very lifeblood of a competitive economy*."
>
> US FTC 2003: 3, emphasis added[5]

As input to its review of the patent system, IPAC hosted a seminar in Healesville in November 1980. One of the speakers, an economics professor at Yale, emphasised the over-riding importance of competition principles, and the high likelihood of regulatory capture whenever there was a regulatory intervention in the market:

> "There are general principles which are of the highest importance, that markets should be left to operate freely whenever possible, that one must look further afield than those involved in and regulating an industry when canvassing opinions regarding changes in public policy, and finally, if a market environment is created which can be abused or manipulated then such a market will be abused and manipulated."
>
> Beggs 1981: 44

These comments are as valid today as they were nearly thirty years ago.

They were not taken on board by the IPAC review. In contrast, the Cutler review takes the view that 'it is imperative that IP policy make the transition that competition policy made over a decade ago now, from a specialist area dominated by lawyers, to an important front of micro-economic reform' (Cutler et al. 2008: 85). If patent policy is treated as economic policy, then key principles from competition policy and regulatory policy become relevant.

An over-riding principle of competition policy is that intervention should not occur unless there is a 'beyond reasonable doubt' demonstration that the intervention will confer a net benefit. This principle precludes extensions to market regulation without prior assessment of net benefit and harm, and any need for compensation. This approach is complementary to evidence-based policy: indeed the two are mutually reinforcing. This principle is clearly stated in the Ergas report:

> "The Competition Principles Agreement seeks to promote efficiency by ensuring that legislative restrictions on competition are only maintained where their benefits clearly outweigh any costs they may impose."
>
> IPCRC 2000: 5

While this rule operates at a more macro level—for example it is useful in considering whether the subject matter of patents should be extended, there are also operating principles from the field of de-regulation that are useful in the implementation of policy. As is discussed below (Section 5.2) the patent system as it operates in practice has a large number of rules which strongly bias decisions in favour of grant of a patent once an

[5] Citing from *Bonito Boats, Inc. v Thunder Craft Boats, Inc*., 489 U.S. 141, 146 (1989)

application has been lodged. In this Australia is no different from the USA where a 'plethora of presumptions and procedures tip the scales in favor of the ultimate issuance of a patent, once an application has been filed' (US FTC 2003: 8). Consistent with best practice in competition and regulation, this should be reversed, and the onus of proof at each stage of an application should lie with the party seeking the market intervention.

This would also be consistent with the fact that today's world is extremely innovative. When the invention exception was written into the *Statute of Monopolies* in 1623 the pace of invention and innovation was much different. Today the 'new, improved' product or process is the rule not the exception. The patent system's historical roots, and continued use of archaic language, can limit this recognition, exhibiting biases in favour of the applicant and against the public interest. Given that most innovation is cumulative this can potentially be very harmful to innovation.

Certainly one clear point can be made about the issue of balance in the patent system. Overall the patent system should operate to increase not to reduce Australia's economic well-being.

2 Patent policy: what should be patentable?

The conventional argument for government intervention in the innovation market is that knowledge has public good characteristics, copying will be cheap, and innovators will therefore be unable to make a profit on their innovation investment through normal market mechanisms. This conventional wisdom is well set out in Chapter 4 of the Cutler review.

The critical question is: is this conventional story correct?

There is now substantial evidence on this issue, briefly summarised in the Section 2.1. Section 2.2 considers whether there is any direct evidence about the welfare impact of the patent system.

2.1 The evidence base

The large and growing evidence base on the relationships between patents and innovation on the one hand, and competition and innovation on the other provides valuable guidance to policy makers in determining where the balance in patent policy should lie. McGonigal undertook such a review as input to the 1984 IPAC enquiry into the patent system (McGonigal 1981). McGonigal reviewed a number of US studies on estimated gains from innovation and technical change and the estimated deadweight losses from monopolistic practices. He noted that these estimates rested on 'fairly heroic assumptions', had been criticized as suffering from serious methodological shortcomings and were of doubtful validity (McGonigal 1981: 145).[6]

McGonigal also reviewed the evidence on the then popular Schumpeterian hypothesis that market power is *necessary* for innovation. After a wide review of the available studies he concluded that if there is any relationship between firm size and/or market structure and innovation it is complex, non-linear and complicated by other factors. He noted a dearth of studies on alternative strategies of technological growth through inter-enterprise or international borrowing or imitation. (McGonigal 1981: 149). More recently Bessen and

[6] Despite these major concerns about the reliability of these estimates, the Bureau of Industry Economics (BIE) relied heavily on these reported studies in concluding that the deadweight losses of patent monopolies were unlikely to be high (BIE 1994: 42).

Meurer have reviewed a wide range of evidence on any relationship between patents and economic growth. They find that evidence of any such relationship is both limited and contingent—*it depends critically on the design of the patent system* (Bessen and Meurer 2008: 91-93).

The current evidence base includes:

- A large number of empirical studies on the mechanisms companies use to achieve returns from their investment in innovation (Scherer et al. 1959 (USA); Taylor and Silberston 1973 (UK); Mansfield 1986 (USA); Levin et al. 1987 (USA – the Yale survey); Cohen et al. 2000 (USA – the Carnegie-Mellon survey (CMS)); Arundel and van de Paal 1995 (large European firms); Harabi 1995 (Switzerland); Goto and Nagata 1996 (Japan); González-Álvarez and Nieto-Antolín 2007 (Spain).
  - These studies *all* show that in most industries patents are ranked as the least effective means of ensuring a return to investment in innovation;
    - the sole (and consistent) exception is the pharmaceutical and fine chemical industries, which involve highly codified technology;[7]
  - In particular the Mansfield study investigates the proportion of innovations that would not have been developed or commercialised, absent patents (see Table 1). He finds that outside of pharmaceuticals, and to a lesser extent chemicals, most industrial innovation would occur without a patent system
  - These studies are confirmed on a much wider scale by results from the various national innovation studies
    - in 2004-05 the Australian National Innovation Survey shows that 34 per cent of Australian firms were innovating (ABS 2007: 12).
      - → About 2,100 firms (8 per cent of innovating firms) were introducing 'new to the world' innovations, and about 2,800 firms (10 per cent of innovating firms) were introducing 'new to the Australia' innovations (ABS 2007: 12-13). It is these firms that might be expected to own patents.
      - → Unfortunately data on methods used to protect intellectual property are not provided by type of innovation. For all innovating firms, 74 per cent used no method of protecting intellectual property, and 3.8 per cent used patents (21.6 per cent for firms with more than 200 employees). If all reported patent use is among new to the world/Australia innovators, then about one in five such firms use the patent system.
      - → In summary, about 5,000 firms (18 per cent of innovating firms; 6 per cent of all firms) might be expected to consider using patents. At most, however, only one in five does so.

[7] Students of innovation frequently use a tacit to codified dimension to explore knowledge. At the broadest level codified knowledge is that which has been reduced to written form and so is more readily transferred between people, while tacit knowledge ranges from 'know-how' to the range of assumptions about how the world works that are so fundamental they are rarely written down. For a discussion of this dimension in the explicit context of innovation and the patent system see Mandeville 1996. For a discussion of the conditions under which knowledge will transfer, and the importance of knowing the code as a key condition for unlocking codified knowledge see Saviotti 1998.

- These findings are replicated in national innovation surveys elsewhere: only a small minority of innovating firms use the patent system. Other means—mostly based on market mechanisms—are more effective in providing a return to innovation expenditure. For example, 1990-1992 data from the first European Community Innovation Survey (CIS1) show the most important methods of appropriating a return to innovation are lead-time advantages and complexity (Arundel 2001: 615-5).[8] CIS3 (1998-2001) data show that, to protect innovations, 36 per cent of firms use lead-time compared to 17 per cent applying for patents and 11 per cent owning at least one valid patent at end 2000 (Eurostat 2004).

  - The strength of this evidence—that in general patents are not needed to ensure a return to innovation investment—has caused at least two world experts on industrial innovation to express surprise at the growing support for patent policy in the face of this evidence (Richard Nelson and F.M. Scherer).[9]

Table 1 Percent of innovations that would have been affected, absent patents

Industry	Not developed	Not commercially introduced
pharmaceuticals	60%	65%
chemicals	38%	30%
petroleum	25%	18%
machinery	17%	15%
fabricated metal products	12%	12%
primary metals	1%	8%
electrical equipment	11%	4%
instruments	1%	1%
office equipment	0%	0%
motor vehicles	0%	0%
rubber	0%	0%
textiles	0%	0%

Source: Mansfield 1986: Table 1 (p. 175).

- Empirical evidence also shows that the cost of imitating is substantial. A low cost of imitating is one of the fundamental assumptions in the view that knowledge has public good characteristics which lead to general failure in the innovation market. But theoretical (Cohen and Levinthal 1989; Mandeville 1996; Saviotti 1998) and empirical studies show that this assumption is the exception rather than the rule.

[8] A multiple choice among five listed methods was allowed. Two were the formal methods of patents and registered designs. The fifth was secrecy (Arundel 2001: 616).

[9] "The swing in the climate towards such an endorsement [of patent policy] is specially puzzling in the light of the empirical research that has been done on the efficacy of patent protection" (Mazzoleni and Nelson 1998: 274). "During the 1980s and 1990s, important … initiatives … strengthening patent … systems…. The political influences that led to these changes are interesting in their own right. Even more interesting, however, is the fact that governmental emphasis on patent systems increased in the wake of impressive new findings from economic studies showing that patents played a surprisingly minor role in well-established corporations' decisions to invest in research, development, and technological innovation" (Scherer 2006: 1).

- Mansfield and colleagues found that the average ratio of imitation to original costs was 0.65, and the average ratio of imitation to original time was 0.70 (Mansfield et al. 1981). For one in seven innovations, imitation costs were no lower than the original innovation costs, largely due to the innovator's greater technological capacity.
- Data from the much larger 1983 Yale survey confirmed these findings. In general, imitation saved only 50 per cent of the cost of the original R&D. However more major innovations were more expensive to replicate, and replication took longer—sometimes over 3 years; most often at least 6-12 months (Levin et al. 1987).
- During the period of first-mover advantage the innovating firm can therefore clearly charge above marginal cost and so recoup the innovation investment (Boldrin and Levine 2004).

- Unfortunately the compulsory nature of TRIPS has put paid to natural experimentation. However there are some recent natural experiments in relation to patent protection for pharmaceuticals. These have been scientifically studied.
  - Many European countries did not grant patents for chemical products until the adoption of the European Patent Convention (EPC). Italy benefitted from this situation and developed a globally-leading generics industry, that sold product to the US military (Scherer 2006: 33). Adoption of patent protection led to a massive reduction in the size of the generics industry, a substantial worsening in the pharmaceuticals balance of trade, and no increase in capacity in developing new chemical entities (Scherer and Weisburst 1995).
  - In India, which has more recently adopted patent protection for chemical products, there is no evidence of any increased R&D directed to local medical needs. There has been increased R&D but this is largely directed to US regulatory compliance for generic products so is entirely unaffected by the new Indian patent statute (Chaudhuri 2007).
- Evidence on the role of competition as a driving force underlying innovation is surprisingly sparse. However Boldrin and Levine's recent work contains several small case studies of innovation in competitive circumstances.
  - These range from the development of the Cornish steam power engine, through plant innovation in the US before the introduction of monopoly protection for plant varieties,[10] to Germany's global lead in chemicals in the late nineteenth and early twentieth centuries (Boldrin and Levine 2008). The innovativeness of the financial sector prior to the advent of finance patents is well known (Tufano 1989), and IPAC remarked on the rapid development of the Australian software industry in a competitive environment (IPAC 1984: 41).

[10] Comparing productivity growth in US agriculture generally and corn in particular to changes in 'intellectual property protection' for plants, Boldrin and Levine find no evidence of any increase in productivity following the introduction of the 1970 US *Plant Variety Protection Act*. Agriculture is, of course, far more typical (than industrial products) of the relatively competitive markets in which the conventional 'knowledge as public good' argument for patents suggests that there will be significant failure in the innovation market.

These studies raise serious questions about the effectiveness of patent policy. Indeed the most interesting gap in the evidence is any systematic scientifically-based evidence that patents are needed to induce innovation. Certainly there are anecdotes, but there are also anecdotes about the damage patents have done to other innovating firms (e.g. Kodak, RIM, those sued by E-Data, etc.). Historical analysis and scientifically selected case studies can inform and add depth to the kind of systematic evidence needed as a basis for policy that is oriented in the public interest. But anecdote does not constitute a scientific evidence base.

Along with this empirical evidence base, there have been developments in theoretical expositions which also challenge the validity of the conventional static neo-classical model of general market failure. Particularly useful contributions are that:

- the incentive effect of patents in a static model can be completely reversed in a dynamic model, because of the innovation benefits of imitation (Bessen and Maskin 2000). Given that innovation is quintessentially about a dynamic world, a dynamic model of innovation is clearly to be preferred;
- where first-mover advantages are significant, an industry norm of cross-licensing patents can reduce market-based incentives to innovate as the innovator is compelled to share these profits with others (Bessen 2003); and
- unless the initial investment cost is very high relative to market size, normal first-mover advantages will allow firms to price above marginal cost, so obtaining a return on their innovation investment (Boldrin and Levine 2004).

This broad empirical evidence challenges the conventional view that knowledge in industrial use has strong public good characteristics which prevent industrial innovators from making a profit through normal market mechanisms. Indeed, it challenges that perspective so strongly, that the overall conclusion is that **there is no evidence of any general failure in the market for innovation.** There may be specific failures in markets where knowledge is highly codified or where innovation investment is very large compared to the size of the market. **But there is no evidence of any general market failure.**[11]

In summary then there is no evidence of any general need for patents. However, innovation markets may fail where there is a high degree of codification and/or where the initial investment is very large compared to the size of the market. This suggests that a welfare-enhancing patent policy system is one that grants patents on a narrow discretionary basis. Australia has given up the right to do this.[12] However threshold requirements for grant of a patent monopoly could be set at a much higher level—this would substantially reduce the volume of patents granted. As incremental 'inventions' are more likely to create social costs then social gains, this would improve the welfare outcome of the patent system.

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[11] Despite this, there is a persistent belief in the myth that there is a general failure in the market for innovation, and that patents are therefore essential (a *sine qua non*) for innovation (Macdonald 2004). Myths are remarkably resilient to evidence, as Macdonald points out. Indeed this is clear from the Ergas and Cutler reviews, both of which put forward the conventional, and unsubstantiated, view that there is general failure in the market for industrial innovation. It is to be hoped that the Rudd Government's emphasis on evidence-based policy will finally lead to these conventional views being properly assessed and interrogated.

[12] Scherer suggests that, for low-income countries, this was a Faustian bargain as the *quid pro quo* for TRIPS was never delivered (Scherer 2006). Whether Australia has had a similar experience is not known. It is unclear what benefit Australia expected from being a 'friend of intellectual property' during the Uruguay negotiating round.

2.2 Policy effectiveness

Another way of approaching the issue of what should be patentable in a welfare-enhancing patent system is to look to program evaluations. Unfortunately, there does not ever appear to have been a serious evaluation of the delivery of patent policy. The 1984 IPAC was billed as an economic evaluation, but the only economist on the committee lodged a dissenting statement saying that '[t]his report does not live up to its claim to have adopted an economic perspective and to have applied economic criteria' (IPAC 1984: 79). The IPAC review did however commission a number of studies. The conclusion from the supporting research was that 'the benefit/cost ratio of the patent system in Australia is negative, or at the very best, in balance' (Mandeville et al. 1982: 213). This statement was, of course, made before the substantial expansion in patentable subject matter. There are no objective data on the height of the inventive step in the early 1980s compared to now.

As noted above, there is now considerable empirical evidence seriously questioning the necessity for patent policy. Given the goal of increasing innovation, the most critical issue in assessing the effectiveness of patent policy is what proportion of patented innovations are *induced* by the patent system.[13] I have been unable to find any estimates of the proportion of innovations induced by the patent system, so have developed my own rough estimate (Moir forthcoming-b).[14] This draws on the empirical studies above, particularly Mansfield's work in estimating what innovations would not occur absent patents, and the data from the CMS on reasons for patenting (Cohen et al. 2000). The assumptions underlying these estimates err generously on the side of patents as an effective inducement mechanism. Details of these estimates are provided in Appendix 2.

Overall only some 3 to 4 per cent of patented inventions in Australia are both induced by the patent system and have the potential to generate the positive spillover benefits that would offset any costs imposed by the patent system. Other countries where the proportion of patents domestically owned is small would be in a similar situation.[15] At the opposite end of the spectrum is the USA, where some 25 to 33 per cent of patented inventions may be induced and potentially generate positive externalities.

The results for Australia—that 3 to 4 per cent of granted patents carry the full weight of offsetting the deadweight and other losses attributable to all granted Australian patents—should surprise no-one. For many years only 8 per cent of standard patents have been granted to applicants resident in Australia. Most of the alleged dynamic benefits of patents—particularly knowledge spillovers—flow overseas (NOIE 2004: 97).[16]

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[13] Surprisingly few commentators on the patent system raise this issue of the inducement effect. Only Machlup and McGonigal point to inducement as a central issue (Machlup 1958; McGonigal 1981). This may be partly because of the difficulty of measuring induced innovation. The difficulties are not, however, insurmountable. For example the Bureau of Industry Economics (BIE) has successfully estimated innovation induced by the R&D tax concession (BIE 1993: 90-98)

[14] In some ways this approach parallels that of Machlup in estimating whether a one-year extension in patent life would be welfare-enhancing (Machlup 1958), and Lemley's estimates of the resources that should be devoted to patent examination (Lemley 2001). A series of assumptions are made, drawing on the best available evidence, to produce rough estimates.

[15] For example the proportion of patents owned by residents is 12.4 per cent in the UK and 15.1 per cent in Sweden (Bates 2003: 55).

[16] In a work on 'intellectual' property, it is important to give credit where credit is due. The author of both the NOIE study and the 1994 BIE study on the economics of patents is the economist John Revesz.

Studies of the value of patents focus on private value, so are of limited use for public policy analysis. It is well known, from patent renewal studies, that much of the private value of patented innovations lies with a tiny proportion of them. Pakes estimated that half the total private value lay with 5 to 10 per cent of granted patents (Pakes 1986: 777-8). In an study of high-value patents,[17] Harhoff and colleagues found that fully 76 per cent of the total gross private value of this set of 222 valuable patents rests in just 19 (Harhoff et al. 1997). These data suggest that most of the private value of patents lies with as few as 1 to 5 per cent of patents.

More recently, Bessen and Meurer have estimated the private value of patents for US publicly listed firms. Their estimates:

> "suggest that the economic benefits of patents are very highly concentrated among a small number of firms. Over one-half of the value of worldwide patents accrues to a small number of large pharmaceutical firms; over two-thirds accrues to firms in the chemical and pharmaceutical industries."
>
> Bessen and Meurer 2008: 109

More than half a century ago, Corwin pointed out that only a few companies benefited from the US patent system, and went on to argue that this was a poor rationale for maintaining it given the probability that the overall impact of the patent system was negative (Edwards 1949). Apart from Boldrin and Levine's recent estimates, there is almost no academic work on the concentration of patent ownership.[18] I have recently made some estimates of the companies which own most patents in the USA and Australia. While there is a slightly higher proportion of individual ownership in the USA (12 compared to 8 per cent), the share of patents owned by organisations is highly concentrated in a small number of companies. One-third of patents owned by organisations in each country are owned by just 100 companies.[19]

In the USA 43 of these 100 companies are US-based. In Australia only one company in the top 100 list is based in Australia—Silverbrook Research Pty Ltd ranks 76th among Australia's most frequent patenters.[20] The small proportion of innovating firms using patents was noted above. Among firms which own Australian patents there is a highly skewed distribution. While the top 100 companies own 34 of all patents owned by organisations, there is a very long tail of companies owning just a few patents. Overall 908 companies own 19 or more patents from applications in the 1990-2001 period, and this constitutes 64 per cent of patents granted to organisations. So the data in the Figure 1 are a truncation of the full distribution. Firstly, the three companies owning most patents have been excluded, or the remainder of the graph would have been invisible. Secondly the

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17 Patents sought and granted in both the US and in Germany, where renewal fees were paid to keep the German patents in force for their full life.

18 Watson and Holman noted considerable interest in industrial concentration, but the neglect of interest in the ownership of patents (Watson and Holman 1970). The neglect continued—based on information from the ISI Web of Knowledge (as at 13 March 2008) their study has never been cited.

19 Actually 33 per cent in the USA and 34 per cent in Australia (Moir 2008: 10-11).

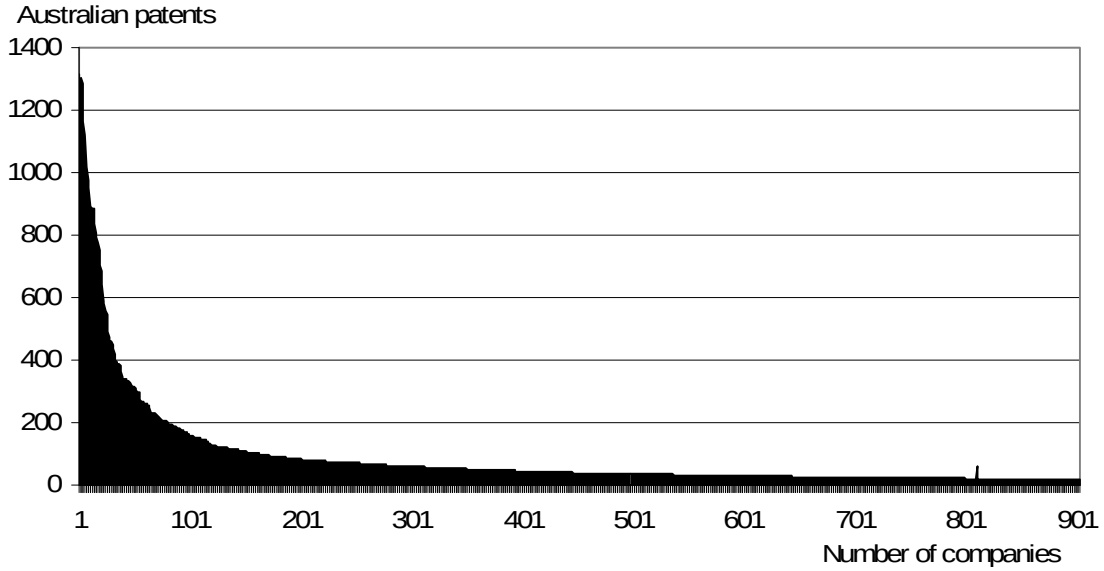
20 Companies owning the most standard patents granted from applications made between 1990 and 2001. These are the most recently available data, as it now takes seven years for IPAustralia to process a cohort of patent applications. As Griliches pointed out, grant data by grant year are misleading as they reflect administrative resourcing not business decision making (Griliches 1990).

unknown but very large number of companies owning fewer than 19 patents are excluded.[21]

While patent benefits are very concentrated, very little is known about costs (Cole 2001). Almost the only thing that is generally known about the costs of patent systems, is that part of the cost is widely distributed. The costs imposed by use of monopoly power are higher prices and reduced output, and these costs can be shared between many users (and potential users who cannot afford the price). These costs are similar to the costs imposed by tariff barriers, but are far more difficult to estimate. It is often suggested that these costs are low, but such claims have not been substantiated with any evidence.

Information on what proportion of patents is used and in what manner is critical to assessing the economic cost of patent systems. The 1984 IPAC review recommended that patentees should be required to provide details of patent use periodically when they renewed their patents. Unfortunately this recommendation was never taken up.

Figure 1 Ownership distribution of Australian patents, 1990-2001



Notes: Based on grants for standard patent applications filed between 1990 and 2001. Excludes the three companies with most patents (Ericsson 1858; Hoechst (Sanofi-Aventis) 1818; and Procter & Gamble 1526). Also excludes all companies with less than 19 patents granted in the period.

Nor is there much data on the more concentrated costs imposed on innovating firms by the patent system. Bessen and Meurer have pointed out the very significant costs of searching to establish the boundaries of patented technology, a cost that increases with the volume of patenting. This cost is incurred only by innovating firms. They also show that the net private return from patents to publicly listed US firms (excluding pharmaceutical companies) is substantially negative (Bessen and Meurer, 2008). This is argued to be due to the difficulties of establishing patent boundaries, which gives rise to a high risk of inadvertent infringement, and thus to substantial litigation risk.

[21] Assuming a (rather high) average of ten patents per company, this would mean over 5,000 extra companies beyond the 905 shown in Figure 1.

Despite IPRIA's useful project on patent litigation in Australia, no data are yet available on the costs and consequences of infringement litigation on Australian firms. Many patent disputes in Australia are between overseas-based firms and so are unlikely to affect Australia's economic health. But some disputes are between Australian-based firms, and some involve a foreign-based and a domestic-based firm. Where questionable patents are upheld, a company will usually be ordered to cease the 'infringing' line of business and to pay damages and costs.[22] Royalties may also be collected in respect of both valid and questionable patents simply on the basis of a solicitor's letter. Systematic data from all legal actions to enforce patents is essential if Australia is to know the costs of its patent regime, and whether these are offset by possible benefits from induced innovation.

This section has presented a very quick effort to assess the patent system to see whether it is welfare-enhancing and what light this throws on patent policy. There are two critical findings. There is a dearth of data on the costs and benefits of the patent system, although such data could (and should) be collected. A very tiny percentage of patents (about 3 per cent) carry the full weight of providing the dynamic benefits to offset any costs imposed by the whole set of granted patents. It seems improbable that this small set of patents could create social returns sufficient to offset the social costs of Australia's patent system.

In summary, all the available evidence and the recent theoretical developments suggest patent systems are probably welfare-reducing. Patents are not critical in inducing innovation unless the degree of codification is very high (and imitation costs genuinely very low) or the initial investment very large compared to total market size. There are no available empirical data from patent evaluations to offset the weight of this evidence.

3 Patents in practice: what is being patented?

The *Patents Act 1990* allows for the grant of a legislatively-backed monopoly for inventions (defined as any 'manner of manufacture' as in Section 6 of the 1643 *Statute of Monopolies*) that also meets specific criteria of novelty, inventiveness and utility. It is widely agreed that what has been accepted as a patentable invention has changed over recent decades.

While parliament has from time to time codified new legal doctrines, there is no evidence that the legal doctrines so codified have ever been subject to any economic (or other) policy analysis. So the broadening in what is patentable seems to occur within the administration of the patent system, through the adoption of changing legal doctrines (policies).

This section explores what can in practice be patented in Australia, making some comparisons with what could be patented at earlier times. The starting point is a brief consideration of the 'manner of manufacture' definition, identifying a range of subject matter being patented today, but which was not patented even a few decades ago. Two of these extensions are then explored in more detail: software and incremental 'inventions'.

3.1 'Manner of manufacture'

The complex 'manner of new manufacture' test remains the basis of Australia's definition of a patentable invention. It was designed at a time when most inventions were mechanical. A particular area that has always caused difficulty is the patenting of processes (Merges

[22] See, for example *Welcome Real-Time v. Catuity*, a case discussed in Section 4.2.

1999; Stern 1999).[23] Processes raise far greater boundary problems for patent law than physical artefacts. Such difficulties seem compounded by the lack of any clear definition of a patentable invention. The High Court's 1959 NRDC definition, that a 'manner of manufacture' is *any artificially created state of affairs that has economic value*, seems broad and imprecise from a policy perspective.

- IPAC considered that 'manner of manufacture' did no more than distinguish between the 'useful' and 'fine' 'arts' (IPAC 1984: 40, see Appendix 1);
    - but while these terms may have been helpful decades if not centuries ago, they provide little guidance today. Indeed they are problematic because they ignore at least one other category of activity, the 'liberal professions'. When the 'liberal professions' are also considered, then fields like accounting, medicine and law clearly used to be excluded from patentability. Now these fields seem to be defined as 'useful arts';
- Christie considers that it means there are no subject matter limits to patentability in Australia, other than the exceptions in the *Patents Act 1990* (Christie 2000).
- Van Caenegem considers the NRDC criteria are 'vague and embryonic', as demonstrated through difficulties in their application (van Caenegem 2002: 44).

IPAC considered whether explicit restrictions should be introduced for chemicals and for software. The committee was unanimous in recommending against the extension of patentability to software, both because there was no demonstrated need, and because of the substantial practical difficulties that would be involved. It was however divided as to the benefit of excluding chemicals and pharmaceuticals from patentability. The majority considered that the evidence to warrant such an exclusion was insufficient (see Appendix for full text from the IPAC report on this matter).

IPAC recommended retention of the traditional 'manner of manufacture' definition of an invention because of the extensive body of case law, and the 'flexible' manner in which it had been used. The IPCRC took a similar approach, accepting that the 'open-textured standard' imposed costs, but considering that there were also costs to a more codified approach. Most submissions to the IPCRC argued for the retention of the 'manner of manufacture' test because it had shown it could respond 'flexibly' to changing technologies. IPAC did not comment on the views presented in submissions to its enquiry, though in his dissent from the report Professor Lamberton noted the report was constrained by 'special pleading by those directly involved' (IPAC 1984: 80).

While economists tend to interpret the phrase 'patentable subject matter' as a question of which fields of technology should be patentable, lawyers treat it in a far more complex and multi-faceted manner (Bochnovic 1982). Because the original phrase is actually 'manner of *new* manufacture', there are strong elements of novelty and inventiveness embedded in the concept. There are also a number of caveats in the original Section 6 exemption, all concerning the need for balance in granting patents. For example Lord Coke, a leading

[23] There is also some indication that the patent system has also always had problems with chemicals (Dreyfuss 2000; Lawson 2008), but this is not a matter I have studied in any detail yet. There are also arguments in the literature that some of the very low inventiveness standards applied to biotechnology products are due to erroneous application of analogies from the chemical field (for example the erroneous application of a non-obviousness standard from chemicals to DNA sequences (Thambisetty 2008: 33-34)).

legal expert at the time, considered that the patenting of improvements was 'contrary to law" (the common law that is) (Walterscheid 1995a).

The proviso that a monopoly for invention should not also be generally inconvenient is an open invitation to balance in the patent system, and is specifically included in the terms of reference of this review. But it does not seem to have been much used, at least in recent decades. Indeed, this part of the definition of a patentable invention does not appear to have stopped legal decisions to extend patentability to matters never previously patented, such as mathematical algorithms, methods of medical treatment or gene sequences. In some of these decisions some judges have specifically taken the view that if parliament has not listed a matter for exclusion, *then very long-standing traditions of exclusion can be over-turned*. It is unclear why judges have recently adopted this view. The specific exclusion in the *Patents Act 1990* was introduced through negotiation with the Democrats and an independent. There is absolutely no evidence that the government's acceptance of IPAC's advice not to amend the 'manner of manufacture' definition meant open season on patent boundaries. There is no evidence that the introduction of one limitation during Senate negotiations in any way implied that either of the major parties (the legislative majority) considered that the traditional boundaries of patentability were now defunct.

If one looks at the kinds of things actually being patented today, there are a number of areas where patents that would have been refused only a few decades ago are now being granted. These include:

- software;
- mathematical algorithms;
- business methods;
- compositions which do not differ from things found in nature (particularly genetic material);
- methods of medical treatment; and
- incremental 'inventions'.

The extension of patents to software and business methods provides some interesting insights into the difference between policy and practice as it is an area where there was explicit government consideration of extending patentability. This is considered further in Section 3.2.

Many informed commentators consider that many very obvious patents are being granted in the USA (Harris 1986; Jaffe and Lerner 2004; Lunney 2001, 2004; Merrill 2003). There is every indication that Australia's inventiveness threshold is no higher, and perhaps lower (Lawson 2008).[24] The issue of incremental 'inventions' is considered in Section 3.3.

3.2 Software 'inventions'

With the development of computers in the mid-twentieth century, there was an active policy debate as to whether patents should be extended to this new technology area. In the USA the 1966 President's Commission on the Patent System recommended that patentability not be extended to software, and in 1980 copyright protection was formally

[24] I have recently completed a study where I assessed a small universe of 72 business method patents against the economic inventiveness standard that there should be a contribution to knowledge (Moir forthcoming-a). Only one of the 72 patents was considered to possibly make such a contribution. Many simply involved the computerisation of known methods or the application of well-known techniques (audit, benchmarking, general ledger codes, financial ratios) to a field where it had not previously been patented.

extended to cover computer programs (Samuelson et al. 1994; Smith and Mann 2004). Subsequently the US government lobbied others to provide this form of protection for software. Its first success was in Japan. In 1994 it succeeded in having copyright protection for computer programs made compulsory as part of the TRIPS Treaty. The Australian history was similar (except for the influence on other countries). The 1984 IPAC review of patents considered the issue, and concluded both that there was no need for patents to encourage software innovation and that implementing patent 'protection' for software would raise substantial practical problems (see Appendix 1). In 1984 the government specifically amended the Copyright Act was to formally extend copyright protection to computer programs (Bell 1987).

When TRIPS was agreed in 1994 it was accepted that the most appropriate form of 'protection' for software was copyright, and Article 10 *requires* copyright 'protection' for computer software. It was commonly understood that computer software was not patentable, and the question of the patenting of business methods was not even discussed (New Zealand Ministry of Economic Development 2002: 51).

There has been policy consideration of, and a government decision about, patenting software. The decision was to provide software 'protection' solely in terms of copyright. It is clear from the IPAC report (Appendix 1) that it was not thought necessary to take action to prevent software patenting. It was widely accepted that this was the law. This view had been clearly expressed in 1968 in a decision by an Australian Patent Office Hearing Officer on a (software) method for solving linear programming problems more quickly:

> "Computer programming is a relatively young art and, although many stratagems and simplifications have been devised so far, a much greater number may be expected to be devised in the future. It would certainly be mischievous to the State and generally inconvenient if, after investing a million dollars in a computer, the owner were to find himself prevented from operating it efficiently, or in any other manner he may wish, or with any degree of privacy or secrecy he may desire."
>
> *British Petroleum Co. Ltd.'s Application* (1968) 38 AOJP 1020: 1021

The 1981 US Supreme Court case *Diamond v Diehr* was generally agreed at the time to mean that inclusion of software in a broader invention did not prohibit the patenting of that broader invention but it did not permit the patenting of the software component. The IPAC review had taken a broad approach to considering software, including 'accounting, investment, and other systems of doing business' (IPAC 1984: 40), so it could be assumed that the government's acceptance of IPAC's recommendations included that patents not be extended to either software or business methods.

In 2003 ACIP advised the government on the new problem of business method patents (which the IPCRC had not really addressed as it assumed none would pass the threshold tests of novelty and inventiveness (IPCRC 2000: 153)). ACIP recommended no action because only about 60 business method patents were being granted each year and the costs of any action to prevent business method patents might outweigh the benefits.[25] The government accepted these recommendations, noting that it had not yet responded to the ALRC recommendation for a review of the 'manner of manufacture' definition of invention.

[25] ACIP also recommended that the matter be kept under review for 5 years (ACIP 2003: 35-36). By 10 August 2008 Australia had granted 1620 business method patents (898 where the primary classification was a business method class).

These two decisions, together with the bi-partisan ratification of the TRIPS treaty, indicate a clear official policy position:

- software should be protected by copyright not patents; and
- although business method patents are being granted, the numbers and level of concern are insufficient to warrant taking action to prevent this.

There is a substantial gap between this policy position, and the actual implementation of patent policy. This gap is discussed further in Section 4 below.

3.3 Incremental 'inventions'

Identifying a formal government position on the level of inventiveness required for the grant of a patent monopoly is more challenging.

IPAC considered the issue of inventiveness under the heading 'fostering national interests'. But their discussion focused solely on what knowledge could be used in the novelty and inventiveness tests, not how effectively these tests operated as 'entry requirements'. They recommended some very limited changes to allowable existing knowledge. So too did the IPCRC. [26] The IPCRC's recommendations were made in the context of a clear understanding of the need to balance the probability of granting uninventive patents against that of rejecting inventive applications. They were also made in the context that some submissions (including from the Department of Industry, Science and Resources) suggested that the inventive step in Australia was low. But given their judgement that business method applications would not meet the threshold tests for patentability, they may have had a mental image of a reasonably high step. In addition to minor changes to the definition of prior art for inventiveness, they recommended a modest change to the decision-making rule for novelty and inventiveness.

The 1994 BIE study on the economics of patents presumed that the inventive step in Australia was of a reasonable height. It noted the possibility of unnecessary costs if patents were granted to non-innovative products or processes, but considered that the novelty and non-obviousness tests prevented this occurring (BIE 1994: 45).

It is difficult to determine the government and legislature's understanding of the height of the inventive step, as most of the debate on the *Patents Amendment Bill 2001* was political. The second reading speech made no comment about the consequence of the changes, except that it would bring Australia into line with other countries and 'result in stronger patent rights' (Hansard, House of Representatives, 24 May 2001: 26974-75). The debate on the introduction of the innovation patent in 2000 is more informative. The second reading speech contrasted the type of 'improvements, adaptations and refinements' to which the innovation patent was directed with 'major inventive advances' (Hansard, 29 June 2000). During the limited parliamentary debate only Mr Ross Cameron, MP, spoke about inventors, inventions and innovation. He referred to a number of significant inventions such as the aeroplane and space craft. Members of the legislature may well believe that standard patents are only granted for 'major inventive advances'.

It is hard from this material to draw firm conclusions as to the understanding held by government, parliament, and expert advisory committees as to the height of the inventive step. The limited evidence suggests they may think it substantial. Certainly it is unlikely

[26] Including re-recommending IPAC recommendations that had not been implemented.

that the government would adopt a policy favouring a low standard, as this would mean a policy that the patent system should be welfare-reducing not welfare-enhancing.

As noted above many experts consider that the current standard of inventiveness in US patent law is extremely low. Bakels and Hugenholtz (2002) argue cogently that the current very low inventiveness standard in Europe is based on standards introduced through case law (legal doctrine). Thambisetty shows a range of 'silly outcomes' (doctrinal incoherence) occurring in patent law, and argues that a principal reason is that in many cases, especially those heard by the EPO TBAs, and the CAFC, the decisions are made within the self-reinforcing but isolated patent community (Thambisetty 2008). I have elsewhere provided empirical evidence on the very low inventiveness standard in Australia in respect of business method patents (Moir forthcoming-a). This low standard derives directly from specific rules and 'doctrines' used in implementing patent policy, so it is also likely to be found in other subject matter areas. Lawson considers the inventiveness requirement for a standard patent in Australia has been reduced to a very low level—a per se rule (Lawson 2008).

Overall it seems likely that the actual inventiveness standard is lower that the standard determined in patent policy. This matter should be urgently explored. If the government prefers a very low inventiveness standard, and the grant of legislatively-backed monopolies for very incremental 'inventions', then there is no problem with that aspect of patent administration. But if the government desires a high inventiveness threshold, so that monopolies are granted only when it is likely that there will be a resulting benefit to the nation, then there is a substantial problem in patent implementation.

4 Why the gap? problems in patent administration

As noted in Section 1.4 there are many parallels between patent policy and tax policy. Both are systems implemented through law. Both are systems where individual entities can gain substantial private benefits by 'gaming' the system. This gaming behaviour ('clever legal drafting') has long been known to be rife within the patent system. Nearly 60 years ago, in a treatise on how best to ensure effective competition policy, Edwards noted that:

> "As it reaches the patent office the application combines technological and legal invention, and the latter, if of superior quality, may do much to offset deficiencies in the former."
>
> Edwards 1949: 218

But while tax policy has been subjected to substantial analysis and considerable experimentation with regard to how to prevent such behaviour, patent policy has not. However the parallels are sufficient that many lessons can be drawn from tax policy. These are discussed in Section 4.1.

Attention is then turned to what can be learned from an economic review of specific legal decisions and specific legal doctrines. Unfortunately there does not seem to have been any work on this subject, at least in Australia. Several cases are selected and discussed from an economic policy viewpoint in Section 4.2. This discussion might seem odd to any lawyer reading the material. The intent is not a doctrinal analysis, but an initial assessment of the economic impact. A similar approach is taken in Section 4.3, this time with respect to a number of legal doctrines that seem to be critical in affecting the height of the inventive step. The discussion of abstract and general claims in Section 4.4 is able to draw on existing

analysis, as this matter has attracted the attention of economists. Finally in Section 4.5 this material is analysed for the patterns it displays. The object is to identify patterns that will identify why there appears to be such a large gap between policy and its implementation in respect of the patent system.

4.1 'Gaming' the system

Given the very high value that can be extracted from the few patents that hold most of patent value, the concentrated ownership and the large community of intermediaries who make a living from the patent system, there is a strong incentive for private parties to attempt to 'game' the system. 'Legal entrepreneurship when economic stakes are high does not work simply by exploiting change and complexity that is inherent in post-industrial societies. It also works by contriving change and complexity' (Braithwaite 2005: 148). Similar issues are found in respect of tax law, where wealthy parties have a strong incentive to 'game' the system.

In both patent law and tax law there are substantial financial incentives for parties who are well able to afford expert legal advice to 'game' the system. Legal semantics—'clever' legal drafting—have been widely used to undermine statutory and doctrinal exclusions (see, for example Brödner 2003; Thambisetty 2008). This is in some ways parallel to the kind of financial arrangements which are picked up by the 'anti-avoidance' principles of tax law. Both strategies are designed to undermine / avoid the purpose of the law. Braithwaite (2005) argues that in such circumstances it is important that statute law have over-arching principles which trump specific rules. He also argues that it is important that there be 'anti-avoidance' mechanisms[27] and that the legislature must be willing to intervene when judicial decisions are made that undermine the purpose of the legislation.

One major difference, however, is the culture within which the tax office and the patent office are embedded. No-one likes a tax cheat, so the tax office operates within a general cultural climate that places a high priority on its role as an 'honest gate-keeper'. The patent examiner faces as very different climate. With the shift in the Australian Public Service in the 1980s to a focus on stakeholders and delivering value to stakeholders, the patent office seems increasingly single-minded in its desire to meet the needs of inventors and the innovating community. ACIP, for example, has no representatives from competition or consumer policy, nor any economists. The only two representatives of the 'public interest' are senior public servants who are also tasked with meeting 'stakeholder' needs. This shift in climate makes the task of the examiner, as guardian of the public domain, rather difficult.

The Cutler review has raised the question of whether 'intellectual property' should be treated as a matter of competition policy, and perhaps fall under a different portfolio (Cutler et al. 2008: 85-86). This suggestion is welcome. If 'intellectual property' policy were located within the portfolio charged with the overall health of the economy, off-setting pressures would increase the probability that the patent system would be balanced to ensure a clear welfare gain for the economy.

Both the tax system and the patent system have evolved large number of intermediaries who assist clients in the face of complex requirements. Another system that created such a

[27] The Patent equivalent to complex tax-avoidance products is 'clever drafting'. Both are designed to undermine the purpose of the legislation. As Prescott J said in a UK case on an Australian business method 'invention': 'You are not allowed to get around the [statutory provisions] … by … a mere change of form' [2005] EWHC 1589 (Pat) at 36.

body of intermediaries was the tariff system, though nowadays few tariff consultants are left. The role of the tariff consultant was very similar to the role of the patent attorney. The principal 'value' each adds for clients is the ability to craft an application to fall on the 'right' side of a regulatory boundary. So the incentives for innovators to 'game' the system are reinforced by the incentives for patent attorneys to deliver 'value' to their clients by making the unpatentable patentable. Within the tax system these incentives are offset by civil and criminal penalties for under-mining the system. No such penalties apply to an innovator who seeks a patent for an uninventive 'invention', or a monopoly for more than they have invented. Similarly in tax policy accountants and tax agents incur penalties for behaviours which undermine the integrity of the tax system. Application of a similar principle within the patent system would mean that patent attorneys would incur penalties for behaviours which undermined the integrity of the patent system.

Two important principles that should be incorporated into the patent statute are the purpose of providing an incentive to innovation, and the desire that this incentive be balanced against the harm done by the grant of monopolies.[28] In other words the legislation needs to spell out the clear economic goals of the patent system, and specify that a reasonable quantum of inventiveness is required so that a patented invention be likely to contribute a benefit to the nation which will offset the harm caused by granting a monopoly. These two objectives would give much clearer guidance to administering agents in interpreting the statute in a welfare-enhancing manner.

Drawing on the experiences of tax law, it seems essential to include in patent law not just clear objectives setting out over-arching principles, but also an 'anti-avoidance' principle. As is widely known 'clever legal drafting' has been responsible for much of the expansion in patentable subject matter. This undermines the democratic role of executive government and parliament. Specific rules need to be adopted which will require decision makers (whether the initial examiner or the final appeal judge) to focus on the *essence of the invention*—that which is contributed to society. There must be clear rules which treat legal semantics for what they—a means of undermining parliament's intent.

Braithwaite suggests for tax policy that principles should trump specific rules where there is a conflict. Adoption of these reforms, which have worked well in the tax policy system, would clearly do much to return patent law to a system of balance.

4.2 Case law: subject matter

Despite its economic objectives, changes in patent policy occur through judicial decisions in determining individual cases, often between private individuals (or companies), with no party specifically representing the public interest. Case law seems not to have been subjected to systematic economic analysis. It has simply (and regularly) been codified into statute law without any evident assessment of whether this is to the benefit of the nation or not. In this section several legal decisions are briefly considered from an economic viewpoint. The objective is to attempt to determine the range of factors which create the large gap between formal patent policy, and the patent system as it is administered.

[28] While balance has been an important feature of patent policy since 1624 it is not written into the statute. As noted above the purpose of patent policy is not written into the statute.

Patenting improvements

An early case is where a judge made a pragmatic decision to accept legal changes introduced by administrative officers—in this case the extension of patentability to improvements. For over a hundred years patents for improvements were considered to be 'contrary to law.' Yet in 1776 courts took the pragmatic approach of adopting (unlawful) existing practice into case law (Walterscheid 1995b). This undermined the very narrow exemption provided in Section 6 of the *Statute of Monopolies*. While a completely new manner of manufacture could not undermine the common law right to carry on a trade, an improvement was more likely to impinge on what others were doing, or might independently do in the near future.[29] This judgement opened the doors to the possibility of granting monopolies where the benefit to the nation was less than clear-cut.

This example is relevant today. The IPCRC emphasised the pivotal policy importance of maintaining a distinction between discovery and invention in ensuring that patent policy did not undermine competition policy. 'Property rights in discoveries … could give rise to unreasonable barriers to potential competitors or to those who wished to use the 'discovery' in other fields of endeavour' (IPCRC 2000: 152).

Despite the importance of this distinction to competition policy, the Australian Law Reform Commission (ALRC), in considering gene patents, took the view that so many discoveries had now been granted patent monopolies that one should simply accept the situation.[30]

Adopting and codifying bad policy—based on no evidence and highly questionable in terms of its economic impact—does not make it good policy. Indeed it brings policy makers and the legal system into disrepute for ignoring the public interest.

Welcome Real-Time v Catuity

In *Welcome Real-Time v Catuity*,[31] Heerey J remarked, with no reasons, that he found the US Court of Appeals for the Federal Circuit (CAFC) *State Street Bank* case persuasive. Since then business methods have been deemed patentable in Australia. From an economic viewpoint, the lack of any evidence for a major policy change is disturbing.[32] To import overseas law, without argument, justification, public debate, or reference to the appropriate policy making authority seems a very strong form of judicial law-making. Also disturbing

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29 Another strange belief in patent policy is that there will only be one inventor. But simultaneous invention is the norm rather than the exception (Boldrin and Levine 2008). Kitch noted that '[m]ultiple inventions of the same thing are not rare. When technological developments bring something into the realm of the possible, it may be known to many and many may search. If their resources are similar, they will arrive at the goal at about the same time (Kitch 1977: 269). Dreyfuss comments that '[i]n the fullness of time, it is highly likely that every invention will be made; to a large extent, the real goal of patent law is not to induce invention, but instead to induce it sooner rather than later' (Dreyfuss 2008: 438).

30 "However, the time for taking this approach to the patenting of products and materials [that discoveries should not be patentable] has long since passed. For decades, naturally occurring chemicals have been regarded by patent offices in many jurisdictions as patentable subject matter, when they are isolated and purified. This principle has been applied by analogy to biological materials, including genetic sequences, on the basis that they are 'merely' complex organic compounds. This development was certainly not foreseen when the modern patent system was established, and a different approach might have been available when the issue first arose for consideration" (ALRC 2004: 6.52)

31 [2001] FCA 445 (17 May 2001).

32 It also ignores the substantial economic and legal criticism of the US decision (for example, Krause 2000; Menell 2006; Stern 1999; Thomas 1999).

in regard to this judicial comment is that it was made without any input from any party representing the public interest.

The essence of the invention in *Welcome Real-Time* was the use of a well-known software technique (dynamic storage) applied in the software environment of smart chips, and designed for use in loyalty programs. Effectively this was a process designed to deliver consumer loyalty rewards, achieved through the smart chip. Loyalty programs and rewards have been around for decades if not longer. Heerey J considered this was not a business method but 'a method and device, involving components such as smart cards and POS terminals, in an infinite range of retail businesses.' To an economist this reads very strangely. The 'invention' is specifically designed for use in loyalty programs, which are a core business method, part of marketing. The 'invention' simply adopted a well-known software technique to replace less efficient means of recording purchases and rewards. How can it then not be a business method?

In the judgment the relevant technology ('art') was in fact specified as loyalty programs,[33] and it was held unreasonable to expect people skilled in loyalty programs to be aware of dynamic storage techniques. The validity of the patent was upheld, despite the fact that it clearly contributed no new knowledge. Heerey J noted that Welcome had been involved in loyalty programs since at least 1995, that in 1995 Shell had introduced a 'scheme-wide currency programs based on chip cards', that a company called Gemplus proposed several solutions to the Welcome's French subsidiary Carte Jeunes, and that the inventor 'accepted that the idea of using memory dynamically was a well known computer systems technique in 1995, but not in that context.' From an economic viewpoint it is hard to see why this combination of facts gave rise to any patentable invention:

- the inventiveness lay entirely in the software programming (dynamic storage);
  - this was a well known software technique in 1995;
- consequently there was no new knowledge;
- the use was entirely in respect of a business method; and
- there was no possibility of any benefit from which to offset costs.

To the extent that there was any quality of inventiveness this lay in the use of a well-known technique in a marginally different environment. But software is a general purpose technology. It is to be expected that it will be used in a wide variety of environments. More generally, such transfers of ideas and processes from one application to another are the essence of competitive market places—'*the very lifeblood of a competitive economy'* to quote the US Supreme Court.[34] In a modern innovative economy, open to global influences and with a well-educated workforce, such adaptations are the norm and not the exception. There is no economic basis for the grant of a monopoly for such normal developments. The ordinariness of this 'invention' is confirmed by Catuity's independent invention of a similar process—quite unsurprising given the general knowledge of dynamic storage and its suitability for this purpose. Although Catuity was engaged in commercial trials in early 1995 this was not early enough for a prior use defence. Catuity was found to have infringed the Welcome Real-Time patent, was ordered to cease using their independent invention, and to pay damages and costs (McFarlane 2001).

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33 This is internally inconsistent with the view that the 'invention' was not a business method.

34 US FTC 2003: 3, citing from *Bonito Boats, Inc. v Thunder Craft Boats, Inc*., 489 U.S. 141, 146 (1989).

Emperor Sports

Emperor Sports is a very different decision, but equally disturbing from an economic viewpoint. It illustrates the narrowness of the interpretation of permissible existing knowledge for the inventiveness test.[35]

Australian patent 662,655 is essentially for removable tags for use in touch football. A request for re-examination was received after grant, and the patent was revoked on the grounds that it was obvious, given several previous US patents. The applicant appealed, and Lindgren J held that the relevant person skilled in the arts would not have considered consulting the US patent database, so such information could not be used to show that the invention was obvious. The Commissioner appealed to the Full Federal Court, but they agreed that it was unreasonable to expect a Rugby League or Australian Rules coach, referee, umpire or administrator to search US patents (APLF 2006).

This decision effectively means that in many fields, particularly fields with moderate to low levels of technology and patenting, all previous knowledge demonstrated through the grant of patents becomes irrelevant for determining if an 'invention' is inventive or not. This makes a mockery of the whole question of an objective test of inventiveness and of the balance between the grant to the 'inventor' and the public interest. It is, however, clearly founded on the wording of Section 7(3) of the *Patents Act 1990*.[36]

Grant

A third case of interest is the *Grant* case. This was an application for an innovation patent. It was rejected four times. The applicant repeatedly appealed showing the extent to which the patent system allows a potential innovator to seek a new opinion on the patentability of their 'invention'. The third and fourth decisions are of considerable economic interest.

The 'invention' is for a method for shifting assets into a trust structure so that they cannot be claimed by legitimate creditors. This appears to an economist to be a method of undermining the laws of the land. But according to the issues paper the interpretation of Section 50(1)(a) of the *Patents Act 1990* is very narrow (ACIP 2008: 30). It seems from an economic viewpoint that the intent in making unpatentable inventions whose use would be contrary to law would include inventions whose purpose was to avoid compliance with the law. This argument was used only in the third decision, and as a secondary consideration.

From an economic viewpoint, the soundest decision was this third rejection, but lawyers seem to find it a strange decision. Branson J determined that the critical principle in the case was that 'an invention should only enjoy the protection of a patent if the social cost of the resulting restrictions upon the use of the invention is counterbalanced by resulting social benefits.'[37] This view can be seen to derive directly from the caveats in Section 6 of the *Statute of Monopolies,* including that the invention should also not be contrary to law,

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35 *Commissioner of Patents v Emperor Sports* (2006) 225 ALR 407;(2006) 67 IPR 488; [2006] FCAFC 26.

36 The material that can be considered in the inventiveness test is specified in Section 7(3). Section 7(3)(b) specifies the conditions under which two or more pieces of prior art can be combined as "being information that the skilled person mentioned in subsection (2) could, before the priority date of the relevant claim, *be reasonably expected to have ascertained, understood, regarded as relevant and*, in the case of information mentioned in paragraph (b), *combined* as mentioned in that paragraph" (http://www.austlii.edu.au/au/legis/cth/consol_act/pa1990109/s7.html, accessed 14 September 2008, emphasis added).

37 *Grant v Commissioner of Patents* (2005) FCA 1100: 20.

not hurt trade, and not be generally inconvenient. As an additional reason for rejection she noted that the invention might shield the owners from laws enacted in the public interest.

Her reasoning was specifically rejected by the Full Federal Court: 'we do not find it necessary to discuss the requisite economic benefits of the alleged invention';[38] 'Nor is the Court in a position to determine the balance between social cost and public benefit. Parliament has already made that judgment, as its predecessor did in 1623, by rewarding innovation with time-limited monopoly.'[39] From an economic viewpoint this seems very poor logic. The parliamentary determination is with respect to *the patent system overall*. Many specific inventions have been refused patent monopolies because there is no net benefit to society (see Section 4.3). Indeed the patent system *requires* courts to make such judgements with regard to specific inventions. The argument as put directly overrides all the provisos in Section 6 of the *Statute of Monopolies*, yet it is this section which defines a patentable invention in Australia. It is clear that the invention, if implemented, would have been welfare-reducing, particularly for legitimate creditors. Yet at no point in the four decisions was there any specific reference to the 'generally inconvenient' conditionality of the definition of an invention, nor to the specific exclusion in Section 50(1)(a).

In this decision the Full Federal Court also took the opportunity to confirm that, in its view business methods are patentable in Australia. Indeed the Court also questioned a decision of the Patent Office in the *Szabo* case that any science or technology basis was necessary for an 'invention' to be patentable. The court commented that is was not sure that the argument that a science or technology base was required for patentability was correct.[40] From an economic viewpoint the evidence for any need for a patent is limited to highly codified or very lumpy investment innovations. This would seem tantamount to at least requiring a technology base. This decision again indicates a great willingness to expand the patent system without any evidence of benefit to the nation.

CCOM

CCOM is quite an old case,[41] but it was instrumental in extending patentability to software. It is selected for discussion because there were two decisions, one of which seems economically sound, and the other unsound. The 'invention' took a well-known linguistic technique applied to writing Chinese characters, but used it in a computer.

The initial judgement was that the *CCOM* 'invention' used a computer in a conventional manner to reproduce mental processes. This decision was overturned by the Full Federal Court, which based its decision on UK legal reasoning:

> "that *more than a mental process* was involved in claiming the process of application of certain steps represented by a computer program on a standard computer, *since the method as claimed was incorporated in the program and in apparatus in a physical form.*"
>
> van Caenegem 2002: 46, emphasis added

[38] *Grant v Commissioner of Patents* (2006) FCAFC 120: 43.

[39] *Grant v Commissioner of Patents* (2006) FCAFC 120: 45.

[40] (2006) FCAFC 120: 37-38). The *Szabo* case is *Re Peter Szabo and Associates Pty Ltd* (2005) 66 IPR 370). The outcome of this possible proscription remains to be seen.

[41] CCOM Pty Ltd v Jiejing Pty Ltd (1994) 27 IPR 577; (1994) 28 IPR 481. CCOM was a petty patent.

This reasoning seems astounding to an economist. Certainly there is a mental process involved in computerisation. It is a very similar process to translation from one spoken language to another, except that here the language is a computer language. But it is completely unclear what the 'more' is. This is not explained, and is not evident to a programmer. The apparent explanation 'since the method as claimed was incorporated in the program and in apparatus in a physical form', is to say no more than that it was a software program running on a general purpose computer. It is unfortunate that the government did not step in to correct this most extraordinary and welfare-reducing policy decision.

This 'invention' involved straightforward computerisation. In other words it did not even merit the word 'invention'. From the viewpoint of the need for there to be a balance in a patent system to ensure that monopolies are not granted where they are not deserved, this decision seems to shift the likely balance of benefit and cost, making the patent system a less attractive proposition from the perspective of national well-being. The decision had a substantial impact on the economy as it introduced into Australia the myth that computerisation of a well-known method is inventive ('a patentable invention').

Before turning to a range of 'legal doctrines' (policies) on inventiveness, it is useful to see what others have to say on the gap between patent policy and its administration. Pila finds a large gap between policy and practice in respect of how Australian and UK law treat methods of medical treatment. She concluded that:

> "the rudderless nature of [judicial] decision makers' responses to medical method patents has been to the detriment of 20th century patents law in its precipitation of at best unclear, and at worst unconvincing, legal principles."
>
> Pila 2001: 461

In regard to a different aspect of patent law—fair-basing—McBratney has shown that a series of judgements have led to an outcome very different from that intended by parliament (McBratney 2003). This may well be the case with regard to the doctrinal rules affecting patentable subject matter and the height of the inventive step.

4.3 'Legal doctrine': novelty and inventiveness

Patent law presumes that there is a good, readily available, library of material demonstrating the current state of knowledge (Cohen and Lemley 2001). This forms the 'prior art' against which novelty and inventiveness is tested. But not all knowledge is permissible as the basis for testing novelty and inventiveness. This is the first point at which an economist is surprised. Given the purpose of a patent system, the knowledge base would be presumed to be *the existing body of knowledge*. Not in patent law. The concept of a *body of knowledge* does not seem to exist in the patent system.

It is an objective of patent policy to generate knowledge about new ways of doing things, so that the benefits from this may spill over to the rest of the economy offsetting the deadweight losses of monopolies. But if the existing body of knowledge used to test inventiveness or novelty is artificially narrowed, this tilts the playing field in favour of the applicant, and against the public interest. Statute law (Section 7) embodies doctrines developed through case law that severely limit the existing knowledge against which an alleged 'invention' is measured.

The novelty test has become defunct because novelty is now measured against *only one piece of knowledge at a time*, not against the existing body of knowledge. This doctrine was introduced in 1880, in a case between two private parties, and subsequently adopted into UK and Australian law.[42] Inventiveness can be measured against *two* pieces of knowledge *and* common general knowledge, but there are severe limits to this 'generous' interpretation of the body of existing knowledge. As noted above, the *Emperor Sports* case has excised from the inventiveness knowledge base most patented knowledge in fields where the normal worker ('person skilled in the art') would not think of looking at patent databases. This surreal outcome can only be changed by amending Section 7(3) of the *Patents Act 1990*.[43] It is a clear and exact application of the words in that section.

The *Patents Amendment Bill 2001* introduced a requirement for applicants to submit information from overseas patent office searches for existing knowledge. This was first watered down, then eliminated in late 2007.[44] As long as most existing knowledge is ruled out of court for the purposes of assessing the novelty or inventiveness of a patent application, and applicants are exempted from any obligations to provide information on relevant existing knowledge, the standard for the grant of patents will inevitably be low. From an economic policy perspective it seems extraordinary that applicants for a government-sanctioned monopoly are not required to provide critical information on which the merits of their application can be judged.

These problems are compounded by the narrow approach that now seems to be taken in defining the relevant field of technology. In respect of the US patent system, Bagley (2001) has demonstrated how technology fields are now so narrowly construed that most relevant existing knowledge ('prior art') is ruled inadmissible in the obviousness (inventiveness) test. In a key Australian case, *Welcome Real-Time*, the way in which the relevant field was construed, not as smartcard technology, but as loyalty programs, was critical to the decision of validity. The 'invention' was clearly well-known in information technology (the technology used in implementing the invention), but by defining the technology as the business field of loyalty programs, this relevant existing knowledge became irrelevant to the decision.

The presumption of a good, readily available, library of material demonstrating the current state of knowledge falls apart in fields like software and business methods, where much existing knowledge is uncodified (not available in documentary form). There is a large literature looking for solutions to this problem, particularly in the USA (see, for example, Graham et al. 2002; Hall et al. 2003; Levin and Levin 2003). Ullman suggests that the greatest problems are with extremely obvious patents because the obvious is not written down (Ullman 2000). One option is to exclude such fields from patentability. Another simple alternative would be to place the onus on the party seeking the monopoly to demonstrate inventiveness.

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42 *Von Heyden v. Neustadt* (1880) 50 L.J.Ch. 126 at 128; 14 Ch.D. 230 (see Bochnovic 1982: 20).

43 The choice of this adjective is inspired by van Caenegem's comment on the 'person skilled in the art' (see below).

44 There had never been any obligation on an applicant for an Australian patent to provide full information on previous knowledge related to their application. The 2001 amendments, though reduced in the Senate, still required applicants to provide the results of searches by overseas patent offices for previous knowledge (a recommendation originally put forward by IPAC in 1984, then again by the IPCRC in 2000). Subsequently this requirement was watered down before being substantially removed on 22 October 2007 (http://www.ipaustralia.gov.au/ pdfs/news/ON20071018%20Patents%20 Amendments%20Regulations.pdf, accessed 22 November 2007).

These limitations on the evidence that can be used to judge novelty and inventiveness are combined with a variety of 'legal doctrines' that introduce further limits. One is the qualities imputed to the inventiveness judge—the 'person skilled in the 'art''. In his recent text on 'intellectual property' law, van Caenegem comments on the view that the person skilled in the 'art' should be:

> "… a *typical uninventive worker* in the field. This again is rather *surreal*, certainly in a field where inventiveness is a common attribute of every typical worker, as for instance at the higher end of scientific research. Then all that is required is that the invention, as a step onward from the prior art, is not obvious. No ingenuity, revolutionary insight, creativity or major step forward need be shown; some small inventive spark is enough, and it matters not whether that inventive step resulted from a sudden insight, or from careful study, reflections and research"
>
> van Caenegem 2007: 85, emphasis added

As noted above, we now live in a world where innovation is the norm and not the exception. The administration of patent policy does not yet seem to have caught up with this. Rules such as requiring that inventiveness be judged by the kind of person who would never be employed at the forefront of invention sets up another bias towards the grant of monopolies for uninventive 'inventions'.

Another 'doctrine' (policy) that seems particularly welfare-reducing to an economist is the 'combinations' doctrine. Australian patent examiners (like many of their counterparts overseas, including in the USA) are not allowed to deem the combination of two or more old ideas obvious, unless there is *documentation* suggesting such a combination, or unless that would be the *sole* combination that a practitioner would come up with, given common general knowledge, and the problem to be solved. The Australian Patent Examiner's Manual (Section 2.5.3.5) quotes from case law:

> The proper question is … whether it would have been obvious to a *non-inventive* skilled worker in the field to select from a possibly very large range of publications *the particular combination* subsequently chosen by the opponent in the glare of hindsight … The prior existence of publications revealing those integers, as separate items, and other possible integers *does not of itself* make an alleged invention obvious. It is the selection of the integers out of, perhaps many possibilities, which must be shown to be obvious. ... The opening of a safe is easy when the combination has been already provided.
>
> *Minnesota Mining and Manufacturing v Beiersdorf* (1980) 144 CLR 253 at 293, emphasis added

In this view the fact that many people would have come up with the same invention does not make it obvious, unless *everyone* would come up with *only* that combination. Because at least some others would have come up with a somewhat different combination, it is not obvious under patent law. Indeed this suggests that the more old ideas you combine, the less likely it will be that a patent office can reject your combination as obvious. From an economic policy perspective, this development in patent law appears dysfunctional. It results in Australia granting such silly monopolies as "A Financial Education System", (AU 2003203582, sealed December 2003), which is a system for teaching children about finance based on concept of the child working for her pocket money, but including credit, insurance and investment options.

There also seems to be something of a disconnect between modern patent judgements and those that occurred some time back. The *3M v Beiersdorf* decision cited above can be

contrasted with such judgements as that which set up the (seemingly now rarely used) analogous use principle. In 1865 the Lord Chancellor said:

> "Upon that I think that the law is well and rightly settled, *for there would be no end to the interference with trade, and with the liberty of any mechanical contrivance being adapted,* if every slight difference in the application of a well-known thing were held to constitute a patent …" [45]

This 1865 decision is very much in the vein of the earlier (1838) decision where a similar principle was enunciated:

> "It would be a very extraordinary thing to say, that because all mankind have been accustomed to eat soup with a spoon, that a man could take out a patent because he says you might eat peas with a spoon. The law on this subject is this: that you cannot have a patent for applying to a well-known thing, which might be applied to 50,000 different purposes, for applying it to an operation which is exactly analogous to what was done before."
>
> (1838) 3 Hayward's Patent Cases 125, 141 (from Brennan and Christie 1997: 29)

In Australia this sentiment was repeated in the 1959 *Microcell* judgement. The High Court ruled that:

> "If stainless steel and its properties were known, and many kinds of articles had been made of it, it would not be possible for a man to claim a monopoly for making kitchen sinks of stainless steel merely because he was the first man who ever thought of doing this. … *It is not an inventive idea for which a monopoly can be claimed to take a substance which is known and used for the making of various articles, and to make out of it an article for which its known properties make it suitable, although it has not been used to make that article before.*
>
> (1959) 102 CLR 232, 248 and 249 (from Brennan 2002: 29, emphasis added)

These earlier decisions ensured that balance between the public good and the incentive to the innovator was present in the patent system. Somehow that seems to have changed. Australia is regularly granting patents for the use of known procedures in new (and not so new) situations, such as audit for tracing chemicals, benchmarking for real estate, financial ratios in financial systems, general ledger codes in accounting systems.[46] If Australia's patent system is again to become welfare-enhancing, the reasons for this radical change in the balance of patent decisions need to be determined, and action taken to re-establish a sensible balance between the interests of would-be patentees and the public. Is this substantial shift in perspective simply a change in the opinions held by most Australian judges? Or have there been more subtle changes in the law that push modern judges into decisions that appear so contrary to the public interest?

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[45] *Hamilton E. Harwood and Another v The Directors, etc of the Great Northern Railway Company*, (1865) 11 HLC 654 at 682-3, 11 ER 1488 at 1499 (emphasis added).

[46] A system for validation of chemical usage in the production of foodstuffs (AU2004233489); Method and Tool for Assessing the Sustainability of a Development (AU2004200942); System and Method for On-line Analysis and Reporting of Financial Operation Data from Community Pharmacies (AU2003204214); and Transaction accounting processing system and approach (AU2005255399).

4.4 Administration: abstract / general claims

Another frequent criticism of patent systems is that many claims are written at such a high level of generality that there appears to be no difference between the idea and its implementation. This problem is pervasive in software and software-based claims, but is not limited to these fields. Business method patents, for example, are written in terms of such broad concepts as 'calculating modules', 'control means', 'display means', 'receiving device', 'capture apparatus' and so on. They rarely include any technical specifications, even where specific devices are used. This means that the patent specifications disclose little other than the general idea of the 'invention'. An example of such drafting is provided in Appendix 3. It shows the claims for a rather short (only 9 claims) business method patent, sealed in September 2007. It computerises a scheduling conversation. The claims refer to such elements as 'a subscriber's terminal', 'a communication network', 'a first function unit', 'a presence-at-destination information'.

Bessen and Meurer (2008) raise two difficulties with abstract claims. Abstract claims significantly increase the cost for innovators of establishing the boundaries to patented technology. This happens because it takes longer to establish the relevance of a patented technology, and because the interpretation of the language is indeterminate. The problem can be illustrated with another business method patent, this time for an e-commerce advertising application. The original language of claim 1 is presented in Figure 2, together with a translation into english.

As Bessen and Meurer point out, the volume of incremental patents, together with the vague claim language creates such difficulties in establishing patent boundaries that innovating firms face a very high risk of inadvertent trespass. This can radically alter the net private return for patent users. It also creates costs for innovating firms which are not using the patent system. As Bessen and Meurer so rightly point out, it will only ever be the innovating firm that is at risk of facing unanticipated demands for the payment of patent royalties.

The second problem with vague and abstract claims is that this can lead to ownership claims to an invention, or to embodiments of an invention, that the owner does not actually possess at the time of the application. Bessen and Meurer provide several examples. Where such patents are enforced (for example the E-Data patent, US 4,528,643) other businesses incur substantial costs.[47] Again there is a clear negative impact on the net balance of the patent system.

The Cutler review has recommended that:

> "Patent law should be reviewed to ensure that the inventive steps required to qualify for patents are considerable, and that the resulting patents are well defined, so as to minimise litigation and maximise the scope for subsequent innovators."
>
> Cutler et al. 2008: 86

This recommendation effectively has two parts, one dealing with inventiveness and the other with claim clarity. Both are to be commended.

[47] For the E-data story see Bessen and Meurer 2008: 1-2, 4-5, 8-9, 194-195.

Figure 2 Australian application 2004210528 "On Line Advertising"
Patent sealed 19 July 2007

Claim 1: An on line interactive advertising system which enables viewing of advertising by a person engaged in an activity in which the person receives electronic data and/or images and at the same time and at the option of the person views said advertising; the system comprising;

[translation: someone at a computer (or similar) receives electronic information and chooses whether to look at advertising too]

a consumer station which receives electronic data or images; an information provider which delivers said electronic data or images to said consumer station, a host having a website with which said consumer station communicates and interacts, an advertising provider in communication with said host; wherein the advertising provider communicates via said host with said consumer station via the internet upon election by said consumer station responsive to an invitation from said host; wherein, without requiring software downloaded and installed into the consumer station, the consumer receives said advertising material by responding to a random invitation from the host, which appears at the consumer station wherein, when said consumer elects to view advertising from said advertising provider via said host, the consumer receives rewards, credits or benefits commensurate with the length of time advertising is viewed.

[translation: the consumer is using a computer, connected to the internet, and, in response to an invitation, can choose to access a website with advertising without having to download any software; the invitation is random and if the consumer chooses to look at the ads s/he gets rewards related to how long s/he looks at the ads].

4.5 Identifying patterns

This section attempts to draw together the discussion of the preceding three sub-sections to identify factors which might underlie the gap that exists between patent policy and patent administration.

- in many cases the 'invention' as discussed in a legal case appears to be quite different from the invention apparent when reading the patent specification
  - examples are the Welcome loyalty business method and CCOM's mere computerisation of a well-known method;
  - this poses immediate difficulties from an economic perspective. If what is being discussed in court is different from what has really been 'invented', then what kind of game is going on?
    - is this simply a game of legal semantics? if so, how can it be stopped?
    - or is there some other aspect of patent law that causes courts not to focus on the actual inventive contribution? if so, how can that be fixed?
- in many cases there appears to be no consideration of the public interest. Why not? Are courts in some way prohibited from considering the public interest? What changes are needed to ensure that each time a patent's validity is considered, the public interest is fully represented? Are the rules designed so that due weight can be given to this?

- why is the existing knowledge base so constrained? Where is the benefit in handing out a monopoly where there is no actual contribution to knowledge?
- why are applicants exempted from any requirement to provide information about the existing knowledge base? Why are the descriptions of the advance from existing knowledge in patent specifications written in such unclear language?
- why are patents granted where the language in the specification is vague and abstract? (This is of course apart from the fact that they are not written in useful scientific language). How does the system ensure that different interpretations of this language are not used when validity is being negotiated with the patent office and when they are used in infringement proceedings?
- why is the administration of the patent system so focused on avoiding type I errors (failing to grant patents for genuine inventions)? As the *Grant* case shows, there are many opportunities for an applicant to seek a review of a negative decision. In such a case the costs appropriately fall on the applicant and on the public (court costs).
- why is the administration of the patent system so indifferent to the possibility of type II errors (granting patents for uninventive 'inventions')? A large range of elements in the system are each slanted towards type II errors, and the combination provides a heavy probability of grant once an application is filed.
  - in Australia grant rates for standard patent applications vary between 88 and 94 per cent.[48] Given that some applications lapse for business reasons, this seems an extraordinarily high grant rate.
- why is there so little attention to the costs imposed on innovating firms by the very large volume of incrementally inventive patent monopolies?

5 Making patent policy welfare-enhancing

The empirical evidence reviewed briefly above clearly demonstrates that patents are of minor importance in most technology fields, and are therefore likely to induce little additional invention. They may become relevant where inventions are highly codified, or where the initial investment is large compared to the market.

The norm in regard to regulatory intervention in the market is that this should occur only where the benefits clearly exceed the costs. That is, for inventions that might not occur without a patent system. As competition is the pre-eminent principle and main means of stimulating innovation, patent monopoly boundaries need to be set as narrowly as possible. Government-sanctioned monopolies should be granted *only where there is clear evidence they are necessary to induce welfare-enhancing innovation*.

The manner in which patent policy is implemented shows that almost any application, however trivial, will be granted a monopoly. Issues underlying the gulf between patent policy and patent practice were explored in Section 4. This is by no means considered to be a comprehensive discussion of this important topic. Rather it is designed to illustrate some of the many problems in the policy delivery system. A more complete assessment of the

[48] Calculated from grant data supplied by IPAustralia and applications data from P30(Feb08) available at http://www.ipaustralia.gov.au/about/statistics.shtml (accessed 29 July 2008). These estimates are for the application years 1995 to 1998. Data exclude PCT applications which never entered national phase. Subsequent application years appear still incomplete in terms of processing.

problem would require a multi-disciplinary team, and, preferably a much wider and more detailed economic assessment of patent case decisions and patent policy 'doctrines'. It is for this reason that:

I strongly recommend that the investigation into what should be patentable in Australia take place in two parts—a clear statement of patent policy, then a multi-faceted investigation into how best to remove the gap between policy and practice.

This final section of the submission has four sections. Possible constraints to Australia's freedom of action in this important policy area are discussed in Section 5.1. The system biases towards type II errors (the grant of 'bad' patents) are explored further in Section 5.2. Recommendations on patent policy are presented in Section 5.3. Finally some initial thoughts on how the gap between policy and implementation can be reduced are presented in Section 5.4.

5.1 Constraints

The economic evidence presented in Section 2, shows that the first-best course of action would be to dismantle the patent system in its entirety. The price for this would likely be too high, as retaining a welfare-reducing patent system is a requirement of membership of the international free trade community. A second-best option is to reform the patent system to radically reduce the volume of patents granted, by introducing a very high inventive step and returning patentable subject matter to the limits that existed some thirty years ago. Both these measures would be TRIPS-compliant.

TRIPS is regularly quoted as a constraint on the Australian government's capacity to design patent policy to maximise Australian welfare. Further constraints were adopted in the controversial Australia United States Free Trade Agreement. But within TRIPS and the AUSFTA there is actually considerable capacity for adjusting our patent system to maximise national well-being. This freedom of action is regularly glossed over. This may well because the fiction that TRIPS limits change is more palatable than the real—but unspoken—constraint: the behaviour of the US government, especially the 'Trade Representative' (USTR),[49] and lobbying by sectional interests benefiting from the system.

There may however be room to call on our 'special relationship' with the USA to gain the freedom of action to use TRIPS in a flexible manner. Recent studies of the US patent system strongly suggest that there are as many reasons for concern that the US patent system may be welfare-reducing as there are in Australia (US FTC 2003; US National Academy of Sciences 2004; Bessen and Meurer 2008; Jaffe and Lerner 2004). Given that fewer patents are domestically owned in Australia than in the USA, and that Australia's market is only some 2 per cent of the total OECD market, a low-risk means of experimenting to find a welfare-enhancing design for patent policy would be to experiment with improved design in smaller countries such as Australia.

[49] The story of the US's tactics to extend domestic patent monopolies to trading partners is well told by Drahos 2002 and Sell 2003. Scherer points out that lower income countries only agreed to TRIPS because they were offered three offsetting benefits, of which an end to the tactics of the USTR was one. He suggests these offsetting benefits never eventuated (Scherer 2006). Drahos documents the forum-swapping tactics used in the post-TRIPS environment by the USA (Drahos 2001).

5.2 Levelling the playing field

One of the key mantras of competition policy is the need for a 'level playing field'.

Systematically, throughout patent law and administration, such a strong priority is being given to avoiding the risk of rejecting inventive inventions (type I errors) that very large numbers of patents are being granted for uninventive inventions (type II errors). The grant of uninventive patents incurs high costs for the economy, through their impact on competition and invention (US FTC 2003: 5).

While design of any policy involves trade-offs, there is widespread agreement that a low inventive step incurs high social costs, not offset by any spillover benefits. In discussing this issue, and the design of patent policy, Jensen and Webster suggest that there will always be some errors (Jensen and Webster 2004). This is true. But if the patent system is to become welfare-enhancing, the way it is balanced requires radical change. Currently almost every element of the patent system favours the grant of a patent. If the system were re-designed in the light of competition principles, and the fundamental premise of regulatory intervention in markets—that this should not occur unless there is a demonstrable benefit which exceeds any costs beyond reasonable doubt—then the balance of each premise would be reversed. Such a system would be far more likely to grant patents only for inventions that had the possibility of contributing spillover benefits, thus offsetting the social costs created by the patent system.

There are many small rules in the patent system which create a bias towards grant, once an application has been filed. The outcome is that the patent playing field is substantially sloped, with the would-be monopolist at the top, and the public benefit at the bottom. An incomplete list of the biases towards type II errors (grant of 'bad' patents) in the patent system is:

- *legislative presumptions of novelty and inventiveness* mean that the government has to show that a patent application is uninventive, rather than the applicant showing that it is inventive.
  - the onus of proof should be consistent with regulatory norms and lie with the applicant;[50]
- the body of existing knowledge used as the basis for testing novelty and inventiveness has been severely reduced by doctrinal rules, codified into the statute;
  - novelty can be tested against only one document at a time;
  - a reference in one document to a second document is insufficient to allow the second document to also be considered;
  - all patent documentation can be disregarded in the inventiveness test;
  - technology fields ('arts') are so narrowly defined that considerable existing knowledge is often ruled inadmissible;

[50] Extraordinarily, the TRIPS Treaty includes an Article requiring that the normal burden of proof be reversed in the case of process patents. Article 34 sets out circumstances where a product shall be deemed to have been produced using a patented process unless the alleged infringer (the accused) proves otherwise (http://www.wto.org/english/docs_e/legal_e/27-trips_01_e.htm, accessed 30 April 2008). However Article 34 applies only to litigation about infringement of a granted patent. Nothing in the TRIPS Treaty prevents an administrative requirement that applicants for patents be required to demonstrate that their inventions meet the statutory requirements of novelty, utility and inventiveness.

- there is no obligation on the applicant to provide full information on the body of existing knowledge relevant to their 'invention;
- there are endless opportunities for the applicant to negotiate with the examiner and amend the application, including bringing in as key features of the 'invention' aspects which were not originally deemed salient, but which allow the application to pass the very low novelty and inventiveness tests;
- the judge for the inventiveness test (the 'person skilled in the 'art'') is required to be unimaginative;
- the decision-making rule is *balance of probabilities*. The norm for regulatory intervention in markets is that the benefit of the intervention must be *significantly greater* than the harm. Such an option was dismissed by the IPCRC as being inappropriate for a civil matter (IPCRC 2000: 166). But patent policy is a tool of economic policy, and the appropriate decision-making standard should be economic not legal. The standard should be *beyond reasonable doubt*; and
- 'inventions' which combine well-known elements are not dismissed as obvious unless someone *has specifically suggested* that combination in writing.

There are also biases in the post-grant part of the patent system. Again these favour type II errors. Of particular concern is the lack of any effective mechanism to challenge invalid patents.[51] The large volume of such patents acts as an impediment to innovators, significantly increasing the cost of boundary search and making the likelihood of inadvertent trespass unreasonably high. There are a number of reasons for this:

- there is a substantial asymmetry in the incentive to litigate a patent between the patent-holder and alleged infringers, allowing many uninventive patents to remain unchallenged;
- general rules for legal proceedings make it extremely difficult for non-profit organisations to challenge invalid patents, particularly when faced by well-resourced patent owners; and
- the Patent Office seems not to take action to recommend to government statutory reform of welfare-reducing changes to the system, such as the 2006 interpretation of the wording of Section 7(3) to excise patented knowledge from the body of existing knowledge for the inventiveness test in non-technology fields.

5.3 Recommendations on patent policy

A clear statement on the goals of patent policy is needed. This should explore the complex trade-offs, and make a clear statement about the need for there to be a benefit to Australia in exchange for the monopoly grant. The form of this benefit should be clearly specified, and should revolve around the concept of a substantial inventive step. It could be specified as a 'reasonable contribution to knowledge' or a 'substantially more effective/ improved product or process'. Certainly the statement needs to make clear the community expectation that the government not hand out monopolies in exchange for no consideration. Indeed it needs to make clear that the consideration should be substantial.

[51] While Australia has a pre-sealing opposition process, this presumes firms will actively monitor acceptances, at some substantial cost. It is also interesting that the fee for lodging an opposition is far higher than the fee for acceptance.

I recommend the government make a clear policy statement that it will not grant monopolies lightly, and that where a patent monopoly is granted this will only be in exchange for a substantial benefit to the nation.

The major extensions to patentable subject matter that have been made without proper evidence should be wound back. As patent policy involves monopolistic regulation of markets, policy changes should be made in the context of whether more (or less) regulation is in fact needed, and whether there is substantial evidence that such regulatory intervention will do more good than harm. That is, an evidence base is urgently required in patent policy.

In its review of business method patentability, ACIP commented that 'Australia has on the whole benefited from the adaptiveness and flexibility of the 'manner of manufacture' test of patentability' (ACIP 2003: 2). No evidence was presented to support this judgement. IPAC found that no convincing case had been made to extend patentability to software, and was divided as to whether there was a case to exclude chemicals and pharmaceuticals from patentability (Appendix 1). In an area where there ought to be careful thought and analysis before intervening to regulate a well-functioning market, an inflexible definition would be more in Australia's interests, as it would ensure such deliberate consideration took place.

In its business method review ACIP commented that:

> "Previous decisions on the patentability of other controversial areas, such as software, genes, bioinformatics and the treatment of humans, *have not been based on assessments of whether patent protection is necessary* in order to encourage innovation in those particular fields. *To require such assessments* for all inventions which are not in a field of technology would result in Australian law having different criteria of patentability for different areas of innovation. This *appears to be undesirable*…"
>
> ACIP 2003: 33, emphases added

But when patent policy is viewed as economic policy—as recommended in the recent Cutler review—then the *only* basis for extending patentability to types of inventions for which patents have not previously been granted would be on the basis of a rational assessment of all the evidence. As yet there is no evidence that monopolies are needed in any of these fields.

The patent statute should be amended to expressly exclude the following from patentability: software (in any form); algorithms (in any form); bioinformatics; methods of medical treatment for humans; compositions which do not differ from compositions found in nature (including genes and gene fragments);[52] and business methods. There has never been any evidence that there is any market failure in any of these fields. Indeed if Australia exempted these fields from patentability, it could anticipate attracting substantial new research funding in these areas, as the impediment and cost of inadvertent trespass would be removed.

All these exclusions are TRIPS-compliant. They create boundary problems, but boundary problems are implicit in any market regulation, and simply have to be dealt with. Previous boundaries were eroded by the continuous extensions in patentable subject matter, argued in court, often between private parties. The boundaries need to be reinstated. The challenge

[52] That is, we would benefit by expressly abandoning the myth that the now standard process of isolation and purification turns matter which is identical to that found in nature into an invention.

and costs of boundary problems are not a reason for removing boundaries, though they might be a reason for removing market regulation. They are certainly a reason for including over-arching principles and anti-avoidance principles in the patent statute (see Section 4.1).

In drafting such amendments lessons need to be drawn from the European experience. In reviewing the proposed European Software Directive for the European parliament, Bakels and Hugenholtz drew attention to two major issues. One was the very low inventiveness threshold that has developed in European patent law, as in other jurisdictions. The other was the large number of software patents being granted despite the legislative exclusion in the European Patent Convention (EPC). They suggested that the European Patent Office (EPO) requirement for a 'technical character' was drawing only a very arbitrary distinction, easily avoided by 'clever drafting'. They recommended that the exclusion for computer software and business schemes be moved from Article 52(2), where the exclusion is limited by an *as such* provision (Article 52(3)), to Article 52(4) where the exclusion would be absolute (Bakels and Hugenholtz 2002: 36). Australia could learn from this and adopt an absolute exclusion. The European experience also highlights the importance of having the patent equivalent of tax law 'anti-avoidance' principles to offset 'clever legal drafting' games. It also shows the importance of patent appeal cases being determined in normal courts of law, not in specialist courts such as the CAFC and the EPO's Technical Boards of Appeal (TBAs).

The view that there needs to be a technology basis to a patentable invention has been so widely held that it has rarely been written down. Traditionally this was achieved by limiting patentability to inventions that were 'manufactures' or which drew on the 'useful arts' (technology).[53] But now this limit seems in danger of being removed from the patent system, both in the USA and in Australia.[54] But there are some equally tacit assumptions in patents law that make it difficult to extend patentability beyond a technology base without bringing patent law into severe disrepute. One of these assumptions is that there is an accessible well-documented library of existing knowledge (Cohen and Lemley 2001). The other is that it is possible to distinguish very clearly the boundaries between patented 'inventions' (Bessen and Meurer 2008). Neither of these assumptions holds in the software and business method areas.

In considering the role of science in modern invention, the role of mathematics as an underlying enabling science, drawn on in many other fields, needs particular consideration. Because mathematics is so different from the other sciences, a restriction on patentability

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53 The US Constitutional authority to 'promote the progress of science and the useful arts' combined proposals for authors and inventors. Science at that time had a similar meaning to knowledge and the 'science' part was directed to copyright. Indeed the titles of first two US patent acts were 'An Act to Promote the Progress of the Useful Arts' (see discussion in Walterscheid 1997, 1998). The 1966 report of the US President's Commission on the Patent System was also called '"To Promote the Progress of … Useful Arts" in an Age of Exploding Technology'.

54 The Australian Federal Court comment on the *Szabo* case was discussed above. The USPTO Board of Patent Appeals and Interferences (BPAI) reviewed a case that an examiner had rejected as it lay outside the 'technological arts' (*Ex parte Lundgren*, 76 USPQ 2d 1385 (*BPAI* 2005)). The majority reversed the examiner's decision, finding that his position introduced a new test for patentability for which there was no statutory basis. Smith J dissented, finding it reasonable to interpret the term 'useful arts' in the Constitution as 'technological arts', and noting that 'the process as claimed is not tied to any known science or technology'. Thambisetty interprets this as a signal that the USPTO 'intends to steer away from the limiting notion of 'technology'', and notes that this is 'a doctrinal shift of radical proportions' (Thambisetty 2008: 22). A 'doctrinal shift' is legalese for a policy change.

where the inventiveness lies centrally in a mathematical algorithm or its use should be carefully considered. For hundreds of years it was widely accepted that mathematical algorithms were not patentable. This tacit agreement was undermined when a doctrine was developed (in the USA, but quickly adopted in Australia), that it was reasonable to patent an invention that centred on use of a mathematical algorithm, *provided not all uses of the algorithm were pre-empted* (Stoinaoff 1999: 505). This is another example of legal semantics being used to substantially change agreed policy in a manner that undermines balance in patent law. No evidence was ever presented that this policy change was welfare-enhancing. The old boundary should be reinstated.

I recommend that patentability be limited to inventions based on technology, that is the application of science. Long-standing boundaries that were integral to balance in the patent system should be re-instated. These will need to be specifically written into the statute, and should be drafted as absolute exclusions. These welfare-enhancing boundaries include absolute prohibitions on: mathematical algorithms; software; methods of doing business; compositions identical to those occurring in nature (including genes and gene fragments); methods of medical treatment; and bioinformatics. Any invention, where the heart of the invention takes any of these forms should be specifically excluded from patentability.

This recommendation is entirely TRIPS-compliant.

5.4 Recommendations on patent administration

In taking action to address the gap between patent policy and patent administration it is essential that experts from a wide range of backgrounds and disciplines be brought together to design a robust and effective system. But just as it would be inappropriate to invite tariff consultants to the table in designing free trade policies, it would be inappropriate to invite patent attorneys into this team. There are plenty of academics with expertise in 'intellectual property' law who could provide necessary legal input.

I recommend that a multi-disciplinary team be brought together to address the problems underlying the gap between patent policy and patent administration and make proposals for the design of a robust administrative system that will be resistant to strategic efforts to undermine the policy objectives.

Limiting 'gaming' behaviour

The most important issue to address in closing the gap between patent policy and patent administration is addressing the problems created by 'gaming' behaviour. In doing this patent administration can learn from tax administration. Certainly experts in maintaining the integrity of the tax system should be brought into the design of a more robust patent administration system. Essential elements include:

- writing into the statute the twin policy goals of inducing genuine invention and ensuring that only inventions which might create a benefit for society are granted patents;
- 'anti-avoidance' principles to ensure that semantics are not used to undermine the purpose of the legislation; and
- substantial penalties for both applicants and their advisors for behaviour which undermines the purpose of the patent statute.

Re-balancing the slope of the playing field

The next most important issue is to address the biases in the system that slope the playing field towards the grant of 'bad' patents. Critical among these are:

- removing the presumptions of novelty and inventiveness from the statute;
- placing the onus on the applicant to demonstrate novelty and inventiveness;
- removing the limitations on existing knowledge used in novelty and inventiveness tests:
  - indeed the whole case law on novelty and inventiveness has become so welfare-reducing that it should be abandoned and replaced with an objective test as to whether the invention makes a substantial contribution to knowledge;
- introducing time limits and re-drafting limits to the 'prosecution' process with the view to ensuring that patents issue much more quickly;
- moving 'intellectual property' to the treasury portfolio so that equal concern is given to consumer and competition stakeholders as to innovator stakeholders.

I recommend that in addressing the gap between patent policy and patent practice, the system be re-designed to give priority to the public interest and innocent innovators.

Inventiveness and claim clarity

It is, of course, absolutely essential that the height of the inventive step be raised. There are a variety of ways in which this could be done. In terms of practical economic outcomes it appears that the 'novelty' and 'inventiveness' concepts as they exist now in patent law and administration have been so compromised as to be useless as threshold requirements for grant of a monopoly. As noted in Section 4.4 Cutler recommendation 7.2 is to raise the height of the inventive step, and significantly improve the clarity of patent specifications.

I endorse both parts of this recommendation. A wide range of options as to how best to achieve this need to be considered in the context that however good any new 'anti-avoidance' principles are, there will continue to be those who attempt to undermine the policy. The USA has been facing similar issues, and a wide range of options have been proposed. These include useful ideas like ensuring that examiner confirmation of the exact boundaries of the 'invention' have standing in any subsequent litigation. It is essential that monopoly owners not be able to expand their 'ownership' of technology beyond their actual contribution to knowledge.

I strongly endorse the Cutler review recommendation (7.2) to substantially raise the inventive step, and to substantially improve claim clarity.

Compensating losers

Consideration needs to be given to recompensing those who suffer as a consequence of patent monopolies. It is widely accepted that consumers suffer from the static efficiency losses of monopolies. Perhaps patent fees could be used to fund consumer representative actions against uninventive patents? It is less often considered that it is only *innovating* firms which are the subject of infringement litigation (Bessen and Meurer 2008). The extent of the independent invention defence needs to be reviewed to ensure that innovating Australian firms are not limited by patents, except from direct copying.

Indeed consideration could be given to restricting the rights granted in the patent monopoly. In terms of the policy objective to enhance the level of innovation, grant of the right to

prevent independent inventors from using their innovations seems dysfunctional. If the right to prevent use of independently created innovations were removed from the patent right, this would remove some of the costs it imposes. This would make the patent right similar to the anti-copying rights that are the essence of most other forms of government-sanctioned 'intellectual property'.

I recommend that in addressing the gap between patent policy and patent practice, serious consideration be given to reducing the damage done by the patent system to independent innovators. This could include reducing the patent monopoly to an anti-copying monopoly, and hypothecating a proportion of patent fees to fund public interest challenges to invalid patents.

Constant monitoring

Because of the importance of innovation to the future prosperity of Australia, it is essential that case law decisions and changes to examination procedures and rules be regularly reviewed for their economic impact, that the results of these reviews be publicly debated, and that parliament be willing to intervene if case law decisions undermine the economic policy goals.

I recommend that all case law decisions and changes to examination procedures and rules be reviewed for their economic impact, that the results of these reviews be reported in detail to parliament.

Regular evaluation

Finally, to ensure that the patent system remains welfare-enhancing, it is important to develop a monitoring database, and to undertake regular economic and performance evaluations. There have been previous calls for the development of data on which patent policy decisions could be based. The IPAC review recommended collection of data on the use of patents, perhaps periodically on renewal (IPAC 1984: 78). This recommendation has never been implemented. More recently Bakels and Hugenholtz have called for the establishment of a European Patent Observatory (Bakels and Hugenholtz 2002: 44). No action has been taken. In the specific field of the extension of patents to software and business methods, there have been several efforts to develop a knowledge base for use in policy determination in the USA. These have been stopped (Kahin 2003).[55]

[55] In regard to the US judicial expansions in subject matter to software and business method patents, efforts to collect evidence on their policy impact have been prevented by interested parties. "The White House Office of Science and Technology Policy commissioned a study on software patent quality and business effect by the Science and Technology Policy Institute at RAND in early 1998. However, it was suspended at the request of a U.S. multinational company concerned that the study would undercut efforts to secure greater international acceptance of software patents. The penultimate Senate draft of the American Inventors Protection Act of 1999 mandated a General Accounting Office study of business method patents, but this was removed at the behest of the patent bar. Despite calls by the 1999 National Research Council report, *Digital Dilemma*, for research on the effects of software patents, no studies have been commissioned, nor has the National Science Foundation supported any empirical research on the subject" (Kahin 2003). Bessen and Meurer comment that the Federal Trade Commission (US FTC 2003) recommendation which was most prominently rejected by the Intellectual Property Owners Association (dominated by patent lawyers from large firms) was Recommendation 10 'expand consideration of economic learning and competition policy concerns in patent law decisionmaking' (Bessen and Meurer 2008: 293-4).

As noted in Section 2.2, it is not possible to undertake a full effectiveness assessment of the patent system because appropriate data do not exist. This lack of critical economic data on patent systems is becoming embarrassing. There is an urgent need to collect data on patent use, both from the angle of the patent owner and the innovating firm which is affected by the patent owner's use of a monopoly. When patents are renewed patentees should be required to provide information on how the patent is being used. This would not be an onerous task for patentees—a simple one-page pre-coded set of options could be provided. These data on how patents are being used would be invaluable information for assessing both the costs and the benefits of patent policy. They would provide a basis for establishing whether there are significant differences between different categories of patents in their costs and benefits.

Indeed it might also be reasonable to require that the Patent Office be advised whenever any legal action is taken to enforce a government-sanctioned monopoly. This would fill a major gap in knowledge. Patent law is being used to impose costs on other parties, so should it not also incorporate compulsory provision of information about this?

A second avenue for collecting useful data on patents is the National Innovation Surveys that are now undertaken regularly in many countries, including Australia. Given the clear policy orientation of these surveys, it is surprising how little information they collect about patent use.[56] But these surveys provide an ideal opportunity for finding out a great deal more about the operations of patent systems. In particular they could be used to collect data both on the forms in which patents are used by firms that own them, and on the impact of patents owned by other firms on the behaviour of innovating firms. They could also be used to estimate the extent to which patents and other government innovation programs operate to induce innovation which would not otherwise occur. These are currently major gaps in knowledge about the impact of patent systems. It is time they were filled.

I recommend that:

*** the patent system be subject to the same serious, regular and independent evaluation as is normal for major government programs;**

*** patent owners be obliged to advise the Patent Office whenever action is taken to enforce a standard patent; and**

*** the next National Innovation Survey include questions designed to provide information on the impact of patent use on third parties, and on the extent to which patents, or other government programs to encourage innovation, are effective in inducing innovation which would not otherwise occur.**

[56] Or perhaps it is not. Perhaps innovation analysts are well aware that patents are of only very limited use in encouraging innovation, and hence do not waste space asking about them.

Appendix 1: IPAC consideration of 'manner of manufacture'

[re-presented here in full because not available electronically, and often inadvertently misquoted or misrepresented]

"… the words "manner of … manufacture". This concept involves little more than that an invention must belong to the useful arts rather than the fine arts.

"Over the past 350 years the courts have interpreted and applied the concept of manner of manufacture in an expanding and generally non-selective fashion, except for a tendency to focus on manufacturing industry, more or less in accordance with the expansion of technology and industrial activity, and the needs and understanding of the times.[21]

"From the standpoint of public interest or industrial policy objectives, however, the question of what sort of inventions should or should not be patentable needs to be asked and, indeed, has given rise to much debate throughout the history of the patent system. In principle, it would be possible to legislate about what may be patented for the purpose of seeking to implement selective economic policy objectives, according to Australia's perceived needs and circumstances. In particular, this could be done for the purpose of encouraging or discouraging innovation, or stimulating or precluding patenting, either in certain industries or technologies or in relation to particular descriptions of products or processes. Surgical and medical techniques for human therapy, and mixtures of foods and medicines are regarded in many countries as being unpatentable on public interest grounds. Pharmaceutical and therapeutic compounds are regarded as unpatentable per se in many less developed countries which do not have an indigenous pharmaceutical manufacturing industry. Some advanced countries such as the UK, Germany, Switzerland and Japan, have at one time or another limited the patentability of chemical compounds to assist their indigenous chemical industries to compete against foreign-based companies. Such an approach reflects perceived negative or restrictive effects of patent rights, particularly when granted to foreigners.

"On the other hand, reflecting positive, pro-competitive aspects of patents, it would be appropriate to ask whether the concept of manner of manufacture should be broadened specifically to embrace modern technologies, particularly those which are software based (either in the narrow computing sense or in a more general sense which might include accounting, investment, and other systems of doing business).

"As a general view, the Committee considers that attempting to fine tune the patent system in this way would be unlikely to prove very useful for the purpose of implementing economic policies in the way postulated. There are other available measures of a more flexible and immediate nature, such as tariffs, taxation incentives, and other forms of specific selective encouragement or discouragement. Compared to these measures, changes to the criteria for patentability, and more particularly the subject matter for which patents can and cannot be obtained, would be likely to prove a very slow, blunt and inefficient instrument for influencing the economic direction of particular industries or fields of technological development in Australia. Not the least relevant consideration in this connection is that particular exclusions which might be proposed would take up to 16 years

[21] For a full discussion of the scope of the concept of "manner of manufacture", see Dufty at paragraphs 1.1.001 to 1.1.005.

to work out of the system, in so far as there are existing patents relating to the subject matter to be excluded.

"More specifically, with regard to chemicals and pharmaceuticals, the majority of the Committee considers that there was insufficient empirical evidence or other information to determine whether exclusion of these fields from patentability would positively stimulate the development of an indigenous manufacturing industry or what effect it would have on the availability of drugs and other fine chemicals on the Australian market.

[page 41]

"Two members of the Committee consider that some explicit restriction of patentability for inventions in this field would be appropriate in view of Australia's stage of development in chemical manufacturing. For example, Australia might do well to follow the recent Chinese patent legislation which expressly excludes from patentability, pharmaceutical products, substances obtained by means of chemical process, foods, beverages and flavourings. The majority rejects this view, considering the public interest in this question to be adequately provided for, having regard to the recommendations elsewhere concerning competition law and compulsory licensing. It is apparent, moreover that, world-wide, patents are important in the pharmaceutical and chemical industries, and that this is one of the areas in which the observation that reform should be approached with considerable caution has application.

"Likewise, there has not been made out to the Committee any case for legislating specifically to bring all forms of computer software within the scope of patentable subject matter. We note also that hitherto the computer software industry in Australia has been developing rapidly without relying on patent protection. This, coupled with the great practical difficulty of setting boundaries for patentable software and conducting systematic and thorough novelty searches, convinced the Committee that it should not recommend explicit extension of the field of patentability to cover software.

"Finally, it has often been suggested that the reference to "manner of manufacture" as the touchstone of patentability should be replaced by an explicit statement of what is and what is not patentable. For example, a codified definition was substituted in the UK Patents Act for the former reference to manner of manufacture to bring that legislation into line with the European Patent Convention. We consider that the existing concept operates quite satisfactorily. It has the advantage of being underpinned by an extensive body of decided case law which facilitates its application in particular circumstances. At the same time it has, in the past, exhibited a capacity to respond to new developments. To replace it with a codification would be likely to produce far more problems, with attendant costs, than it would solve. On this point, the Committee agrees with Dufty's observations.[22]

IPAC 1984: 40-41

"Dufty" refers to one of four commissioned studies. A. Dufty, R. Baxt, and E. Campbell (Monash University Law School), "Report to the Industrial property Advisory Committee" on specific topics in industrial property law and policy, Patent Office, Canberra, 1983. Volume 1 by Dufty deals with Patentable Subject Matter, Invalidity on the Grounds of Obviousness or Lack of Novelty, and Infringement and the Rights of Third Parties.

[22] See Dufty at Section 1.1.

Appendix 2 Induced innovation: estimates for Australia and the USA

If patents are not important in appropriating a return to investment in innovative activities, they can hardly operate to induce much innovative activity. The empirical evidence on this issue was briefly summarised in the text. This evidence can be used to make a very rough estimate of the proportion of patents that might represent induced innovation. The approach used is similar to that used by Lemley (2001). While inexact, it does at least provide an indicative estimate of the effectiveness of patent systems in inducing innovation. Estimates are developed here for Australia and the USA to provide two contrasting cases.

Ideally one would match the empirical estimates on the proportion of patents that would not take place if patents were unavailable with data on granted patents. Unfortunately patent classification systems do not map well to industry classification systems.[57] It is therefore necessary to take a second-best approach, and separate out those few industries where innovation activity might fall, absent patents. In the estimates below, granted patents are separated into a group where a very high proportion of patents might be induced, and a second group where a much lower proportion is induced.

The first group is taken as the pharmaceuticals and fine chemicals industries, as the survey data show unambiguously that it is here that firms systematically report patents to be important in ensuring a return to innovation. It is assumed here that *all* patented inventions in these fields are induced by the patent system. This assumption substantially over-estimates induced patents in this group, as the survey data (and real world experience) show that some pharmaceutical and chemical innovation would occur absent patents.[58]

In most other technology fields, firms report patents as the least important protection mechanism. Mansfield specifically asked about what innovations would not have been commercially introduced or developed in the absence of patents. Outside the chemically based industries the highest reported percentage so affected was for machinery, where 15 to 17 per cent of innovations would not have occurred (Mansfield 1986: 175).[59] Using data on defensive patenting from the Carnegie-Mellon survey, between 63 and 74 per cent of innovations are reported as being patented to protect their owners from infringement suits. The corollary is that some 26 to 37 per cent are required for active rather than defensive purposes.[60] A generous assumption about induced inventions is therefore that between 25 and 40 per cent are induced by the patent system.

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57 This is in addition to the problem of determining whether to map industry of invention, production or use. For an excellent discussion of these issues, and some early efforts to develop concordance tables, see Griliches 1990.

58 For a summary of the real world experience see Boldrin and Levine (2008: chapter 9), or for a specific study of the Italian experience see Scherer and Weisburst (1995). Mansfield specifically asked respondents whether innovations would have occurred absent patents. He reports that 60 to 65 per cent of pharmaceutical innovations would not have been developed or commercially introduced (Mansfield 1986: 175). This leaves some 35 to 40 per cent that would have occurred absent patents.

59 Mansfield's data are reproduced in the text of this submission (Table 1).

60 In fact the proportion not taken out for defensive purposes cannot be calculated from these data as firms reported multiple reasons for patenting. Nonetheless as these estimates exceed the direct estimates of the proportion that would not occur provided by Mansfield, they provide a basis for an upper estimate of induced patents.

In most countries, the bulk of patents are owned by overseas-based companies (Bates 2003; Lamberton and Mandeville 1980). So in making estimates of induced innovation in any specific country, it is important to consider the likelihood that the patent system in one country will induce an innovation by an innovator resident overseas. This likelihood will vary with the size of the market where the innovation is being patented, in comparison to the size of the market in the innovator's home country. Where a market is large, its patent system may very well have an inducement effect for overseas innovators. But where the market is small this seems unlikely, unless the company's home market is also small.

In estimating induced patents in Australia, it seems improbable that Australian patents would offer much of an inducement effect for innovators from the North American, Japanese or UK/European markets.[61] In contrast, a New Zealand innovator might take into account the possibility of an Australian patent monopoly in determining whether to proceed with a costly innovation. This leaves a large number of countries with a very small share of granted Australian patents (3 per cent). These are a mixed set, with some having much larger markets and some much smaller than Australia. It is assumed here that the inducement effect for innovators based in these countries is the same as for Australian and New Zealand firms.

There may, of course, be specific innovators based in large markets where Australia forms a large share of a specific niche market, and Australian patents are therefore important. Equally there may be innovators in New Zealand where the ability to acquire an Australian patent creates no incentive to innovate. But the general pattern assumed here, that the inducement effect depends on relative market sizes, probably holds in most cases.

Based on these assumptions it is estimated that some 10,033 - 13,093 patents out of the 203,815 granted in Australia between 1990 and 2006 may have been induced by the patent system (Table A2.1). This is some 4.9 to 6.4 per cent of granted patents.[62] This low figure should not surprise. It has long been known that a patent system is unlikely to induce much innovation in a small economy, especially where the proportion of activity in high-technology areas is low (Penrose 1951).

It is induced innovations which are responsible for any positive innovation impacts flowing from the operation of a patent system. From the perspective of any nation, it is the induced innovations which give rise to positive externalities and dynamic efficiency gains. These benefits flow from a re-allocation of resources, increased consumer surplus, and knowledge spillovers. But if a patented product is imported, the resource re-allocation will be in the country of origin. Where knowledge spillovers depend on local working (for the transfer of the important associated know-how), then where patented goods which are imported such spillover benefits will not take place within the domestic economy.[63]

There are, of course, no data on the proportion of patented products locally produced in Australia. But with the dismantling of tariff barriers, and the small size of Australia's market compared to global markets, it can be assumed that many products patented in

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[61] Of all Australian patents granted from 1990 to 2005, 88 per cent went to applicants resident in Europe, Canada, Japan or the USA. Using GDP as a measure of market size, Australian forms only 2 per cent of the total OECD market.

[62] If we were to assume that all patents from Australian, New Zealand, and 'other' residents (25,337) were induced innovations, this would still be only 12.4 per cent of patents granted in the period.

[63] Geographic proximity appears important for knowledge spillovers (Jaffe 1986). The fact that in a small open economy most dynamic benefits will flow overseas was also noted in NOIE 2004: 97.

Australia are imported. A rough proxy has been adopted for locally produced patented goods: those where the patent is owned by an Australian innovator.[64] On this basis some 6,752 to 8,812 patents represent induced inventions owned by Australian residents (3.3 to 4.3 per cent of granted patents). It is this set of patents which must generate the dynamic efficiency gains to offset any social costs created by the patent system.

Table A2.1 Estimated patents induced, Australia, 1990-2006

Grants to:	# patents granted	% induced	# induced	# not induced
residents of USA, Japan, UK, other European countries, and Canada	178,478	0%	0	178,478
Australian and New Zealand residents	18,652			
residents of other countries	6,685			
AU, NZ and 'other' residents: pharmaceuticals, and fine chemicals (estimated) *	4,931	100%	4,931	0
Grants to AU, NZ and 'other' residents: other technology fields (estimated) *	20,406	25%	5,102	15,305
		40%	8,162	12,244
Total granted	**203,815**		**10,033 - 13,093**	**190,722- 193,783**

Notes: Data on standard patents granted for the period 1990-2006 are from IPAustralia's website (http:// www.ipaustralia.gov.au/about/statistics.shtml, Table P31(Feb08) Countries of Origin of Granted and Certified Patents, accessed 19 July 2008).

* Estimated patents granted by technology field is based on applications data for the technology groups 'organic fine chemicals' and 'pharmaceuticals, cosmetics' for the period 1990-2006 (from http:// www.ipaustralia.gov.au/about/statistics.shtml, Table P61(Oct07) Standard Applications by Technology Real standard patent applications, accessed 19 July 2008). Of all standard applications in the period 1990-2006, 19.5 per cent were in these two technology fields (compared to 18.4 per cent of grants in these two technology fields in the 1992-2005 period from Table P63(May06) Grants of Standard patents by Technology, accessed 5 March 2007 but not currently available). The figure of 19.5 per cent was applied to the 25,337 grants for the period 1990-2006 to residents from Australia, New Zealand or 'other' countries.

A quite different picture might emerge for a country such as the USA. Because of the size of the US market, it would be reasonable to assume that the US patent system might induce innovations from firms in most other countries, including those with large local markets, such as Japan and Europe. A starting assumption therefore is that innovation might be induced for 50 per cent of patented inventions from the five large G7 economies outside North America (Japan, France, Italy, Germany and the UK),[65] and for all patents from other countries. It is again assumed that for those patent classes most likely to cover

[64] Of course many Australian firms develop products locally and produce them overseas, importing back into Australia, and some overseas firms have some production facilities in Australia.

[65] While Canada is also a member of the G7, its proximity to the USA and its membership of NAFTA create a different dynamic. It is assumed here that Canadian firms consider the joint Canada/USA market when making investment decisions. They are thus treated in the same manner as US firms.

pharmaceuticals and fine chemicals,[66] 100 per cent of patents might represent induced innovation. For all other classes it is assumed that between 25 and 40 per cent of patents represent induced innovations. These two dimensions are combining for the five G7 countries—that is 50 per cent of Life and Agricultural Science and Chemical Compound patents are assumed to be induced innovations, and 12.5 to 20 per cent of other classes. These assumptions provide an estimate of between 29 and 40 per cent of patented inventions in the US being induced by the patent system (Table A2.2).

Table A2.2 Estimated patents induced, USA, 2001-2005

Grants to:	# patents granted	% induced	# induced	# not induced
US residents	421,372			
others #	121,764			
Sub-total US + 'other', of which:	543,136			
Life and Ag Science classes	42,397	100%	42,397	0
Chemical compounds classes	32,098	100%	32,098	0
Other classes	468,641	25%	117,160	351,481
		40%	187,456	281,185
5 G7 members*, of which:	267,351			
Life and Ag Science classes	13,695	50%	6,848	6,848
Chemical compounds classes	21,172	50%	10,586	10,586
Other classes	232,484	12.5%	29,061	203,424
		20%	46,497	185,987
Total granted	**810,487**		**238,150-325,882**	**484,606-572,338**

Notes: Calculated from USPTO data provided at http://www.uspto.gov/web/offices/ac/ido/oeip/taf/tecstc/classes.htm. 'Life and Agricultural Sciences and Testing Method' and 'Compositions and Synthetic Resins; Chemical Compounds' classes are as described in the U.S. Classification System (Arranged by Related Subjects) June 2006 version available at http://www.uspto.gov/web/offices/opc/documents/classescombined.pdf. Both sites accessed 5 March 2007.

i.e. grants to residents in all countries but the US, Japan, France, Germany and the UK

* Excluding Canada, and the USA.

[66] Of course, patent data are not available by industry classification. The two classes selected ('Life and Agricultural Sciences and Testing Method' and 'Compositions and Synthetic Resins; Chemical Compounds') seem to come closest to covering the industries drugs and fine chemicals, though it is clear from the classification descriptions that these are in fact quite heterogeneous classes. To that extent, use of these classes as approximations will over-estimate induced innovation.

Of course, a fair proportion of these ‘induced’ innovations are owned by non-residents of the USA (between 89,000 and 122,000). So the proportion of US patent grants that appear to be induced among US resident firms and individuals is between 18 and 25 per cent. Of course, in considering dynamic efficiency gains, there will be some benefits flowing to the US economy from patents owned by non-residents. This is because US buying practices seem very US-focused, and overseas firms can experience considerable difficulty selling into US markets if they do not manufacture in the US. 'Local working' by overseas companies will generate spillover benefits to the US economy. In the absence of any direct information on the proportion of overseas-owned patents made in the USA, rather than imported, it is assumed that 50 per cent are manufactured in the USA. This gives a final guesstimate of the number of patents which might generate dynamic efficiency gains for the US economy of between 193,680 and 265,030 (or between 25 and 33 per cent of granted patents). The non-induced granted patents may generate static welfare losses, but cannot generate any benefit attributable to the patent system.

Appendix 3: Example of patent drafting: claims for a computerised scheduling conversation

AU application 2003204139 System for Confirming the Presence at Home
rejected in USA (being appealed) no examiner objections

CLAIMS:

1. A system for offering a delivery service to a delivery destination, said system including:

   at least one subscriber's terminal accessible to a communication network; and

   at least one deliverer's terminal accessible to said communication network,

   wherein said at least one subscriber's terminal includes a first function unit for allowing a subscriber to set, in said at least one subscriber's terminal, a presence-at-destination information which identifies whether said subscriber is present or absent at said delivery destination, and

   wherein said at least one deliverer's terminal includes a second function unit for recognizing whether said subscriber is present or absent at said delivery destination, based on said presence-at-destination information.

2. The system as claimed in claim 1,

   wherein said at least one deliverer's terminal further includes a third function unit for sending an inquiry for inquiring about said presence-at-destination information to said subscriber's terminal, and

   wherein said subscriber's terminal further includes a fourth function unit for sending said presence-at-destination information as set by said first function unit to said deliverer's terminal in response to said inquiry from said deliverer's terminal.

3. The system as claimed in claim 2, further including:

   a delivery information processor accessible to said communication network,

   wherein said deliverer's terminal further includes a fifth function unit for sending a notice of outstanding of a requested delivery service to said delivery destination and said delivery information processor.

4. The system as claimed in claim 3,

   wherein said subscriber's terminal further includes a sixth function unit for sending, to said delivery information processor, a request for offering a requested but outstanding delivery service to said delivery destination, in response to said notice from said deliverer's terminal.

5. The system as claimed in claim 4,

   wherein said delivery information processor includes a seventh function unit for collating said request with said notice, to confirm a correspondence between said request and said notice.

6. The system as claimed in claim 5,

wherein said delivery information processor includes an eighth function unit for sending, to said subscriber's terminal, a delivery schedule which notify when said deliverer plans to offer said outstanding delivery service at said delivery destination.

7. The system as claimed in claim 6,

wherein the delivery information processor includes a ninth function unit for sending delivery-destination-related data to said deliverer's terminal, to enable said deliverer's terminal to send said inquiry to said subscriber's terminal based on said delivery-destination-related data.

8. A system for offering a delivery service to a delivery destination substantially as herein described with reference to an embodiment shown in Figs. 1 and 2 of the accompanying drawings.

9. A method for confirming presence at a delivery destination, said method substantially as herein described with reference to an embodiment shown in Figs. 1 and 2 of the accompanying drawings.

Appendix 4: Answers to issues paper questions

Question 1 – Economic objectives of limiting patentable subject matter (Part 3)
Can placing limits on inherently patentable subject matter be justified on economic grounds?
Answer 1 – Absolutely. There is no evidence that patents are needed to encourage innovation in most technology areas. Patents which do not induce additional innovation can only be welfare-reducing.

Should the subject matter of each individual invention be assessed to determine whether a patent is necessary to encourage innovation, or should such an assessment be done for entire fields of technology?
Answer 1b – Both. Entire fields should be ruled non-patentable (see Qs 2 and 10 below and text of submission). In addition any individual patent application must be assessed to ensure that it achieves a substantial level of inventiveness, adds to the total body of knowledge, does not undermine law, and is likely to be of benefit to the nation.

Question 2 – Economic effect of inherent patentability test.
What would be the consequences on innovation of imposing or removing limits on patentable subject matter? Are you aware of any empirical data on such consequences?
Answer 2 – There are no current limits to patentable subject matter. Bessen and Meurer (2008) show that this has led to a situation for large US publicly listed firms where the net private benefit is negative. There was substantial comment prior to the extension of patentability to software and related fields that these fields were innovating at a rapid rate. No evidence has ever been produced that this extension in monopolies was ever needed. The consequences of returning to a narrow technological base with a high inventive step would be to enhance national economic well-being. The only possible negative consequences might be pressure from the US Trade Representative, and special pleading from those who earn a substantial return from these monopoly grants.

Question 3 – Ethical reasons for limiting patentable subject matter (Part 4)
Can placing limits on inherently patentable subject matter be justified on ethical grounds? Is it appropriate for legislation to predetermine ethical limitations on patentable subject matter, or is it more appropriate for courts to determine such limitations on a case-by-case basis?
Is patent law an appropriate avenue for dealing with ethical issues? If not, what is an appropriate avenue?
Answer 3 – Patents such as the *Grant* application, which are directed to undermining the laws of the Australia (or the States) should be unpatentable. Australia should also consider carefully where it chooses to put the profits of (usually large and foreign) companies ahead of the health of its citizens and residents. On these grounds methods for medical treatment should be returned to the status of being unpatentable. A high inventive step is essential for pharmaceutical compounds, to ensure that health receives an appropriate priority over profit.

Question 4 – Ethical effect of inherent patentability test.
What would be the ethical consequences of imposing or removing limits on patentable subject matter? Are you aware of any examples of such consequences? **Answer 4 – No comment**

Question 5 – Other reasons for limiting patentable subject matter.
Other than economics, ethics and national security, can placing limits on inherently patentable subject matter be justified on any other grounds? **Answer 5 – No comment**

Question 6 – Content and structure of current Australian law (Part 7)
Does the content of current Australian law meet the objectives of the system? Are decision makers focusing on the appropriate principles? **Answer 6 – No and no.**
Is the legislative structure of current law appropriate for the content? **Answer 6b – No.**
Is the current law clear to decision makers and users of the system? Does the content or structure of the current test cause you any significant problems? **Answer 6 – No and yes.**

Question 7– Issues with current Australian law
Do you have any comments on issues A to H identified in Part 11.3.1?

A combination of flexible and proscriptive tests
B value of existing body of case law
C general inconvenience, mischievous to the state and hurt of trade
D archaic language
E threshold of inventiveness
F threshold of utility
G scope of rights awarded
H requirement for grant

Answer 7 – Aspects of items E, G and H of these matters are addressed in the body of this submission. In regard to other issues raised:

A **Innovation and competition policy lie within the responsibility of executive government and the legislature and should not be left to the courts. To ensure that the patent system is welfare-enhancing patentability should be narrowly and proscriptively defined. Extensions to patentable subject matter should be enacted only on the basis of evidence that the benefit would substantially exceed the harm.**

B **The current body of case law has created a welfare-reducing system. I do not therefore consider that it has other than a negative value.**

C **These tests do not seem to be currently used, as evidenced by the *Grant* case. They should be replaced by specific prohibitions on inventions which:**

- **undermine the law**
- **put the health of Australians at risk**
- **undermine the public domain by granting patents for discoveries; and**
- **creating prices so far above a normal return on investment that they are welfare-reducing.**

D **The archaic language encourages semantic games. Technology should be referred to as technology not as 'art'; existing knowledge should be referred to as existing knowledge not as 'prior art'; the application process should be an application process not a prosecution process, and so on.**

F **The current utility test is so broad as to be meaningless. The original intent was to attract new industries to the benefit of the national economy. Because courts have such difficulty with intangibles, and because there is no evidence of any failure in the innovation market in the tertiary sector, patents should only be granted for genuinely tangible outputs – in the normal meaning of the word.**

G **The patent system would be far less welfare-reducing if the right granted were only a right to prevent copying, not a right to prevent independent invention. At a minimum 'infringers' who had independently invented the same invention should not have to pay either costs or damages. It is enough that they have to stop using their own invention (*Catuity* now seems to have gone out of business).**

H This would cease to be a problem if the full onus of proving beyond reasonable doubt that their application was a 'patentable invention' lay with the applicant.

Question 8 – International integration

Is it more important to achieve best practice or to harmonise with a major jurisdiction? Are any jurisdictions preferable over others?

Answer 8 – Patent policy should be determined to achieve the most positive net outcome for Australian citizens. Harmonisation of patent policy benefits mainly large internationally oriented companies, most of which have little interaction with the Australian economy except to sell product at monopoly-protected prices. Australia should ensure that any efforts to harmonise patent law provide maximum flexibility for sovereign governments, and ensure that any standards adopted are based on evidence that they are welfare-enhancing for all nations.

Question 9 – International compliance of current Australian law

Is current Australian law compliant with our international obligations?

Answer 9 – Yes, and the proposals in this submission are also compliant with Australia's international obligations.

Question 10 – Preferred patentable subject matter

According to what you believe are the appropriate objectives and constraints of the patent system, what sorts of subject matters do you think should be inherently patentable and what should not? Would your preferred content be compliant with Australia's international obligations?

Answer 10 – Only inventions based on technology should be patentable. This would exclude inventions where the inventiveness lay solely in a mathematical algorithm, whether or not it fully pre-empted the algorithm. Inventions which undermine the law of the land should also be unpatentable. Methods of medical treatment should be unpatentable. Compositions identical to those found in nature, including biological products, should not be patentable, whether or not they have been 'isolated' or 'purified'. The government should also seriously consider areas where human rights and needs should trump corporate profits, and consider further exclusions from patentability. All these exclusions would be TRIPS-compliant.

Question 11 – Legislative structure

What sort of legislative structure would be appropriate to achieve your preferred content identified in Question 10? Are any foreign structures preferred?

In principle, when should statutory provisions excluding specific subject matters be used? Should such provisions be expanded, such as by including the exceptions from patentability allowed under TRIPS?

Answer 11 – A total re-write of the Patents Act, overseen by competition and consumer authorities. See above for exclusions, and text of submission for learning from the experience with the EPO that exclusions must be strictly written. If the whole Act were re-framed on the basis of the applicant proving beyond reasonable doubt that there was a benefit in providing a monopoly, then some of these difficulties might well disappear.

Question 12

Do you have any other comments?

Answer 12 – The comments in my submission about competition and strategic 'gaming' behaviour are central to any effective reform of the patent system.

References

ABS, (2007), *Patterns of Innovation in Australian Businesses 2005*, Canberra: Australian Bureau of Statistics, Cat. No. 8163.0.

ACIP, (2003), *Report on a Review of the Patenting of Business Systems*, Canberra, (http://www.acip.gov.au/library/bsreport.pdf, accessed 30 August 2008).

_____, (2008), *Patentable Subject Matter: Issues Paper*, Canberra, (http://www.acip.gov.au/library/Patentable%20Subject%20Matter%20Issues%20Paper.pdf, accessed 31 August 2008).

ALRC, (2004), *Genes and Ingenuity: Gene Patenting and Human Health* ALRC Report No. 99, (http://www.austlii.edu.au/au/other/alrc/publications/reports/99/, accessed 11 November 2007).

APLF, (2006), 'The Emperor Sports Decision: Ramifications for the Law of Inventive Step in Australia', (Association of Patent Law Firms) www.aplf.org/mailer-private/issue2006-22.html, accessed

Arundel, A., (2001), 'The Relative Effectiveness of Patents and Secrecy for Appropriation', *Research Policy*, 30:4, 611-624.

Arundel, A. and G. van de Paal, (1995), 'Innovation Strategies of Europe's Largest Industrial Firms'.

Bagley, M., (2001), 'Internet Business Model Patents: Obvious by Analogy', *Michigan Telecommunications Technology Law Review*, 7, 253-288.

Bakels, R.B. and P.B. Hugenholtz, (2002), *The Patentability of Computer Programs: Discussion of European-Level Legislation in the Field of Patents for Software*, Study commissioned by the European Parliament.

Bates, M., (2003), 'Smaller Developed Nations: the Cash Cows for Royalty Milking?' *Australian Intellectual Property Law Bulletin*, 16:4, 54-56.

Beggs, J., (1981), 'On the Evaluation of the Australian Patent System' in Australian Patent Office (eds), *The Economic Implications of Patents in Australia*, Canberra: Australian Patent Office, pp. 39-44.

Bell, A., (1987), 'Apple Computer Inc v Computer Edge pty lts – and Subsequent Federal Legislation' in W.J. Taggart (eds), *Computer Law in Australia: A Collection of Essays*, Sydney: Legal Books Pty Ltd., pp. 12-21.

Bessen, J.E., (2003), *Patent Thickets: Strategic Patenting of Complex Technologies*, available at SSRN: http://ssrn.com/abstract=327760 or DOI: 10.2139/ssrn.10.2139/ssrn.327760 (March).

Bessen, J.E. and E. Maskin, (2000), *Sequential Innovation, Patents, and Imitation*, Cambridge, Mass.: Department of Economics Working Paper No. 00-01.

Bessen, J.E. and M.J. Meurer, (2008), *Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk*, Princeton and Oxford: Princeton University Press.

BIE, (1993), *R&D, Innovation and Competitiveness: An Evaluation of the Research and Development Tax Concession*, Canberra: Bureau of Industry Economics Research Report 50.

_____, (1994), *The Economics of Patents*, Canberra: Bureau of Industry Economics Occasional Paper 18.

Bochnovic, J., (1982), *The Inventive Step: its Evolution in Canada, the United Kingdom and the United States*, Munich: Max Planck Institute for Foreign and International Patent, Copyright and Competition Law.

Boldrin, M. and D.K. Levine, (2004), 'The Case Against Intellectual Monopoly', *International Economic Review*, 45:2, 327-350.

_____, (2008), *Against Intellectual Monopoly*, Cambridge: Cambridge University Press also at http://www.dklevine.com/general/intellectual/againstfinal.htm, accessed 6 July 2008.

Braithwaite, J., (2005), *Markets in Vice, Markets in Virtue*, Sydney: The Federation Press.

Brennan, D.J., (2002), 'An Essay on the Eligibility of Business Methods for Australian Patent Protection', *Journal of Law and Information Science*, 13:1, 8-33.

Brennan, D.J. and A.F. Christie, (1997), 'Patent Claims for Analogous Use and the Threshold Requirement of Inventiveness', *Federal Law Review*, 25:2, 237-262.

Brödner, P., (2003), 'The internet: universal information infrastructure for the emerging knowledge society' in E. Helmstädter (eds), *The Economics of Knowledge Sharing: A New Institutional Approach*, Cheltenham, UK and Northampton, MA, US: Edward Elgar, pp. 147-169.

Chaudhuri, S., (2007), *Is Product Patent Protection Necessary in Developing Countries for Innovation? R&D by Indian Pharmaceutical Companies after TRIPS*, Calcutta: Working paper Series No 614 (September).

Christie, A.F., (2000), 'Some Observations on the Requirement of Inherent Patentability in the Context of Business Method Patents', *Intellectual Property Forum*, 43, 16-22.

Cohen, J.E. and M.A. Lemley, (2001), 'Patent Scope and Innovation in the Software Industry', *California Law Review*, 89:1, 1-57.

Cohen, W.M. and D.A. Levinthal, (1989), 'Innovation and Learning: The Two Faces of R&D', *The Economic Journal*, 99:397, 569-596.

Cohen, W.M., R.R. Nelson, and J.P. Walsh, (2000), *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)*, Cambridge, MA: NBER Working Paper 7552.

Cole, J.H., (2001), 'Patents and Copyrights: Do the Benefits Exceed the Costs?' *Journal of Libertarian Studies*, 15:4, 79–105.

Cutler, T., N. Gruen, M. O'Kane, S. Dowrick, N. Kennedy, G. Davis, C. Livingstone, M. Clark, J. Foster, J. Peacock, and P. Kelly, (2008), *venturousaustralia - building strength in innovation: Report on the Review of the National Innovation System*, Canberra: Department of Innovation, Industry, Science and Research, (http://www.innovation.gov.au/innovationreview/Documents/NIS-review-web.pdf, accessed 12 September 2008).

Drahos, P., (2001), 'BITs and BIPs Bilateralism in Intellectual Property', *The Journal of World Intellectual Property*, 4:6, 791-808.

_____, (2002), *Information Feudalism: Who Owns the Knowledge Economy*, London: Earthscan.

Dreyfuss, R.C., (2000), 'Are Business Method Patents Bad for Business?' *Santa Clara Computer & High Technology Law Journal*, 16:2, 263-280.

_____, (2008), 'Nonobviousness: A Comment on Three Learned Papers', *Lewis & Clark Law Review*, 12:2, 431-441.

Edwards, C.D., (1949), *Maintaining Competition: Requisites of a Governmental Policy*, New York: McGraw-Hill.

Eurostat, (2004), *Innovation in Europe: Results for the EU, Iceland and Norway*, Luxembourg: European Commission, (available at http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-59-04-257/EN/KS-59-04-257-EN.PDF, accessed 9 December 2007).

González-Álvarez, N. and M. Nieto-Antolín, (2007), 'Appropriability of innovation results: An empirical study in Spanish manufacturing firms', *Technovation*, 27:5, 280-295.

Goto, A. and A. Nagata, (1996), *Technological Opportunities and Appropriability*, Tokyo: NISTEP Report No. 48.

Graham, S.J.H., B.H. Hall, D. Harhoff, and D.C. Mowery, (2002), *Post-Issue Patent "Quality Control": A Comparison of United States Patent Re-examinations and European patent Oppositions*, Department of Economics, Paper E02-321.

Griliches, Z., (1990), 'Patent Statistics as Economic Indicators: A Survey', *Journal of Economic Literature*, 28:4, 1661-1707.

Hall, B.H., S.J.H. Graham, D. Harhoff, and D.C. Mowery, (2003), *Prospects for Improving US Patents Quality via Post-Grant Opposition*, Berkeley: Copetition Policy Center Working Paper No. CPC 03-38.

Harabi, N., (1995), 'Appropriability of technical innovations; An empirical analysis', *Research Policy*, 24:6, 981-992.

Harhoff, D., F.M. Scherer, and K. Vopel, (1997), *Exploring the Tail of Patented Invention Value Distributions*, Mannheim: Discussion paper FS IV 97 - 27, Wissenschaftszentrum Berlin (January).

Harris, R.W., (1986), 'Prospects for Supreme Court Review of the Federal Circuit Standards for Obviousness of Inventions Combining Old Elements', *Journal of the Patent and Trademark Office Society*, 68, 66-.

IPAC, (1984), *Patents, Innovation and Competition in Australia*, Canberra: Industrial Property Advisory Committee.

IPCRC, (2000), *Review of Intellectual Property Legislation Under the Competition Principles Agreement: Final Report*, Canberra: Commonwealth of Australia.

Jaffe, A.B., (1986), 'Technological Opportunity and Spillovers of R & D: Evidence form Firms' Patents, Profits and Market Value', *American Economic Review*, 76:5, 984-1001.

Jaffe, A.B. and J. Lerner, (2004), *Innovation and its Discontents: How Our Broken Patents System is Endangering Innovation and Progress, and What to Do About It*, Princeton: Princeton University Press.

Jensen, P.H. and E.M. Webster, (2004), *Factors Affecting the Power of Patent Rights*, Melbourne: Working Paper No. 31/04 (December).

Kahin, B., (2003), 'The Expansion of the Patent System: Politics and Political Economy', *First Monday*, 6 1 www.firstmonday.org/issues/issue8_3/kahin/index.html, accessed 22 June 2006.

Kitch, E.W., (1977), 'The Nature and Function of the Patent System', *Journal of Law and Economics*, 20, 265-290.

Krause, W., (2000), 'Sweeping the E-Commerce Patent Minefield: The Need for a Workable Business Method Exception', *Seattle University Law Review*, 24:1, 79-105.

Lamberton, D.M. and T.D. Mandeville, (1980), 'On Patents and R&D: Some Observations on Australian Experience', Presented at OECD Science and Technology Indicators Conference, STIC/80.58, Paris, Paris.

Lawson, C., (2008), 'Quantum of Obviousness in Australian Patent Laws', *Australian Intellectual Property Journal*, 19, 43-65.

Lemley, M.A., (2001), 'Rational Ignorance at the Patent Office', *Northwestern University Law Review*, 95:4, 1495-1532.

Levin, J. and R.C. Levin, (2003), 'Benefits and Costs of an Opposition Process' in W.M. Cohen and S.A. Merrill (eds), *Patents in the Knowledge-Based Economy*, Washington, DC: National Academy Press, pp. 120-141.

Levin, R.C., A.K. Klevorick, R.R. Nelson, and S.G. Winter, (1987), 'Appropriating the Returns from Industrial Research and Development', *Brookings Papers on Economic Activity, Special Issue on Microeconomics*, 1987:3, 783-831.

Lunney, G.S., Jr., (2001), 'E-Obviousness', *Michigan Telecommunications Technology Law Review*, 7, 363-422.

_____, (2004), 'Patent Law, The Federal Circuit, and the Supreme Court: A Quiet Revolution', *Supreme Court Economic Review*, 11, 1-79.

Macdonald, S., (2004), 'When Means Become Ends: Considering the Impact of Patent Strategy on Innovation', *Information Economics and Policy*, 16:1, 135-158.

Machlup, F., (1958), *An Economic Review of the Patent System*, Washington, D.C.: Study No. 15 of the U.S. Senate Subcommittee on Patents, Trademarks and Copyrights.

Mandeville, T.D., (1996), *Understanding Novelty: Information, Technological Change, and the Patent System*, Norwood, N.J.: Ablex.

Mandeville, T.D., D.M. Lamberton, and E.J. Bishop, (1982), *Economic Effects of the Australian Patent System A Commissioned Report to the Industrial Property Advisory Committee*, Canberra: Australian Government Publishing Service.

Mansfield, E., (1986), 'Patents and Innovation: An Empirical Study', *Management Science*, 32:2, 173-181.

Mansfield, E., M. Schwartz, and S. Wagner, (1981), 'Imitation Costs and Patents: An Empirical Study', *The Economic Journal*, 91:364, 907-918.

Mazzoleni, R. and R.R. Nelson, (1998), 'The Benefits and Costs of Strong Patent Protection: A Contribution to the Current Debate', *Research Policy*, 27, 273-284.

McBratney, A.J., (2003), *Between Scylla and Charybdis: Navigating Amendment Law in the Australian Patent System*, Brisbane: University of Queensland, PhD (need to check).

McFarlane, R., (2001), 'Business process found patentable by Federal Court of Australia', http://www.findlaw.com.au/articles/default.asp?task=read&id=1992&site=GN, accessed 12 September.

McGonigal, P.G., (1981), 'Patents and Competition Policy: Economic Implications' in A.P. Office (eds), *The Economic Implications of Patents in Australia*, Canberra: Australian Patent Office, pp. 141- 180.

Menell, P.S., (2006), 'Are Software patents 'Anything under the Sun made by Man …'?' Boston University School of Law: Software patents: A Time for Change? Panel on Legal Perspectives, at www.researchoninnovation.org/swconf/program.htm.

Merges, R.P., (1999), 'As Many as Six Impossible Patents before Breakfast: Property Rights for Business Concepts and Patent System Reform', *Berkeley Technology Law Journal*, 14:2, 577-615.

Merrill, S.A., (2003), 'Improving Patent Quality: Connecting Economic Research and Policy', Presented at Intellectual Property Rights (IPR), Innovation and Economic Performance, Paris.

Moir, H.V.J., (2008), *Who Benefits? An Empirical Analysis of the Ownership of Australian Patents*, Paper prepared for the ECPR 2008 Joint Sessions of Workshops, Workshop 14, The Politics of Intellectual Property, Rennes, 11-16 April 2008.

_____, (forthcoming-a), *Do Patent Systems Improve Economic Well-Being? An Exploration of the Inventiveness of Business Method Patents*, Canberra: Australian National University, draft PhD dissertation.

_____, (forthcoming-b), 'What *are* the costs and benefits of patent systems?' in W. Van Caenegem and C. Arup (eds), *Intellectual Property Policy Reform*, Cheltenham, UK and Northampton, MA, US: Edward Elgar,

New Zealand Ministry of Economic Development, (2002), *Review of the Patents Act 1953: Boundaries to Patentability: A Discussion Paper*, available at http://www.med.govt.nz/upload/3649/patentsreview.pdf, accessed 26 August 2007 (March).

NOIE, (2004), *Productivity Growth in Australian Manufacturing*, Canberra: National Office for the Information Economy.

Pakes, A., (1986), 'Patents as Options: Some Estimates of the Value of Holding European Patent Stocks', *Econometrica*, 54:4, 755-784.

Penrose, E.T., (1951), *The Economics of the International Patent System*, Baltimore: The Johns Hopkins Press.

Pila, J., (2001), 'Methods of Medical Treatment within Australian and United Kingdom Patents Law', *University of New South Wales Law Journal*, 24:2, 420-461.

Rudd, K., (2008a), *Australia's Economic Future*, 4 April 2008, London, speech to the Confederation of British Industry and Australian Business, (http://www.pm.gov.au/media/Speech/2008/speech_0168.cfm, accessed 14 September 2008).

_____, (2008b), *Prime Minister of Australia - Address to Heads of Agencies and Members of Senior Executive Service*, 30 April 2008, Canberra, Parliament House, (http://www.pm.gov.au/media/speech/2008/speech_0226.cfm, accessed 11 September 2008).

Samuelson, P., R. Davis, M. Kapor, and J.H. Reichman, (1994), 'A Manifesto Concerning the Legal Protection of Computer Programs', *Columbia Law Review*, 94:8, 2308-2431.

Saviotti, P.P., (1998), 'On the dynamics of appropriability, of tacit and of codified knowledge', *Research Policy*, 26:7-8, 843-856.

Scherer, F.M., (2006), *The Political Economy of Patent Policy Reform in the United States*, Washington, D.C.: AEI-Brookings Joint Center for Regulatory Studies Working Paper 06-22 (October).

Scherer, F.M., S.E. Herzstein, A. Dreyfoos, W. Whitney, O. Bachmann, P. Pesek, C. Scott, T. Kelly, and J.J. Galvin, (1959), *Patents and the Corporation: A Report on Industrial Technology under Changing Public Policy*, Boston: privately published.

Scherer, F.M. and S. Weisburst, (1995), 'Economic Effects of Strengthening Pharmaceutical Patent Protection in Italy,' *International Review of Industrial Property and Copyright Law*, 26:6, 1009-1024.

Sell, S.K., (2003), *Private Power, Public Law: The Globalization of Intellectual Property Rights*, Cambridge: Cambridge University Press.

Smith, B.L. and S.O. Mann, (2004), 'Innovation and Intellectual Property Protection in the Software Industry: An Emerging Role for Patents', *The University of Chicago Law Review*, 71, 241-264.

Stern, R.H., (1999), 'Scope-of-Protection Problems with Patents and Copyrights on Methods of Doing Business', *Fordham Intellectual Property, Media & Entertainment Law Journal*, 10:1, 105-158.

Stoinaoff, N., (1999), 'Patenting Computer Software: An Australian Perspective', *European Intellectual Property Review*, 21:10, 500-507.

Taylor, C.T. and Z.A. Silberston, (1973), *The Economic Impact of the Patent System: A Study of the British Experience*, Cambridge: Cambridge University Press.

Thambisetty, S., (2008), *Increasing Returns in the Patent System: Sources and Consequences*, Paper prepared for the ECPR 2008 Joint Sessions of Workshops, Workshop 14, The Politics of Intellectual Property, Rennes, 11-16 April 2008.

Thomas, J.R., (1999), 'The Patenting of the Liberal Professions', *Boston College Law Review*, 40:5, 1139-1185.

Tufano, P., (1989), 'Financial innovation and first-mover advantages', *Journal of Financial Economics*, 25, 213-240.

Ullman, J.D., (2000), 'Ordinary Skill in the Art', http://www-db.stanford.edu/~ullman/pub/focs00.html.

US FTC, (2003), *To Promote Innovation: The Proper Balance of Competition and Patent Law and Policy*, Washington, D.C.: Federal Trade Commission.

US National Academy of Sciences, (2004), *A Patent System for the 21st Century*, Washington, DC: National Academies Press.

van Caenegem, W., (2002), 'The Technicality Requirement, Patent Scope and Patentable Subject Matter in Australia', *Australian Intellectual Property Journal*, 13:Feb, 41-59.

_____, (2007), *Intellectual Property Law and Innovation*, Cambridge: Cambridge University Press.

Walterscheid, E.C., (1995a), 'The Early Evolution of the United States Patent Law: Antecedents (Part 2)', *Journal of the Patent and Trademark Office Society*, 76:11, 849-880.

_____, (1995b), 'The Early Evolution of the United States Patent Law: Antecedents (Part 3 continued)', *Journal of the Patent and Trademark Office Society*, 77:11, 847-857.

_____, (1997), 'To Promote the Progress of the Useful Arts: American Patent Law and Administration, 1787-1836 (Part 1)', *Journal of the Patent and Trademark Office Society*, 79:2, 61-78.

_____, (1998), 'To Promote the Progress of the Useful Arts: American Patent Law and Administration, 1787-1836 (Part 2)', *Journal of the Patent and Trademark Office Society*, 80, 11-40.

Watson, D.S. and M.A. Holman, (1970), 'The Concentration of Patent Ownership in Corporations', *The Journal of Industrial Economics*, 18:2, 112-117.