1. Introduction

1.1 PUBLIC INTEREST IN PATENT LAWS

Patents are a fascinating example of how well-meaning economic policy can go wrong. This book adds to the evidence about the major difficulties with current patent policy.[1] It does this through an in-depth exploration of how inventive something needs to be to gain a patent. The data presented in this book show that no inventiveness is needed for a patent, if inventiveness takes either its normal meaning or the meaning of contributing new knowledge or know-how.

Patent policy is economic policy. Its essence is a very simple bargain. Society accepts the harmful effects of patent monopolies in exchange for a higher level of invention, and thus a higher level of economic growth. This simplicity of principle has been extremely hard to put into practice – just how inventive should something be to obtain a patent? Where is the point at which the monopoly and transaction costs of patent systems are fully offset by the benefits of inducing innovation that would not otherwise have occurred? If induced innovations generate new knowledge and know-how this provides benefits that spill over to the community to offset the costs of the granted monopolies. But how much new knowledge is enough?

It is challenging to evaluate patent policy. How do the costs imposed by preventing innovation in rival firms and raising prices to consumers compare with the benefits of induced new knowledge that flows to other firms?

Although patent offices hand out many thousands of patents each year, they do not collect any information on how these monopolies are used, making direct evaluation of patent policy an impossibility. Indeed Machlup's 1958 report to the US Senate, based on an analysis of principles and a breadth of knowledge about industry and innovation, remains perhaps the best overall practical evaluation of the economic impact of patent systems. Machlup concluded that at that time the costs and benefits of US patent policy were finely balanced; he certainly considered that any increase in the strength or ambit of the patent system would tip the balance to a negative economic impact. He also implied that for countries with a smaller industrial base and lower technology exports the balance

of evidence would be in favour of a reduced level of patent 'protection' (Machlup 1958: 80).

Despite this conclusion, and without any supporting empirical evidence, over recent years patent systems have become stronger and more widespread. One key driver has been a small number of major global companies operating through their influence on international 'trade' negotiations (Drahos 2002; Sell 2003). Another has been a series of judicial decisions that have broadened the subject matter reach of the patent system and reduced the quantum of inventiveness required to obtain a patent.

Almost simultaneously survey data on innovating firms and the means they use to protect their innovations have become available. These address the question of how much innovation is induced by patent systems and how much would occur anyway – the central concept of induced innovation. The most important of these are two US surveys: the 1984 Yale survey of large R&D performing firms and the 1994 Carnegie-Mellon survey (CMS) of large and small firms (Levin et al 1987; Cohen et al 2000). Replicated in a large variety of surveys outside the USA, these data consistently call into question whether patent 'protection' has any major positive effect on industrial innovation outside of the pharmaceutical industry. The more recent of these studies show an increasing use of patents for strategic purposes (Blind et al 2006; Encaoua et al 2006). This dissonance between the trend in patent policy and the increasing body of evidence questioning the effectiveness of patents has been noted by such renowned authorities on industrial innovation as Nelson (Mazzoleni and Nelson 1998a), Cohen (Cohen 2005) and Scherer (Scherer 2006). Why this dissonance between policy and evidence?

Where regulatory interventions create the possibility for some parties to reap substantial benefits, they have a strong incentive to help set up complex and arcane rules that hide such benefits from general view (Braithwaite 2005). Where those who foot the bill for such regimes are widely dispersed, there is little chance of effective lobbying to offset this – their sole hope is that their interests will be protected by their elected representatives. These features underlie the development of the theories of public choice and regulatory capture (Olson 1971). Landes and Posner conclude that the strengthening of the patent system at precisely the time other markets were being extensively deregulated rested in public choice theory – the small number of entities reaping significant benefits from stronger patents have been successful in their lobbying efforts (Landes and Posner 2004). Democratic protection of the public interest has so far failed.

The complexity of the patent system is well known, and there is a strong degree of animosity by the patent community to those from outside taking

any interest in it. The American patent bar lobbied successfully to prevent the US Government Accountability Office – a highly respected research body – from undertaking a study into business method patenting. Such a study had been part of the penultimate draft of the *American Inventors Protection Act 1999* but was removed in the final statute. This and other derailed efforts to collect and analyse data on how the patent system operates are documented by Kahin (2003a).

The market for innovation has perhaps the greatest degree of government intervention of any market. Yet as Yale Professor John Beggs remarked in the context of an economic review of patents:

> 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)

This salutary warning about patent policy remains pertinent today.

While some economists have not hesitated to undertake econometric analyses using patent data, this is not always informed by an in-depth understanding of patent systems as they actually operate. The time required to develop an understanding of these complex systems can be off-putting. One purpose of this book is to provide a clear and non-legalistic insight into the actual workings of the patent system for economic researchers and industry and innovation policy makers. At present economic research on the patent system has little if any impact on policy makers as much focuses on abstract concepts unrelated to patent practice (van Pottelsberghe 2011). A better understanding of the realities of patent policy might assist in developing more policy relevant research. This book exposes some of the key operating rules affecting the quantum of inventiveness required for a patent grant.

A second purpose is to present the results of an empirical investigation into the actual height of the inventive step. As a concept inventiveness is clearly a continuum; some things are marvellously inventive and others are only a little different from what already exists. The challenge in patent policy is to determine where the boundary lies between quite obvious inventions – mere workshop improvements as it were – and those inventions that genuinely contribute new knowledge and know-how thus providing spillover benefits to offset their costs. This is an essentially subjective judgement, involving as it does guesstimates of future benefits and costs. The proxy variable to short-cut this arduous process has been the concept of inventiveness.

Initially spelled out in section 6 of the *Statute of Monopolies 1623*, the definition of a patentable invention invoked concepts such as "not . . . mischievous to the state, by raising prices of commodities at home, or hurt of trade, or generally inconvenient". This complexity is well summarised in the 1641 Massachusetts code of laws: "There shall be no monopolies granted or allowed among us, but of such new inventions as *are profitable to the country*, and that for a short time" (Article 9, emphasis added).

A third contribution this book makes is its economic perspective on the legal doctrines that constitute patent policy. While there are some exceptions, much legal analysis of the patent system fails to focus on the fact that the policy objectives are economic. This economic perspective on detailed rules may be of some value to those who usually only consider such rules from a legal perspective. A focus on the impact of the rules on innovation investment and national benefit is quite different from the 'property' perspective some others take. 'Property' derived from government intervention and regulation in the market is quite a different thing from the normal concept of physical property acquired in relatively competitive markets.

This book follows the philosophical view of the 1641 Massachusetts code: monopolies should only be granted when they provide a net benefit to the nation, as opposed to a specific benefit to the monopolist. It takes as a foundation principle that the most important policy for a healthy economy is sound and effective competition. It assumes that policy makers intend that patent systems should have a positive economic impact on their nation. It takes the economic perspective that the benefits of a patent system are the knowledge and know-how spillovers from those innovations induced by the patent system. Costs flow from all granted patents, not just those induced by the patent system. They are the higher prices paid where a genuine monopoly can be exercised, the transaction costs in obtaining and enforcing patents and higher search costs where there are large volumes of patents. A further cost is the development of a rent-seeking attitude in business. Where costs are more than offset by the spillover benefits from induced innovation a patent system will be economically beneficial to a country.

1.2 THE CENTRALITY OF INVENTIVENESS

Measuring spillovers is extremely difficult (Griliches 1990), but the underlying assumption – that it is new knowledge which creates the need for and return from the patent system – may be broadly related to the degree of inventiveness. Of course some kinds of new knowledge may generate

greater spillover benefits than others, so one cannot expect a clear and direct association between inventiveness and net benefit to the nation. Nevertheless, the concept of inventiveness has become the principal criterion operating today as a gatekeeper to patent grant. The quantum of inventiveness required for grant – the so-called inventive step – is thus of critical policy interest. Yet because of its very subjectivity there is little independent evidence on its height.

Once inventions moved from the mechanical realm to chemicals and electronics, inventiveness became an increasingly difficult decision. Judges developed various rules of thumb – legal doctrines – which became codified in common law countries as policy rules. Often these were imported from case law into statute law without any evaluation of their economic effects.

The net impact of these rules on the quantum of inventiveness required for a patent grant has led many patent system scholars to comment critically on the very low threshold required. British and then Australian law came to require a mere "scintilla" of inventiveness. The US standard has also fallen to a very low level and there is a large critical literature on the non-obviousness criterion in the US system (e.g. Harris 1989; Hunt 1999; Barton 2000; Lunney 2001; Jaffe and Lerner 2004; Lunney 2004).

Because of its subjectivity, objective proxies for measuring inventiveness have been elusive. Dahlin and Behrens (2005) have developed a proxy for identifying radical inventions. This indicator identified six out of 581 tennis racquet patents as radical, and this definition appears robust on the basis of complementary evidence. While "about 1 per cent" might feel right in terms of the proportion of patented inventions which are truly radical, the other 99 per cent includes at least a proportion of 'inventions' which are reasonably inventive, if not radically so. The challenge is to define clearly what is sufficiently inventive to merit a monopoly. Certainly it is more than a scintilla. But it is not possible to simply invert Dahlin and Behrens' approach – the issue of identifying uninventive inventions is asymmetrical and developing a standardised measure of *lack* of inventiveness is challenging.

Qualitative studies are not generally preferred in economic analysis as small sample sizes make robust statistical analysis inappropriate. Nonetheless a case study approach seems the most appropriate means to investigate the actual height of the inventive step. The data presented in this book are the results of an analysis of the new knowledge or know-how contained in a set of granted patents. This is the reverse question of that asked during the process of obtaining a patent. In several major jurisdictions there is a reverse onus of proof policy – it is the patent office which has to demonstrate that an application is uninventive rather than the

monopoly applicant who has to demonstrate inventiveness. The question the examiner addresses is whether there is sufficient documented evidence to deem the 'invention' obvious. So asking what is the knowledge or know-how contributed uses a radically different yardstick to measure the impact of the legal doctrines which constitute patent policy.

Presenting the results of such a study requires laying out the evidence so others can judge for themselves whether the subjective judgements made are valid. Much of this book is concerned with this issue, presenting details of the core 'inventive' contribution of each patent and assessing their contribution to new knowledge or know-how. In case after case a complete lack of new knowledge is demonstrated. There are two cases where there is a *possible* new idea. But these possible new ideas do not contribute new knowledge or know-how, either in the idea or in the implementation. In both cases the claims seem to fully pre-empt other uses of the idea. This is generally seen as undesirable – ideas should remain for all to use. Only specific applications of ideas are patentable.

Investigating cases in this detail also allows the identification of the specific legal doctrines giving rise to the grant of so many patents that appear totally devoid of any contribution to new knowledge. While reading the rules set out in patent examiner manuals would also suggest that the quantum of inventiveness is highly constrained, these cases show just what a challenge it is for patent examiners to reject uninventive applications. Particularly in the USA and Australia examiners are tied by the plethora of rules that the Federal Trade Commission (FTC) identified as favouring patent grant once an application is lodged (FTC 2003: 8). The patents in the dataset are traced through parallel applications at IP Australia,[2] the United States Patent and Trademark Office (USPTO) and at the European Patent Office (EPO). This allows a consideration of whether there are rule differences affecting the height of the inventive step. The correspondence between examiners and applicants shows just how difficult it is for patent examiners to protect the public interest.[3]

Because of my specific expertise, the cases selected all fall into a new and controversial area of patenting – business methods. But business method cases have the advantage of allowing a wide range of readers to judge for themselves the quantum of new knowledge involved. This 'technology field' is relatively accessible to many analysts, covering as it does financial, trade, logistics, marketing, business performance, human resources, purchasing and other closely related business systems. The nature of the 'inventions' can be described in accessible language and the reader will often be in a position to make an independent judgement about any knowledge contribution. This contrasts with leading edge research in genuine technology areas, where such an assessment would be limited

to a small number of experts. It is possible that this new field is unrepresentative; but all signatories to TRIPS must treat all fields of technology identically, applying the same decision-making rules. If a consistent application of the standard rules generates a vast majority of patents with no new knowledge in this field, then it would be worth investing the specialist resources needed to make a similar assessment in genuine fields of technology.

In a sense this study does nothing more than confirm what is already known: the quantum of inventiveness required for a patent is abysmally low. Indeed in some jurisdictions is appears non-existent. In attending patent conferences and meetings over many years, it became clear that members of the patent community are well aware of this. Indeed members of this community refer to the 5-10-85 rule – that some 5 per cent of patents are truly inventive, another 10 per cent are reasonably inventive and the remainder are simply "rubbish". Barton (2000) confirms these estimates in noting that less than 25 per cent of US patents survive re-examination without change. Quillen (2006) notes that before the establishment of the Court of Appeals for the Federal Circuit (CAFC) in 1982 two-thirds of litigated patents were found to be invalid. Three decades ago Griliches noted that the standard for a patent grant was "not very high" (Griliches 1990: 1663). The low standards were noted even earlier by Edwards, who commented that "[a]s 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).

Despite the substantial evidence that the inventiveness standard is extremely low, the rules used to define the inventive step have been impervious to reform. Existing evidence, strong as it is, has not yet been sufficient to offset the influence of lobbyists. Further empirical analysis of this key policy variable is clearly required if patent policy is to be set on an evidence base and reshaped to deliver a net national benefit. This book is a contribution to that process.

1.3 HOW THIS STUDY IS STRUCTURED

Patents have rarely held a central position as a subject of interest in the economics profession. Indeed some 60 years ago it was suggested that following the near-abolition of the patent system in the UK in the late nineteenth century economists largely abandoned the field to lawyers (Machlup and Penrose 1950). Nonetheless patent policy is quintessentially economic policy, and economic rationales are regularly presented by bureaucrats and lobbyists to support its ever-widening reach. Some

discussion of both the economics of patent policy and the development of legal doctrine is therefore needed to interpret the policy impacts demonstrated by the case studies.

Background on the economic arguments used in discussing patent policy is presented in Chapter 2. This focuses on the key *assumptions* in competing theories about the generation and dissemination of new knowledge. Assumptions about how economic agents behave are central to most economic theories, so their validity is critical to accepting or rejecting a hypothesis. The assumptions underlying theories about patents can be assessed against the increasing empirical evidence now available. This is a very useful step forward. It is possible because of major US innovation studies from the early 1980s and 1990s later confirmed through National Innovation Surveys (NISs) in many other countries. This assessment of the empirical evidence leads to some interesting conclusions about the economics of patent policy.

Attention is then turned in Chapter 3 to how patent law has developed, first with respect to subject matter scope and then with respect to inventiveness. The expansion in the coverage of the patent system to new 'technology' fields has culminated in the grant of patents to business methods, often requiring no technological application. This massive change in scope occurred largely through case law: "the greatest changes in the legal system made by judges, without legislative review or approval, have occurred in the area of patent law" (Boldrin and Levine 2008: 63). The changing doctrines on novelty and inventiveness are reviewed in Section 3.4 as an introduction to the empirical analysis in later chapters. These concepts developed from the mid nineteenth century and patent law inventiveness is now determined by a series of prescriptive rules around an artificially constructed representational skilled worker.

There have been some significant changes in inventiveness rules in recent decades in the USA and Australia, often in cases where private parties are in dispute and the public interest is not represented. The CAFC has developed quite different obviousness standards than those used by the Supreme Court (Harris 1986) allowing a far larger number of granted patents to be deemed valid (Quillen 2006). The Supreme Court has partially addressed the CAFC's elevation of secondary considerations above the statutory obviousness tests. In the *KSR* case it also determined that the skilled worker should be deemed to have normal rather than no imagination. In Australia imagination is still not permitted and severe constraints on the knowledge this person can use were only lifted in 2012.

Chapter 4 draws this economic and legal background together in a consideration of what tests would best ensure that patentable inventions are those which deliver a benefit to the nation. Challenges in developing

effective proxies mean that first-best solutions are not feasible. However a focus on the new knowledge or know-how contributed by an invention offers a useful second-best option. This approach aligns with the question posed by the UK Appeal Court in 2006 (*Aerotel*) when it summarised a key part of the examination process as being designed to answer the question: "What has the inventor really added to human knowledge?" This is in fact quite different from the approach usually taken during examination or in litigation about inventiveness. In developing an alternative approach to determining patent eligibility a number of related issues are canvassed. Should a technology basis be required for a patent to be granted? Should mathematical algorithms be patentable in any form? Is more than pure logic needed for an 'invention' to be patentable? What is the appropriate distinction between an unpatentable idea and a patentable implementation? Does the problem/solution approach assist in identifying knowledge contributions?

Chapter 4 also discusses the selection of a representative set of cases and the methodology used in this study. In summary the inventiveness of the selected 72 patents is assessed on the basis of their claims, which are "construed" to determine the essence of the 'invention'. The core inventive element is then compared to existing knowledge and know-how at the priority date for the patent. The chapter concludes with a discussion of the characteristics of the selected cases. This includes the first presentation of some case material. The 10 cases presented in Section 4.4 are selected to provide a flavour of the range of patented business methods across industries. No new knowledge or know-how contributions are found.

Chapters 5, 6 and 7 present the detailed assessment of the inventiveness of the remaining cases. The inventiveness story is told in terms of the contribution to new knowledge or know-how. It is interwoven with the story of the specific doctrinal rules which appear to determine the grant of a patent even where there is no new knowledge or know-how. While the initially selected set of cases was based on Australian patent grants, 64 have parallel applications overseas. Altogether 190 separate overseas applications were identified with 54 at the USPTO and 38 at the EPO. The cases are traced through the Australian, US and European patent systems comparing outcomes and differences in the rules that led to the grant of obvious patents.

Existing studies of business method patents suggest that a major reason for the grant of so many obvious patents is the difficulty in documenting existing processes in a field where these are rarely written down. This hypothesis is tested in Chapter 5 where the first issue addressed is whether there are difficulties in tracing pre-existing knowledge ('prior art'). For almost all cases existing documented knowledge was found. Once examiners identify existing knowledge applicants regularly redraft

their specifications to ensure that this knowledge does not defeat their application. So the other issues addressed in Chapter 5 are whether existing knowledge can be evaded though amendment (Section 5.3) or the reverse onus of proof policy (Section 5.4). The fact that it is patent offices which have to disprove inventiveness, rather than applicants who have to prove it, creates a lower threshold for the inventiveness test. No new knowledge or know-how is found in any of the 24 cases discussed in this chapter.

In Chapter 6 attention is turned to the vexed question of combination patents. These are 'inventions' that take known elements or processes and combine these in new ways. At their simplest this involves the mere computerisation of known business processes, and there are 22 such cases. There are a further 20 cases where two or more known processes are combined, usually in computerised form, and often using modern electronic networks. There has been a shift in legal doctrine in the USA and Australia lowering the inventiveness standard for combination inventions. The 15 cases discussed identify no contributions to knowledge or know-how.

The cases presented in Chapter 7 cover a more diverse range of issues. The chapter starts by looking at cases where there has been a grant at the EPO or by the UK Intellectual Property Office (UKIPO). The European Patent Convention (EPC) specifically excludes software and business methods from patentability. Some also argue that the EPC has a relatively high inventive step. For both these reasons there is an expectation that outcomes from parallel applications at the EPO and UKIPO would be different from those in the USA or Australia. While there are more cases of clear refusal from these offices, there are also a surprising number of grants. Particularly astonishing are the three cases where the EPO rejected 'inventions' as neither technical nor inventive, but then granted a patent after a few words were moved from dependent to independent claims. The nine cases granted by either the EPO or the UKIPO seem no different in inventiveness from the cases refused by these offices.[4] There are no contributions to knowledge or know-how.

Other issues illustrated by the cases presented in Chapter 7 are the analogous use doctrine – which seems not to be used even where it is clearly warranted – and workshop variations, again an issue raised but clearly not effective in refusing grants (Section 7.3). These legal doctrines were developed to set a floor to the inventiveness standard for patentability but they are now noticeable by their absence. A variety of other patent doctrines – the problem/solution approach; the issue of tangible output; the patenting of ideas; and the use of patents in one country to obtain patents in another – are illustrated through the six cases presented in Section 7.4.

The results are assessed and policy conclusions drawn in Chapter 8. Problems in identifying existing knowledge are not the principal reason

for the grant of obvious business patents. For the majority of cases relevant written knowledge was identified – indeed the amazing finding was the extent to which patents have already been granted for a range of very ordinary business processes. The data in this study show that uninventive patents are granted because of the specific doctrinal rules set up to objectify the concept of inventiveness. Rules about what knowledge can be used, the breadth of the relevant technology, very narrow readings of specific words, the ability to continually amend claims and the reverse onus of proof have all been critical in allowing these grants. This suggests that a radical overhaul of how the key concept of inventiveness is defined and implemented in patent law would assist in returning balance to patent systems. A more balanced patent system would contribute to, rather than detract from, national economic welfare.

The lack of inventiveness in recently granted business method patents also raises questions as to the degree of inventiveness in genuine fields of technology. The evidence presented here strongly indicates that it is *the doctrinal rules* applied in all technology fields which lead to an almost non-existent inventive step. Other technologies are subject to the same rules, and this does much to explain, for example, the European Commission finding of that "*individual medicines* are protected by up to nearly 100 product-specific patent families, which can lead to up to 1,300 patents and/or pending patent applications across the Member States" (European Commission 2009: 10, emphasis added). A pharmaceutical product is a chemical compound, clearly definable. If new knowledge or know-how were required for grant of a patent it would simply not be possible to acquire so many patents for one chemical compound.

An 'invention' which contains no new knowledge or know-how cannot contribute spillover benefits, though it imposes deadweight losses (Jensen and Webster 2004). While it might be argued that such patents will have limited power in the market place, this cannot be assumed. Allowing a company a patent on a known process gives it the power to approach other companies asking for royalties or to cease certain activities. Signature Financial Group's US 5193056 patent computerised government guidelines for minimising tax on certain investment products, foreclosing all other options (Stern 1999: 132). It had significant market power despite being mere computerisation of tax office rules. The case that led to the view that business methods were patentable in Australia imposed costs on Catuity, which was found to have infringed a well-known use of dynamic storage (*Welcome*).

There is little incentive to challenge an uninventive patent unless there is an infringement suit. This is because the litigating company bears the full legal costs and business risks, while the benefits of a successful outcome

are shared with all competitors. Given the high cost and considerable uncertainty of patent litigation, there is substantial evidence that many companies take the path of least resistance and comply. We are all worse off for this entirely understandable response. Indeed in the USA, the fact that one company has paid a licensing fee is now used as indirect evidence that a patent is valid, though it has nothing to do with inventiveness (Jaffe and Lerner 2004). There are other kinds of perverse outcomes evident when one takes a closer look at the actual operations of patent systems (see, for example, Thambisetty 2009). Using litigation to correct deficiencies in patent administration places an unfair burden on innovating companies. The problems of asymmetry and cost also mean it is ineffective as a means of ensuring robust patent policy. Further, many of the rules which create very obvious patents have been introduced by courts.

The only effective means of reforming the system and bringing it back into balance will be action by executive governments and parliaments. A careful consideration of the substantial evidence – as opposed to the self-interested views of interested parties – would make it clear that thorough reform of patent systems is long overdue. The evidence presented in this book shows that a good starting point would be to introduce a requirement for a contribution of knowledge or know-how thus substantially raising the height of the inventive step. Such reform would have a strong positive effect on innovation. As Quillen (2008) has pointed out, it is not the patents you own that promote innovation and commercialisation – it is the patents which *others* own which prevent it.