

PATENT INFRINGEMENT IN AUSTRALIA: RESULTS FROM A SURVEY

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I INTRODUCTION

Enforcement of patents is a pivotal factor in determining whether or not the patent system performs its public role of stimulating innovation.¹ Without the means to exclude imitators, the party who pays for the original idea or invention will, in many cases, not be able to recoup their outlays, with the result that such parties are likely to direct their investment elsewhere and invest less in research and development. Enforceability matters even if the invention embodied in a patent is not being directly commercialised by the inventing organisation. Intellectual property ('IP') owners will not, for example, be able to license, cross-license, or sell their IP rights, or enter into joint ventures based on those rights, if the licensee, buyer or joint venture partner has no confidence that their IP rights confer effective exclusivity over brands, ideas or

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¹ The natural rights argument – that is whether small investors should have equal access to the patent system on essentially moral grounds or on the basis of their rights as a human being – raises larger and more complicated questions. From the perspective of prevailing custom and practice, economic rights are far more circumscribed than human rights. That is, there is a fairly low minimum level of rights accorded to individuals in the economic system on purely moral grounds or on the basis of natural rights. Individuals, impecunious or otherwise, do not have a natural right to get a bank loan, float a company on the share market, to operate in licensed professions and trades, to dig a hole anywhere they desire or build anything on their land etc. Whether these existing practices are desirable is of course a large issue. Hence, we avoid the question of whether a cheap and efficient patent enforcement system is desirable from a natural rights perspective or on the basis of inventors' moral claims, and limit ourselves to the economic issues.

creations. Furthermore, IP owners will be reticent to disclose their ideas to prospective partners if they have doubts about their ability to prevent the other party from expropriating their proposal. Direct enforcement of each and every patent does not have to occur for the patent system to be effective. All that is required for incentives to work is that people believe that infringement will be stopped if necessary.

Ideally, an innovation system should encourage the creation and development of the most valuable ideas regardless of who creates them. From this perspective, IP rights should serve both small economic players and large corporations equally. If the decision to grant a patent and the ability of the owner to enforce their rights depend solely on the calibre of the invention, then the patent system will disperse monopoly power and promote competition. However, if access to enforcement depends on the economic power of the parties, then patent laws will perpetuate rather than counter the concentration of market power: patents will strengthen the already strong.

There are few studies or systematic records offering objective data on how much infringement occurs, or how inventors and owners respond to incidents of possible infringement, particularly in those cases where parties do not proceed to legal action. Existing data do not represent the experience of all innovators. To take one example, a currently popular data source on the extent of infringement is extrapolations drawn from customs seizures of infringing goods.² These data give estimates of copyright and trade mark counterfeiting in international trade. However, because we do not know whether these seizures represent 1 or 99 per cent of all infringements, nor whether they over-represent certain products or locations, these data cannot be generalised to the whole sector or to other kinds of IP rights. Other data are sourced from industry associations, many of which conduct surveys of members in order to produce reports on piracy rates. However, few address patent infringement, and the reports themselves are suspect for being self-serving: they tend to rely on estimates from industry participants, and there is, after all, no incentive for industry players or peak bodies to underestimate rates of infringement.³

Another source of information is surveys of lawyers who advise inventors.⁴ If these surveys comprise respondents who are representative of the whole population of legal advisors, they should produce reasonable estimates of overall enforcement activity and costs for incidents where external lawyers are involved.⁵ Nevertheless, no matter how

² Organisation for Economic Co-operation and Development ('OECD'), *The Economic Impact of Counterfeiting and Piracy* (2008).

³ Australian Institute of Criminology, *Intellectual Property Crime and Enforcement in Australia*, Research and Public Policy Series No 94 (2008).

⁴ Advisory Council on Industrial Property, *Review of Enforcement of Industrial Property Rights* (1999) <http://www.ipaustralia.gov.au/pdfs/general/acip_report.pdf> at 30 March 2010; Chris Dent and Kimberlee Weatherall, 'Lawyers' decisions in Australian patent dispute settlements: an empirical perspective' (2006) 17 *Australian Intellectual Property Journal* 255; American Intellectual Property Law Association, *Report of the Economic Survey 2007* (2007).

⁵ For example, lawyers may be able to estimate the number of cases where a patentee comes to them having noticed copying, and the proportion where court proceedings are filed. If a sufficiently representative set of estimates can be obtained, this information could be combined with information about filed legal proceedings to get some sense of the amount of copying going on outside formal legal proceedings. There are difficulties, however, in framing such a study: for example, in identifying the appropriate sample of lawyers. If patent litigation specialists are surveyed, the data may not capture information about

well executed, these estimates will only be partial since rights-holders will not always consult their lawyers when they detect copying.⁶ The number of infringement cases filed with the courts is another common source of information on enforcement activity,⁷ but these data are even more partial, as many cases of apparent infringement will never reach a court registry. Litigation data captures only one extreme part of the enforcement picture.

A preferred means of obtaining information on the whole story of infringement is to conduct a statistically representative survey of firms or inventors directly. Prior to our survey, the best documented source of information was from William Kingston who conducted a representative survey of 3660 Small and Medium Enterprises ('SMEs') with EU-originating patents granted at the United States Patent and Trademark Office ('USPTO') or European Patent Office ('EPO').⁸ He received 549 replies (15 per cent response rate) and found that 67 per cent of SMEs believed that another party had copied their inventions despite being patented. Two unrepresentative surveys also exist. The first is a year 2000 survey of 98 Japanese-owned subsidiaries in China by You and Katayama. They estimated that 30 per cent of companies believed their patents were being infringed locally.⁹ The second is a survey of 143 firms, with an undisclosed bias and response rate, which was undertaken for the EU Directorate-General for Enterprise and Industry.¹⁰ The study, which only included

complaints from small businesses, which are likely to turn at least in the first instance to their patent attorney or general commercial lawyer rather than a patent litigation specialist.

⁶ A 'back of the envelope' calculation supports this hypothesis. Dent and Weatherall, above n 4 note that a majority of respondents to a survey of lawyers (78 per cent) responded that between 0 and 20 per cent of cases of copying that came to lawyers resulted in court proceedings being filed. This however was a small survey, and did not involve detailed review of lawyers' files. The 'filing rate' for patent cases for the period 1995–2005 found by an earlier study was an average of 22 contentious proceedings filed per year in Australian Federal Courts, or 242 cases over the course of 11 years: Fiona Rotstein and Kimberlee Weatherall, 'Filing and Settlement of Patent Disputes in the Federal Court 1995–2005' (2007) 68 *Intellectual Property Forum*, 65. If that represents, say, 10 per cent of all cases notified to lawyers (which may be a high estimate or a low one, given that lawyers reported only within a range of 0–20 per cent), that would mean 2 420 cases of 'copying' notified to lawyers over that period. As will be seen, this number seems lower than the number we have found in this study.

⁷ See, eg, Rotstein and Weatherall, above n 6 for Australian figures. Many such studies have been undertaken in the United States: see, eg, Jean Lanjouw and Mark Schankerman, 'Enforcement of Patent Rights in the United States' in Wesley Cohen and Stephen Merrill (eds), *Patents in the Knowledge-Based Economy* (2003) 149; Glynn Lunney, 'Patent Law, The Federal Circuit, and the Supreme Court: A Quiet Revolution' (2004) 11 *Supreme Court Economic Review* 1; James Bessen and Michael Meurer, *Patent Failure: How Judges, Bureaucrats, and Lawyers Put Innovators at Risk* (2008); Jay Kesan and Gwendolyn Ball, 'How are Patent Cases Resolved? An Empirical Examination of the Adjudication and Settlement of Patent Disputes' (2006) 84 *Washington University Law Review* 237; for a similar study in Germany see Katrin Cremers, *Determinants of Patent Litigation in Germany*, ZEW Discussion Paper No 04-72 (2004).

⁸ William Kingston, *Enforcing Small Firms' Patent Rights* (2000).

⁹ Kegang You and Seiichi Katayama, 'Intellectual Property Rights Protection and Imitation: An Empirical Examination of Japanese FDI in China' (2005) 10 *Pacific Economic Review* 591.

¹⁰ Simon Rodwell et al, *Study: Effects of Counterfeiting on EU SMEs and a Review of Various Public and Private IPR Enforcement Initiatives and Resources* (2007).

SMEs in certain industries (auto parts, mechanical engineering, textiles, and toys), found 27 per cent of firms believed they had been 'affected' by patent infringement. As the Kingston survey was only of SMEs, it would seem that there are no representative surveys measuring patent infringement in the world. Our picture, therefore, of the whole spectrum of infringement activity is incomplete.

To redress this deficiency, we undertook two surveys of Australian inventors who submitted patent applications to the Australian patent office between 1986 and 2005. Briefly, the first survey was a mail-out questionnaire of the whole population of named inventors on patent applications, in which inventors were asked questions about themselves and the invention, whether they were aware of third parties copying their inventions, their responses to this copying, the reasons their organisation chose to take (or not take) the actions they did, as well as issues relating to costs. The second survey was a follow-up telephone survey of respondents who indicated on the first survey that they were aware of copying of their invention. To the best of our knowledge, no similar studies have previously been attempted anywhere in the world.

A note about this terminology of 'copying' and 'infringement' is necessary at the outset. In law you can have 'copying' without patent infringement, and, strictly speaking, we cannot know conclusively whether there was 'infringement' until a court has made a determination to that effect. However, our survey participants were inventors, who generally do not have legal training; drawing these fine distinctions was likely to cause confusion in the survey. Therefore, both in the telephone survey and the original mail-out survey, we eschewed technical legal language, and asked about 'copying' and 'infringement' without differentiation. The terminology in this paper follows the surveys: we use the term 'copying' to mean actions perceived by the inventor to involve copying (that is, conduct the inventor perceives as involving use of their idea/invention) rather than 'infringement' or 'conduct involving actual copying'. We also asked about *perceived* copying or infringement (that is whether the inventors believed there had been copying), rather than whether there *was* (in fact) such copying. This does mean there is some potential for both false positives (instances where copying/infringement was believed to be occurring, but was not) and false negatives (cases where copying occurred, but went unnoticed by the inventor).

Nonetheless, based on the mail-out survey we estimate that 28 per cent of inventors who submitted a patent application between 1986 and 2005, and 30 per cent of those who received a patent, were aware of copying at some level. We estimate a litigation filing rate of about 0.5 per cent (filings per stock of patents in force in any year). In half of the applications where copying was believed to have occurred, some steps were taken towards enforcement. Some of the remaining copying was trivial, but extrapolating from our results to the population as a whole, there are an estimated 1200 applications over this period (4 per cent of the granted and pending applications) where there was non-trivial potential infringement but the patentee was not able to pursue their monopoly right, beyond sending a letter, because of the further costs of enforcement. More worryingly, there were an estimated further 3200 applications (11 per cent of granted and pending applications) whose owners did not even believe they had the resources to send a letter alleging infringement. These results represent an objective estimate of the extent of detected infringement of inventions, and how patentees respond.

We also asked a series of more detailed questions about reasons for various actions. Some of our findings are intuitive: a more valuable invention is more likely to be

copied; there are multiple sources of information about infringement; decisions not to enforce were influenced by a range of factors including costs, the size of the infringer and whether they were overseas or not. There is also some evidence to suggest that where patents are held by SMEs, they are more important to the business than, for example, where a larger company holds a patent. Some of our findings, however, are more surprising. For example, uncertainty about the validity of patents is less important in people's decision-making than is generally assumed in the law reform literature, and letters appear to be a surprisingly effective mechanism for asserting rights to an invention, leading to a successful outcome (cessation of copying or a license) in 4 out of 10 cases where a letter was sent. As with the incidence of apparent copying per se, letters are more likely to be sent the more valuable the underlying invention, and most probably, where the letter constitutes a credible threat.¹¹ These findings raise some very interesting questions concerning the proper priorities for reform in Australia, and elsewhere.

The remainder of this paper proceeds as follows: Part II outlines the methodology of the study, and Part III sets out the findings in more detail, the policy implications of which are discussed in Part IV. Part V concludes.

II METHODOLOGY

The data reported in this paper have been drawn from two surveys of named Australian inventors on Australian patent applications.¹² The target population of both surveys comprised inventors named on all patent applications, not just those inventors whose patent applications were successful.¹³ Thus, our data relate to a mix of patentable inventions, some of which passed the novelty and non-obviousness tests imposed by the patent office, some of which did not, and some of which had not been examined.

Inventors were chosen as the subjects of the survey rather than patents owners because it was felt that their personal involvement in the creative process would make them the best source of information about the commercial outcome of the invention, even if the patent had been licensed or sold. By contrast, applicants (that is owners) are often organisations and organisational memory can be far from complete, especially given the need to recall events up to 20 years old. Many people are likely to have moved on and relevant knowledge may be spread across a number of people in an organisation. This makes it hard to access information via a survey instrument.¹⁴ We

¹¹ We thank a referee for pointing this out. Letters are more likely to be sent by the corporate sector than the public sector or individuals.

¹² The application was deemed Australian if the 'country of origin' or 'country code' of the applicant was Australia (the first named applicant had an Australian address). Further details of the population/survey method are provided in Appendix 1.

¹³ This is the major point of departure from other inventor surveys from around the world such as the PatVal-EU survey. See Raul González, 'From the Lab to the Market: The Commercialization Strategy of Patented Inventions' (Paper presented at the Academy of Management Conference, Atlanta, Georgia, 11-16 August 2006), and the special issue of *Research Policy* (2007) 36(8) for examples of applications of the PatVal-EU survey.

¹⁴ See Gonzalez and *Research Policy* (2007) 36(8), above n 13 for examples of applications of the PatVal-EU survey, which also involved inventors. It is also worth noting that surveys sent to businesses generally have a lower response rate than was obtained in this survey,

recognise that surveying inventors about enforcement issues requires us to assume that inventors have knowledge about their employer's, or even former employer's, actions and motivations in enforcement. So, for example, in asking about the incidence of copying, we are assuming, in effect, that inventors will be aware of cases of detected infringement of a patent even where the inventor no longer works for the patent owner. In any event, it is plausible that inventors are *more* likely to be aware of copying than a current research and development employee, who may not have been in his or her position long, of an organisation, which may hold large numbers of patents and which may even have acquired a patent part way through its term.¹⁵ Overall, we believe that the benefits of surveying inventors rather than employees outweigh other concerns.

The first of our surveys was a mail-out survey which was sent to every inventor who submitted a patent application to the Australian Patent Office between 1986 and 2005 (one survey per patent application). In total, there were 43 200 inventor-application pairs in the population which had a complete address and inventor name.¹⁶ These applications related to 31 313 unique patent applications (that is, inventions). On the basis of the number of surveys returned to us unopened (and two post enumeration surveys of non-respondents), we estimate that there were 5446 inventions with still valid addresses. We received completed questionnaires relating to 3736 unique inventions.¹⁷ Survey responses came from inventors in a wide range of employment arrangements: the largest proportion being employed by a SME¹⁸ (31.5 per cent); with smaller groups being employees of large companies (15.7 per cent) and public research organisations (7.2 per cent). The residual (45.6 per cent) were individual inventors.¹⁹ Note that these categories are not mutually exclusive since there can be several parties to an application.

The inventions relating to our survey respondents covered a broad cross-section of different technology areas, which were classified using the Office of Science and

because businesses, small businesses in particular, receive surveys on many issues, leading to some level of survey fatigue.

15 See Paolo Giuri et al, 'Inventors and Invention Processes in Europe: Results from the PatVal-EU Survey' (2007) 36(8) *Research Policy* 1107, discussing the inventor-survey methodology and pilot surveys done in that project to support the view that inventors were a good source of information. Giuri et al conducted pilots in which they tested inventors' confidence in answering various questions about their employer or the firms' actions and motivations in relation to licensing and commercialisation more generally; finding, on the whole, that inventors were confident that they could answer the questions. While Giuri et al did not ask questions about enforcement, there is no reason to think that inventors are less well informed about enforcement than commercialisation decisions and issues relating, for example, to licensing decisions which were part of the Giuri et al study.

16 There were an estimated 38 003 Australian applications over the period 1986–2005. Of these however 17.6 per cent did not possess an inventor name, leaving 31 313 unique applications. When estimating population counts for Table 16, we multiple the numbers by 1.214.

17 More information on the population, sample and survey method is provided in Appendix 1.

18 A company is 'large' where it, or its highest Australian-located parent company, has a turnover greater than A\$50m per annum. Otherwise the company is defined as a SME. Definitions of variables are found in Appendix 3.

19 Organisation status was determined by the name of the applicant.

Technology-International Patent Classification ('OST-IPC') technology concordance.²⁰ The distribution by technology area was: electricity and electronics (8.8 per cent), instruments (11.8 per cent), chemicals and pharmaceuticals (11.0 per cent), process engineering (12.0 per cent), mechanical engineering (28.4 per cent), and 'other' (28.1 per cent). The sample also contains a mix of those applications that were granted a patent (54.9 per cent) and those that were not (45.1 per cent).

In order to consider any potential response bias, the population in scope (that is, the population of all patent application inventors) was compared with the sample of survey respondents by the following characteristics: year of application; organisation type; whether the patent was granted (at the end of 2007); and technology area. In all cases, the chi-squared test rejected the hypothesis of independence (at the 5 per cent level) between those that did and did not respond to the survey. That is, the responses were biased. In particular, inventors were more likely to respond to the survey the more recent their application and if they had received a grant (an analysis of the response bias issue is presented in Appendix 1). Given this bias, we have weighted our descriptive statistics by year of application; organisation type; whether the patent was granted (at the end of 2007); and technology area, and applied the conventional Heckman selection technique in our regression estimations where feasible. These techniques statistically correct for known biases.

In the first (mail-out) survey, inventors were asked a series of questions about the nature of the invention itself – for example, whether the invention was radical or incremental; details about the commercialisation stage attempted; whether they were aware of another party copying the idea behind the patent; details about letters alleging infringement; and details about court filings. To obtain more in-depth knowledge about the enforcement experience, a second telephone survey was conducted. From the sample of 3736 responses, 954 indicated that they were aware of another party copying their inventions. However, we were only able to locate 354 through the telephone book and these 354 formed the basis of the second telephone survey.

Similar to above, we conducted a series of tests to see if there was any potential bias in the telephone survey relative to those who indicated on the mail-out survey that they were aware of copying occurring. The same set of characteristics were tested for: year of application; organisation type; whether the patent was granted (at the end of 2007); and technology area. In all cases, the chi-squared test accepted the hypothesis of independence (at the 5 per cent level) between those that did and did not respond to the telephone survey except for an underrepresentation of applications from public research organisations, the chemical and pharmaceutical technologies, and granted patents, and an over representation of electrical and electronics technologies.

²⁰ This concordance gives a smaller, more manageable set of 30 technology categories more clearly related to conventional industry classifications. Classification into an OST technology class depends on the main IPC classification of the patent application.

III FINDINGS

A How common is copying?

When considering patent infringement and enforcement, the most basic questions are how often infringement occurs, or rather, since the subjects of the survey were non-lawyers, how often copying occurs, and how serious that copying is.²¹ To explore these issues, we asked inventors in the first mail-out survey whether they were aware of another party copying the idea embodied in their invention and subsequently, whether they had sent a letter to the person or organisation doing the copying. The sending of a letter is likely to be a first stage of enforcement, indicating some willingness to pursue the infringement. Table 1 presents the mail-out survey responses on the extent of perceived copying and whether or not this was followed up with a letter to the possible infringer. Responses are also disaggregated by whether or not the patent had been granted (as of April 2007).

Table 1: Incidence of (alleged) copying by application status at April 2007, patent applications lodged between 1986–2005

| Copying status | Withdrawn (%) | Pending (%) | Reject (%) | Grant (%) | Total (%) |
|---|---------------|-------------|------------|-----------|-----------|
| Not aware of copying | 76.8 | 84.1 | 74.2 | 67.3 | 71.3 |
| Aware of copying | 22.9 | 15.9 | 24.8 | 32.3 | 28.3 |
| Sent infringement letter | 6.2 | 6.2 | 6.8 | 18.1 | 14.1 |
| Not sent letter | 16.8 | 10.5 | 17.1 | 13.0 | 13.5 |
| Unsure | 0.4 | 0.3 | 1.3 | 1.0 | 0.9 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| <i>Estimated number (scaled up to represent the population)</i> | 3737 | 4089 | 2975 | 20 512 | 31 313 |

Notes: Estimates are weighted by year of application, major technology area and organisational type. Withdrawn includes those that lapse before an examination is requested and those that withdraw before an examination decision is made.

Source: Mail-out survey.

Table 1 shows that overall 28.3 per cent of inventors believed that some level of copying had occurred. As noted above, not all of these cases will represent conduct a court would find infringing.

Breaking down these results between patents granted, withdrawn, rejected and pending reveals something interesting: inventions covered by a granted patent were *more* often subject to perceived copying than those without a patent. About a third of

²¹ As noted in the Introduction, actual infringement, strictly speaking, can only be known once a court judgment has been rendered. It should be noted too that our survey asked about copying and responses to copying; the questions were drafted to avoid engaging in too much detail about technical legal matters.

inventions covered by a patent were the subject of alleged copying, compared with a quarter for those which had been examined and rejected, and one in five for those that had been withdrawn. Superficially, this suggests a patented invention is *more* likely to be copied than one where a patent application has merely been filed, but this conclusion cannot be drawn for several reasons. First, we do not know when the alleged copying occurred. We therefore cannot say whether they are more or less likely to have been copied before or after a withdrawal or the decision on examination: copying may have occurred at a time when there was at least the prospect of patent protection. Issues such as these are discussed below in Part E, where we report the results of a regression analysis. Secondly, it is probable that the inventions under patent are more economically valuable than those without a patent, and are thus more desirable targets for copying, *ceteris paribus*. It is also possible that, because these inventions are more economically valuable, inventors and firms are more conscientious about monitoring for infringement. Thirdly, we have not controlled in this table for the year of application. We expect that more recent applications will be both less likely to have received an examination outcome and to have had less time in which to be copied (this is reflected in the low copying rate for pending applications – those most likely to be recent). Hence, we will have a natural correlation between non-grant and not-copied for reasons which have nothing to do with the efficacy of the grant in forestalling imitation.

Another counterintuitive result from Table 1 is that letters alleging infringement were sent in the case of both applications which were withdrawn (6.2 per cent) and rejected (6.8 per cent). Again, this result is partly explicable by the absence of fine-grained information on the timing of events: letters may have been sent prior to the withdrawal or rejection of the patent. It suggests however that the lack of a granted patent is not a bar to taking some steps to protect one's innovation.²²

The next question of interest is the response to the initial steps towards enforcement. Table 2, which presents the copyists' responses to letters of infringement by application status, shows that of the letters sent, a relatively high proportion overall – 37.4 per cent – were successful (in the sense that the other party agreed to license or stopped the copying). Those relating to granted applications are unsurprisingly more successful in licensing or stopping the copying (38.5 per cent) compared with withdrawn, pending and rejected applications (34.0, 31.0 and 31.7 per cent respectively). Nevertheless, once again it is striking that the numbers are so high in these cases where there is no final granted patent.

²² Damages for patent infringement are calculated from the date that the complete specification is open to public inspection or the date of the infringing conduct, whichever is later: *Patents Act 1990* (Cth) s 57(1). However, under s 123 of that Act, a court may refuse to award damages, or to make an order for an account of profits, in respect of an infringement of a patent if the defendant satisfies the court that, at the date of the infringement, the defendant was not aware, and had no reason to believe, that a patent for the invention existed. Thus it is worth sending a letter even prior to grant, notifying the alleged infringer that a patent is pending (and making them aware that they may be liable for damages even for the period prior to grant if the patent ends up being granted). Of course there is a risk involved in doing so: it may cause an alleged infringer to contemplate opposition to the patent grant under Chapter 5 of the *Patents Act 1990* (Cth).

Table 2: Response(s) to letter of infringement by application status at April 2007, patent applications lodged between 1986–2005

| Response to letter | Withdrawn (%) | Pending (%) | Reject (%) | Grant (%) | Total (%) |
|--|---------------|--------------|--------------|--------------|--------------|
| Agreed to license/cross license, stopped copying | 34.0 | 31.0 | 31.7 | 38.5 | 37.4 |
| Temporarily stopped copying, ignored our letter(s), alleged our patent was invalid | 66.0 | 63.1 | 68.3 | 60.0 | 60.8 |
| <i>Percentage sending letter</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> |

Notes: Estimates are weighted by year of application, major technology area and organisational type.

Source: Mail-out survey.

B Who and what is being copied?

Also of interest is which patented inventions are more likely to be copied. Table 3 presents descriptive information on perceived copying and enforcement behaviours by organisational type, technology area and year of application.

In relation to organisational type, the most striking point is the low percentage of inventors employed in a public research organisation who were aware of copying of their invention, and the low percentage of such copying which led to letter alleging infringement. About one in four inventors in public research organisations who were aware of copying were also aware that a letter of infringement had been issued. There are several possible reasons for this, all of which coalesce around the notion that the public sector, and universities in particular, have a tradition of 'open science' and an understanding of shared ideas (with due acknowledgement).²³ University staff may not have an interest in preventing copying if they only seek patents to elevate their personal prestige or show tangible results from funded research.²⁴ These reasons

²³ Unpublished surveys by Intellectual Property Research Institute of Australia, at the University of Melbourne, have found that sizable minorities of academic researchers believe (falsely) that there is a research exemption under Australian patent law. John Walsh, Charlene Cho and Wesley Cohen, 'View from the Bench: Patents and Material Transfers' (2005) 309 *Science* 2002 found from a survey of 414 biotechnology public sector researchers that copying and infringement is commonly accepted within their research communities.

²⁴ Under current university rules and funding arrangements in Australia, it is common to ask university researchers to report, among their annual performance reporting, any patents obtained relating to their research; patents count as 'outputs' (like research papers and publications) for the purposes of performance and promotion of academic researchers.

would explain both a lower detection rate and a less aggressive attitude towards imitators on the part of public sector organisations, including universities.²⁵

Table 3: Characteristics of inventor by copying status, patent applications lodged between 1986–2005

| Characteristic | | Aware of copying (% of all inventors) | Sent letter claiming infringement (% of all inventors) |
|----------------------------------|--------------------------------|---------------------------------------|--|
| Organisational type ^a | Large company | 20.6 | 10.7 |
| | SME | 33.7 | 19.8 |
| | Public research ^b | 18.4 | 4.8 |
| | Individual | 28.9 | 11.7 |
| Technology area | i Electricity and electronics | 30.5 | 12.8 |
| | ii Instruments | 23.8 | 9.3 |
| | iii Chemicals, pharmaceuticals | 18.7 | 5.2 |
| | iv Process engineering | 26.7 | 16.2 |
| | v Mechanical engineering | 29.9 | 14.4 |
| | vi Other | 31.6 | 17.8 |
| Year of application | 1986–1990 | 36.1 | 22.4 |
| | 1991–1995 | 33.9 | 18.4 |
| | 1996–2000 | 28.6 | 13.1 |
| | 2001–2005 | 21.1 | 8.4 |
| <i>Total all inventors</i> | | 28.4 | 14.1 |

Notes: ^aOrganisational type is not mutually exclusive due to the occurrence of multiple applicants for applications.

^bApplicants with the word institute, university, department or Commonwealth in their name.

Estimates are weighted by year of application, major technology area and organisational type.

Source: Mail-out survey.

Another notable point is that while individual inventors are most likely to be aware of copying, it is inventors from SMEs that are most likely to send a letter claiming infringement. The 'letter rate' was about one in three for individuals but two in three

²⁵ Indeed, it is possible that these attitudes may mean that public sector researchers do not even perceive certain acts as copying – as opposed to simply (appropriate) reuse of knowledge – when they would be seen as illegitimate copying by, say, an inventor working in a SME.

for SMEs. Further analysis in Table 16 below reveals that once other factors such as the technology area and the value of the underlying invention are accounted for, large companies and SMEs are more likely to send a letter if copying has been detected.

Overall there is limited variation in the copying and letter rate by technology area, however chemicals and pharmaceuticals were notable for having the lowest rate for both types of activities. While this might appear, at first glance, counterintuitive, there are a number of explanations, which we discuss below.²⁶ Finally, as expected we found that the copying and letter rates are higher the older the application. Older applications have had a longer time to be copied and be the subject of enforcement activities. This reminds us that our sample represents both patents that have completed their legal term and those that are part way through an incomplete term. Patent applications that were applied for between 1986 and 1990 largely represent patents that have had the opportunity to fulfill the complete (20-year) term. According to Table 3, about one third of this complete term group have been aware of copying over their lifetime.

C How do patent owners find out about, and respond to, perceived copying?

The foregoing tables are based on the 3 736 mail-out responses from the first survey. In order to probe further the reasons behind applicants' behaviour, we refer to data collected from the telephone survey of the 354 contactable inventors who had indicated that they had detected copying. Specifically, we asked how they found out about the copying; which regular monitoring activities they (or their organisation) use; reasons they did or did not send a letter claiming infringement; the cost of the letter and the response of the other party to the letter.

Table 4 presents sources of information about copying, showing the proportion of times these 354 respondents nominated one or more of five different sources (multiple responses to this question were allowed). Essentially, the data shows that inventors use a diversity of sources of information to find out about possible copying. Notably, these results suggest that customers and suppliers are just as important, as a source of information, as direct observation of a sale; discussion in the industry (information from colleagues) is also important. While the corporate sector was not surprisingly most likely to rely on customers and suppliers, SMEs were the most likely to rely on trade fairs. Public research organisations and individuals relied mostly on their colleagues for their information.

²⁶ See below Part III E, page 29 and accompanying fn 57.

Table 4: Source(s) of information about the alleged copying, patent applications lodged between 1986–2005 (n=354)

| | Organisational type ^a | | | | |
|-------------------------------------|----------------------------------|--------------|------------------------------|--------------|-----------------|
| | Large company | SME | Public research organisation | Individual | Total responses |
| | (%) | (%) | (%) | (%) | (%) |
| | Multiple responses permitted | | | | |
| | (%) | (%) | (%) | (%) | (%) |
| Sale by someone else | 29.7 | 38.9 | 13.7 | 33.1 | 36.8 |
| Someone else's catalogue | 29.7 | 25.5 | 13.7 | 22.0 | 23.0 |
| From a colleague | 48.8 | 32.6 | 47.4 | 34.8 | 34.6 |
| See at a trade fair | 2.2 | 15.7 | 6.8 | 7.3 | 8.8 |
| From customers and suppliers | 50.6 | 53.8 | 33.7 | 15.3 | 37.9 |
| Other - informal feedback | 13.3 | 34.0 | 39.5 | 29.9 | 27.0 |
| <i>Total (who reported copying)</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> |

Notes: ^aOrganisational type is not mutually exclusive due to the occurrence of multiple applicants for applications. Estimates are weighted by year of application, major technology area and organisational type.

Source: Telephone survey.

Table 5 presents the main activities the inventors' organisation uses to monitor copying. Again, this shows that companies who detect copying are using a variety of methods, and in many cases more than one method. Similar to their main sources of information, indirect sources via employees and customers are relied upon the most, especially by SMEs: which may suggest, perhaps, a somewhat 'inactive' approach to patent monitoring and enforcement: that is, that patent owners are, to a significant extent, waiting for information about infringement to come to them.²⁷ This may not be a strong finding in the absence of more fine-grained information: for example, 'relying on employees' could, in some cases, be a very active strategy involving specific training to employees or bonuses or rewards for detection. While the proportion using patent office databases is the least used method, at one in four, it suggests an active engagement with the system by this group. The corporate sector was most likely to use patent office records.

²⁷ This would be consistent with the 1999 findings of the Advisory Council on Industrial Property inquiry into patent enforcement in Australia, suggesting that many management decisions regarding IP enforcement are ad hoc, with managers preferring to avoid or ignore enforcement where possible: Advisory Council on Industrial Property, above n 4. The Advisory Council on Industrial Property noted that around 7 per cent of industrial property owners believed that IP Australia monitored industrial property infringement and undertook enforcement action on behalf of the owner.

Table 5: Strategies organisation uses to monitor copying by those who reported copying, patent applications lodged between 1986 and 2005. Multiple responses permitted (n=354)

| | Organisational type ^a | | | | |
|-------------------------------------|----------------------------------|--------------|------------------------------|--------------|-----------------|
| | Large company | SME | Public research organisation | Individual | Total responses |
| | (%) | (%) | (%) | (%) | (%) |
| Search patent office site | 31.8 | 36.0 | 26.8 | 9.7 | 23.5 |
| Employ patent attorney to monitor | 41.1 | 24.6 | 41.6 | 9.6 | 25.0 |
| Read trade or technology journals | 50.4 | 47.5 | 41.6 | 29.2 | 39.0 |
| Rely on employees | 67.1 | 62.8 | 37.9 | 25.7 | 50.1 |
| Rely on customers or suppliers | 47.1 | 73.2 | 24.2 | 33.2 | 51.6 |
| <i>Total (who reported copying)</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> |

Notes: ^aOrganisational type is not mutually exclusive due to the occurrence of multiple applicants for applications. Estimates are weighted by year of application, major technology area and organisational type.

Source: Telephone survey.

Correlations between the strategies to monitor infringement (Table 5) and how the inventor became aware of copying (Table 4) are presented in Table 6. This shows that organisations that search patent office sites were actually most likely to detect copying from trade fairs; those that employ patent attorneys were most likely to discover alleged copying from colleagues; those that scan trade or technology journals about were most likely to discover copying from colleagues as well as catalogues; those that rely on employees were most likely to discover copying from both trade fairs and customers and suppliers; and finally, those that have a strategy that relies on customers and suppliers do indeed find out from these sources but also from direct observation. While the organisation's strategy does not necessarily have to be aligned with how the actual inventor became aware of copying, of interest is that no inventor indicated that they discovered the copying from either patent office searches or patent attorneys.

Table 6: Correlation between sources of information about copying and strategies to monitor copying by those who reported copying, patent applications lodged between 1986 and 2005. Multiple responses permitted (n=354)

| Activities to monitor copying by those who reported copying | Sources of information about the alleged copying | | | | | |
|---|--|--------------------------|------------------|---------------------|------------------------------|---------------------------|
| | Sale by someone else | Someone else's catalogue | From a colleague | See at a trade fair | From customers and suppliers | Other – informal feedback |
| Search patent office site | 0.017 | 0.038 | -0.082 | 0.108* | -0.055 | 0.097 |
| Employ patent attorney to monitor | 0.058 | -0.085 | 0.114* | -0.106* | 0.086 | -0.164* |
| Read trade or technology journals | 0.097 | 0.174* | -0.111* | 0.002 | 0.055 | -0.154* |
| Rely on employees | -0.015 | 0.089 | 0.045 | 0.112* | 0.235* | -0.121* |
| Rely on customers or suppliers | 0.156* | 0.042 | -0.070 | 0.009 | 0.335* | -0.215* |

Note: * Significant at the 5 per cent level.

It is important to bear in mind that our results in Tables 4, 5, and 6 only relate to patent applications where copying was detected since the question was not asked in the broader mail-out survey: this table does not include people who were not aware of copying. It may be that in cases where no copying was detected, fewer methods were relied on.

Our results above (Table 1) indicate that no action was taken to enforce patents in nearly half of the cases where copying was thought to exist. This does not, however, tell us whether patents are achieving their policy goals: in order to make that judgment we need to know *why* some people choose not to take action. Table 7 reports the reasons given by the 150 inventors (or their organisations) who were aware of copying, but did not follow through even to the relatively early stage response of sending a letter concerning the alleged infringement.²⁸ The disaggregation of these data should be read with caution due to the very small frequencies.

²⁸ Again, as noted in Part II, this table assumes that inventors are aware of the reasons why patent owners do not take action to enforce patents; this assumes, then, some discussion within the organization or with the inventor. In public presentations of these results, some lawyers have commented that inventors are not involved in decision-making about enforcement. We are assuming, however, at least some level of discussion within the organization, and a personal connection by the inventor to the invention. As noted in Part II, the fact that inventors are not a *perfect* source of information on these questions is consistent with them being a good, and even superior, source. It would seem likely that the results may be more reliable in the case of individual inventors and for patents held by

Table 7: Reason(s) not to send letter re infringement, patent applications lodged between 1986–2005. Multiple responses permitted (n=150)

| | Organisational type ^a | | | | |
|---|----------------------------------|--------------|------------------------------|--------------|-----------------|
| | Large company | SME | Public research organisation | Individual | Total responses |
| | (%) | (%) | (%) | (%) | (%) |
| Infringement trivial | 9.1 | 6.6 | 11.0 | 14.6 | 11.2 |
| Uncertain about patent's validity | 0.0 | 0.0 | 14.3 | 6.2 | 4.0 |
| Thought would be too costly | 13.8 | 24.8 | 42.9 | 56.9 | 44.1 |
| Used other enforcement strategy | 0.0 | 5.7 | 0.0 | 6.3 | 5.9 |
| Advised not to by lawyer/ patent attorney | 3.5 | 10.6 | 15.4 | 15.7 | 13.6 |
| The infringer was too big | 0.0 | 20.1 | 14.3 | 18.9 | 15.9 |
| The infringer was overseas | 4.3 | 30.8 | 44.0 | 21.3 | 24.3 |
| Thought would be difficult to prove | 0.0 | 9.1 | 29.7 | 28.0 | 20.5 |
| Other | 0.0 | 36.5 | 14.3 | 6.6 | 17.5 |
| No response | 73.6 | 17.0 | 16.5 | 10.0 | 18.1 |
| <i>Total (who reported copying but did not send letter)</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> |

Notes: ^a Organisational type is not mutually exclusive due to the occurrence of multiple applicants for applications. Weighted by year of application, major technology area and organisational type.

Source: Telephone survey.

A number of observations may be made about these results. First, they confirm that a range of concerns are involved: lack of follow through is not due to one single cause. This suggests that 'quick fixes' directed at one or other of these issues will not be sufficient to overcome any reluctance to use IP rights. This is particularly true of

SMEs, where the number of people involved is smaller, than for larger patent holders (and note that we had fewer responses from inventors within larger firms on this question). It may be worth noting, too, that we did not ask more detailed questions about the decision-making process: for example, we did not ask the inventors to place the reasons in an order of priority.

individual inventors, who cited multiple reasons with relative frequency. Interestingly, in the case of inventors in a corporate environment, three dominant reasons emerge as most often cited, which all seem to coalesce around the nature of the fight that would be provoked: cost, that the infringer was overseas, and that the infringer was too big.

Secondly, cost is the main reason overall for not sending a letter, especially for individual applicants; it was the most cited reason for large companies as well.

Thirdly, the 'triviality' of the copying was the reason given in about one in eight cases, except for SMEs where it was only cited by one in 25 inventors. This may suggest that where SMEs hold patents, those patents are more likely to be central to their business than would be the case for large corporations.²⁹

Fourthly, a significant number of inventors cited the fact that the infringer was overseas as being a reason for not sending a letter regarding infringement: one in four overall, with this being second most commonly-cited reason for inventors working in SMEs. While we know that an Australian patent exists, we cannot tell whether the application was part of a family of applications. If there is no patent in the foreign jurisdiction, and the resulting products are not imported into Australia, then there is no legal issue per se (since patents only cover the local jurisdiction); just an economic one. The policy implications are discussed further below.

The final observation, and one which caused us some surprise, is that concerns about patent validity are not a particularly significant barrier at this stage. This is coupled, particularly in the case of inventors in a corporate environment, with the fact that concern about proof of infringement was also cited rarely. This is interesting because patent law reformers have sometimes presumed that uncertainty about validity of the patent was a significant problem for Australian patent owners contemplating enforcement, particularly in light of the fact that there is no presumption of validity in Australian law.³⁰ It is possible that this result is in part an artefact of talking to inventors, who may have difficulty acknowledging doubts about

²⁹ For other evidence to this effect, see Giuri et al above n 15. In this inventor survey conducted in Europe, the researchers found, for example, that small firms use 80.2 per cent of their patents (of which they license out 26 per cent) and leave 18 per cent unused. By contrast, in large firms, 58.9 per cent of patents are used internally (Alfonso Gambardella, Paola Jiuri, and Myriam Mariani, *Study on Evaluating the Knowledge Economy: What are Patents Actually Worth? The Value of Patents for Today's Economy and Society*, (2006) Report the output of ETD/2004/IM/E3/77 conducted for the European Commission, Directorate-General for the Internal Market, 12) but less than 10 per cent are traded: and about 40 per cent are not exploited, more than half of which are blocking competitors: Giuri et al, above n 15.

³⁰ Australian law differs from that in for example the US, which presumes patents valid in litigation: 35 USC §282 (1994). For comments in the Australian context, see Advisory Council on Industrial Property, above n 4, 14-15. This report had a presumption of validity as its 'core objective', on the basis that uncertainty about validity caused much of the complexity and cost of patent litigation, and was a barrier to enforcement: Advisory Council on Industrial Property, above n 4, 11. The Intellectual Property and Competition Review Committee ('IPCRC'), *Review of Intellectual Property Legislation under the Competition Principles Agreement*, Final Report (2000) 175-6 recommended against changing the legislation, on the basis that the onus would already be on the party challenging the validity of a patent.

the validity of the patent. It is not possible to ascertain whether there is such a bias in the absence of a similar, reliable survey of patent owners.³¹

One in five respondents, disproportionately those employed in large companies, did not respond to this question. We do not know for certain why: we speculate that either it was because they were unsure of the reasons (for example, they were not involved in the decision-making, more likely in a large organisation), or they did not want to reveal the organisations' strategies with respect to legal action.

Table 8 gives the main reasons the 186 inventors (or their organisations) *did* send a letter(s) alleging infringement. While it is unsurprising that defending a potentially lucrative market is the key reason given, this number was highest for inventors from SMEs: again supporting the hypothesis that SMEs' patents are more central to their business. 'Defending as a matter of principle' is also important – particularly for inventors in an SME environment – but this, again, may reflect the fact that we interviewed inventors, and not just holders/owners of patents. Public research organisations were the most likely group to use letters for the main, or sole purpose of initiating negotiations about licensing.

Table 8: Reason(s) sent a letter regarding copying/infringement, patent applications lodged between 1986–2005 (n=186)

| | Organisational type ^a | | | | |
|---|----------------------------------|--------------|------------------------------|--------------|-----------------|
| | Large company | SME | Public research organisation | Individual | Total responses |
| | Multiple responses permitted | | | | |
| | (%) | (%) | (%) | (%) | (%) |
| Defend potentially lucrative market | 81.0 | 90.5 | 75.3 | 74.3 | 82.0 |
| Start negotiations on licensing agreement | 3.8 | 26.3 | 59.3 | 26.1 | 26.1 |
| Defend patent as matter of principle | 55.4 | 70.4 | 24.7 | 65.7 | 67.2 |
| Maintain reputation as aggressive competitor | 36.6 | 35.1 | 0.0 | 14.4 | 30.7 |
| <i>Total (who reported copying and sent letter)</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> |

Notes: ^a Organisational type is not mutually exclusive due to the occurrence of multiple applicants for applications. Estimates are weighted by year of application, major technology area and organisational type.

Source: Telephone survey.

³¹ As noted above, there would be difficulties in conducting such a survey: see above n 14, above n 15 and accompanying text.

We also asked inventors about the estimated costs of getting legal advice and legal letters concerning infringement. The results, shown in Table 9, displayed a wide variation in costs. Differences may be due to the frequency with which the organisation seeks such services and the complexity of the situation.

Table 9: Estimated cost of advice on legal rights and drafting letter, patent applications lodged between 1986-2005 (n=138)

| Organisation type ^a | 10th percentile (A\$) | Median (A\$) | 90th percentile (A\$) |
|---|-----------------------|--------------|-----------------------|
| Large company | 15 | 2000 | 12 500 |
| SME | 0 | 1500 | 10 000 |
| Public research organisation | 100 | 100 | 100 |
| Individual | 0 | 500 | 5 000 |
| <i>Total (who reported copying and sent letter)</i> | <i>0</i> | <i>1000</i> | <i>10 000</i> |

Notes: ^a Organisational type is not mutually exclusive due to the occurrence of multiple applicants for applications. Weighted by year of application, major technology area and organisational type.

Source: Telephone survey.

In our larger mail-out survey, we asked those inventors who did report sending a letter alleging infringement how the other party responded; and found their responses, reported here in Table 10, to be quite polarised.

Table 10: Main response of the other party to letter by organisation type, patent applications lodged between 1986 to 2005. (n=416)

| | Organisational type ^a | | | | |
|---|----------------------------------|--------------|----------------------------------|----------------|--------------|
| | Large company (%) | SME (%) | Public research organisation (%) | Individual (%) | Total (%) |
| Agreed to license/cross license | 15.8 | 15.2 | 16.3 | 4.6 | 12.3 |
| Stopped copying | 30.9 | 45.2 | 25.5 | 47.0 | 43.7 |
| Temporarily stopped copying | 15.8 | 21.8 | 6.1 | 11.7 | 17.9 |
| Ignored our letter(s) | 21.8 | 32.0 | 54.1 | 41.2 | 34.1 |
| Alleged our patent was invalid | 47.1 | 25.1 | 29.6 | 24.4 | 27.7 |
| <i>Total (who reported copying and sent letter)</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> | <i>100.0</i> |

Notes: ^a Multiple responses permitted. Organisational type is not mutually exclusive due to the occurrence of multiple applicants for applications. Weighted by year of application, major technology area and organisational type.

Source: Mail-out survey.

According to Table 10, the initial letter seems to be relatively successful in stopping copying in a large minority of cases (43.7 per cent overall); this was true for both individual inventors and those employed in a corporate environment, including those in SMEs (45.2 per cent). It is equally striking that 34.1 per cent reported that the copyist 'ignored our letter' and a further quarter received an immediate response that their patent was invalid – meaning that very early on the patentee is confronted with the possibility that they may face losing their patent if they persist: although, of course, it may simply be a tactic. Ignoring the letter appeared to be related to how persistent the copyist thought the aggrieved may be. The rates at which letters were ignored was greatest for public research organisations' letters (54.1 per cent) and lowest for large companies (21.8 per cent). On average, inventors who reported that the letter was successful also reported that it took 2-3 months to have the alleged infringer cease the complained of activity.

Respondents who sent a letter which was ignored (81 responses) were also asked to conjecture why they were ignored. This is relevant because inventors who experience disillusionment, arising from the ineffectiveness of protection, are unlikely to treat patents as an incentive for innovation in the future. The results are reported in Table 11.

Table 11: Reason(s) inventor believes letter was ignored, patent applications lodged between 1986–2005 (n=81)

| | Organisational type ^a | | | | |
|---|----------------------------------|--------------|------------------------------|--------------|-----------------|
| | Large company | SME | Public research organisation | Individual | Total Responses |
| | Multiple responses permitted | | | | |
| | (%) | (%) | (%) | (%) | (%) |
| They didn't think were infringing | 69.0 | 37.1 | 0.0 | 27.5 | 36.3 |
| They thought you were too small to be threat | 7.1 | 74.5 | 0.0 | 49.4 | 69.0 |
| They believed your patent invalid | 0.0 | 21.8 | 0.0 | 0.0 | 13.4 |
| Don't know | 4.6 | 4.4 | 0.0 | 42.8 | 14.2 |
| <i>Total (who reported copying, sent letter but it was ignored)</i> | <i>100.0</i> | <i>100.0</i> | <i>0.0</i> | <i>100.0</i> | <i>100.0</i> |

Note: ^a Organisational type is not mutually exclusive due to the occurrence of multiple applicants for applications.

Source: Telephone survey.

The majority of respondents (not being from large companies) thought that they were ignored for being too small. It was however interesting that one in three individual and SME inventors acknowledged that the person *they* see as copying might well think that they were not in fact infringing. Acknowledgement on the part of inventors of some uncertainty about the infringement or room for doubt suggests a certain sophistication in the individuals involved. It also suggests that people sending letters are not confined to those instances where they think that the infringement is clear-cut. This may, of course, also hint at a further explanation for the apparent lack of importance of the size of the infringer in making a decision not to send a letter, discussed above in relation to Table 7. The size of the infringer is not a reason not to send a letter – after all, a party has little to lose provided they are careful to avoid making unjustified threats.³² The real decisions must be made at a later point, where the accused party persists.

D Court proceedings

A further series of questions were asked about instances of alleged copying that were the subject of filing proceedings with the court. Using our survey weights, we estimate that of the 31 313 inventions made during the period 1986 to 2005, 792 were the subject of a court filing. This estimated number of 792 represents 2.5 per cent of all applications (=792/31313), 8.9 per cent of applications over which an allegation of copying had been made (=792/8861, see Table 1) and 0.53 per cent of the sum of patents in-force each year (=792/149756). The figure of 2.5 per cent of all applications cannot be compared with estimates of the rate of court filings data per patents in-force *in any given year*, because 792 filings represent an accumulation over 20 years.³³ The filing rate per stock of patents in-force (0.53 per cent) is an order of magnitude greater than the rate estimated by ACIP in 1999 of 0.036 per cent.³⁴ The ACIP figures were based on an analysis of cases filed in the Federal Court of Australia. One explanation may be that our figures include proceedings overseas in relation to patents filed in overseas jurisdictions for the same invention, as inventors were not asked to specify the jurisdiction in which court proceedings were brought.³⁵ Another explanation that cannot be ruled out is that inventors believed court proceedings were filed in some cases where they were not in fact filed. An inventor might be asked to participate in the process of preparing a case for filing, or be aware of such preparations, without being absolutely certain whether the case was actually commenced (a case could settle after drafting of the initial claim but before filing with the court registry). It is also

³² *Patents Act 1990* (Cth) s 128.

³³ It is also worth noting that another small set of inventors (eight of those who indicated that proceedings were not filed) indicated that they had reached the stage of drafting, but not filing proceedings in court. Note that our data are for the number of patents which were the subject of a filing. Litigation numbers differ as several patents may be involved in a given case. In the US there are 1.5 patents per case: James Bessen and Michael Meurer, 'Lessons for Patent Policy from Empirical Research on Patent Litigation' (Working Paper No 05-22, Boston University School of Law, Law and Economics Working Paper Series, 2005) 2.

³⁴ Advisory Council on Industrial Property, above n 4, 9.

³⁵ While an Australian patent cannot be the subject of overseas proceedings, the invention might be the subject of rights overseas. It was thought that entering into too much detail on these points with non-legally-trained inventors would lead to uncertainty and difficulty in completing the telephone survey.

possible that an inventor interpreted other kinds of proceedings – such as patent oppositions – as 'litigation'.³⁶

Table 12 presents our estimate of this number disaggregated by organisational type, and reveals that two-thirds were company applicants and almost all of the remaining third were individuals. The public sector contributed a negligible amount. What is most notable about these results is that filings are broadly representative of both granted applications (column 3) and all applications (column 4) with respect to organisational type.

Table 12: Applications which filed for a court proceeding, granted applications and all applications by organisational type, patent applications lodged between 1986–2005 (n=86)

| Organisational type ^a | Filings | Filings | Granted applications | All applications |
|----------------------------------|-------------|---------|----------------------|------------------|
| | Est. number | % | % | % |
| Large company | 84 | 19 | 20 | 18 |
| SME | 450 | 48 | 42 | 39 |
| Public research organisation | 12 | 2 | 8 | 7 |
| Individual | 246 | 31 | 33 | 38 |
| <i>Total</i> | 792 | 100 | 100 | 100 |

Notes: ^aOrganisational type is not mutually exclusive due to the occurrence of multiple applicants for applications. Estimates are weighted by year of application, major technology area and organisational type. The 3rd and 4th columns are derived from the mail-out survey and are not populations.

Source: Mail-out survey.

The larger mail-out survey also included a question on the outcome of any court proceedings in relation to the patent. The results are reported in Table 13.

³⁶ We are indebted to John Swinson for this point. An 'opposition' is an administrative proceeding within the patent office (ie IP Australia) in which a third party challenges the validity of a patent after it has been accepted by IP Australia but before it has been granted: *Patents Act 1990* (Cth) Chapter 5. Oppositions are managed in an adversarial manner and often by lawyers, so could easily be perceived, by a non-lawyer inventor, as 'litigation'.

Table 13: Outcome of the court proceedings, patent applications lodged between 1986–2005 (n=86)

| | Est. number | % | % of resolved cases |
|-------------------------------------|----------------|-----|------------------------|
| Multiple responses permitted | | | |
| Case still pending | 340 | 43 | 0 |
| Court judgment(s) in our favour | 150 | 19 | 25 |
| Court judgment(s) not in our favour | 261 | 33 | 44 |
| Out-of-court settlement(s) | 183 | 23 | 31 |
| <i>Total</i> | 792 | 100 | 100 |

Notes: Estimates are weighted by year of application, major technology area and organisational type.

Source: Mail-out survey.

The figure of 25 per cent of inventors reporting there had been a judgment in favour of the patentee is lower than the findings of Weatherall and Jensen that patentees were successful overall in 38 per cent of court judgments.³⁷ What is more, statistics drawn from court databases have previously indicated that something like 85 per cent of patent cases settle,³⁸ but only 31 per cent of our respondents reported an out of court settlement. It is possible that inventors have underreported settlements simply because they are not aware of those proceedings: this, however, would be somewhat inconsistent with the fact that the inventors reported *more* proceedings than have in fact been filed in Australia.³⁹ Alternatively, they may have misinterpreted what they have been told about a dispute (for example, interpreting a favourable settlement as a 'win'). On the whole, however, this result strikes us as anomalous.

We used the smaller telephone survey to probe further into the reasons surrounding the decision to file proceedings or not. Note that due to the small numbers, population weightings are not used in these tables. Table 14 presents the

³⁷ Kimberlee Weatherall and Paul Jensen, 'An Empirical Investigation into Patent Enforcement in Australian Courts' (2005) 33 *Federal Law Review* 239, 283. In the US, patent holders win slightly more than half of their cases: Bessen and Meurer, 'Lessons for Patent Policy from Empirical Research on Patent Litigation', above n 33, 3, suggesting that these figures cannot be explained by positing that inventors were thinking of US, rather than local proceedings for infringement.

³⁸ Rotstein and Weatherall, above n 6. Bessen and Meurer report that only 1.9 per cent of federal cases in the US in year 2000 went to trial: Bessen and Meurer, 'Lessons for Patent Policy from Empirical Research on Patent Litigation', above n 33, 3. This figure however may underestimate the numbers of cases resolved by the court in one way or another: in another study, Kesan and Ball have showed that many cases are 'resolved' after a preliminary ruling by a court (for example, a preliminary hearing on validity or interpretation, or a summary dismissal action perhaps relating to part of a claim). Kesan and Ball conclude that 6–9 per cent of cases are terminated through final rulings granting a motion for summary judgment, and that approximately 80 per cent of patent cases settle: Kesan and Ball, above n 7, 264.

³⁹ See above n 34 and accompanying text.

reasons given by inventors who detected copying for not filing patent infringement proceedings.

Table 14: Reason(s) not file in court, patent applications lodged between 1986–2005 (n=159)

| | Number of responses (multiple responses permitted) | % |
|---|--|------------|
| Potential gains didn't justify the cost | 88 | 56 |
| Not worth damaging the relationship | 4 | 3 |
| Would take too long | 33 | 19 |
| Uncertain the patent's validity would be upheld | 12 | 7 |
| No response | 62 | |
| <i>Total (who reported copying and did not file in court)</i> | <i>159</i> | <i>100</i> |

Source: Telephone survey, unweighted.

Unsurprisingly, the key issue was that the potential gains did not justify the costs (dominant despite the fact that, according to Table 8, one of the reasons for pursuing an infringement was the 'principle'). A more interesting observation is that delay was cited by one in five inventors who responded. The delay from start to finish on litigation in Australia has previously been analysed as being on average 2.7 years from filing to the first instance decision, with a further 1.1 years if the matter goes on appeal – giving a total if the matter is appealed of 3.8 years.⁴⁰ This is certainly a delay of significance. But many cases settle – according to Rotstein and Weatherall approximately 85 per cent of patent cases settle in Australia, with peaks in settlements occurring early, that is within the first 100 days, then again between 200 to 300 days.⁴¹ It is possible that the results in Table 14 indicate that people are being turned off by the time a full proceeding will take in court without thinking about the possibility that a result may (and in many cases will) be achieved much more rapidly.

A third striking feature of the results from Table 14 is the small number of respondents (7 per cent) who indicated that concern about patent validity was an issue.

⁴⁰ Weatherall and Jensen, above n 37, 262, 265. It should be noted that this study considered cases where judgment was given between 1997 and 2003: the Federal Court has argued that cases have become more streamlined since that time, so the period may in fact be shorter: see Federal Court of Australia, *Submission of the Federal Court of Australia to the Advisory Council on Intellectual Property on the Interim Report on Post-Grant Patent Enforcement Strategies* (2009) <<http://www.acip.gov.au/enforcesubsinterim.html>> at 30 March 2010.

⁴¹ Rotstein and Weatherall, above n 6. It is worth noting too that ACIP has recently noted that the Federal Court provided, in the context of a review of post-grant patent enforcement, data to show that the percentage of patents cases finalised within 12 months has increased significantly in the last two years: ACIP, *Post-Grant Patent Enforcement Strategies – Final Report* (2010) 39.

If we assume here that those who did file did not have major concerns about validity either, then the relevance of validity in persistent infringement instances is even smaller than the 7 per cent suggested here.

We have commented above on the relative lack of concern about validity issues in the decision whether to pursue an alleged copying to the extent of sending a letter to an alleged copyist. The *continuing* lack of importance of this issue to the point when proceedings are filed is a stronger suggestion that uncertainty over validity is not a significant issue in patent litigation for most inventors – because by this stage an inventor, or the patent owner, will have had the issue of invalidity assessed, either by the alleged infringer or at the very least their own lawyers. Again, one explanation is that this result is an artefact of surveying inventors – who may believe strongly that their invention is valuable and (therefore) the patent (must be) valid. However, we do not think that this is a likely explanation: if there were concerns about validity, we would expect that these concerns, and the science surrounding such concerns, would have been at least raised with the inventor. Assuming the result is *not* merely an artefact of the research design, this further suggests that the Australian government's decision not to accept Advisory Council on Intellectual Property's ('ACIP') recommendation to introduce a presumption of validity may well have been the correct one.⁴² The relatively low level of concern about the validity of the patent is also striking in light of the fact that of the patents which do go to court, 44 per cent are revoked in part or in whole.⁴³ It may be that patent owners know instinctively what legal theorists have argued: that we should hesitate to draw too much from statistics on 'court win rates' owing to the selection bias inherent in the cases that go all the way to trial: it tends to be the borderline cases which end up in court.⁴⁴

Of those who reported filing court proceedings, we also asked the length and cost of the proceedings. Given the small numbers involved, and the fact that some of these proceedings may have been filed in overseas courts, it is difficult to draw any strong conclusions. However, it is perhaps worth noting that in terms of timing, the findings, reported in Table 15, are broadly consistent with previous analysis which found that the vast majority of court proceedings are concluded within the first year.⁴⁵ The median time to resolution is 12 months which is slightly longer than a comparable estimate for the US.⁴⁶ The median reported cost of the court proceedings was \$160 000 which, while high, is perhaps not as high as some people imagine. However, these figures represent the costs of proceedings which may have settled at some early point – they do not represent estimates of the cost only of concluded court cases.

⁴² For the law reform discussions on this issue, see above n 30. The government chose not to make any change in the subsequent amending bill: *Patents Amendment Act 2001* (Cth), amending the *Patents Act 1990* (Cth); for a discussion see Commonwealth Parliamentary Library, *Patents Amendment Bill 2001, Bills Digest* No 2001-02 (2001) 7.

⁴³ Weatherall and Jensen, above n 37, 275.

⁴⁴ George Priest and Benjamin Klein, 'The Selection of Disputes for Litigation' (1984) 13 *Journal of Legal Studies* 1.

⁴⁵ Rotstein and Weatherall, above n 6.

⁴⁶ Kesan and Ball, above n 7, 282 (Table 11).

Table 15: Length of court proceedings, patent applications lodged between 1986 and 2005 (n=29)

| | Number of responses | % |
|-----------------------------------|---------------------|-----|
| Less than 6 months | 10 | 34 |
| 6 to 12 months | 6 | 21 |
| 1 to 2 years | 5 | 17 |
| 2 to 5 years | 6 | 21 |
| More than 5 years | 1 | 3 |
| No response | 1 | 3 |
| <i>Total (who filed in court)</i> | 29 | 100 |

Source: Telephone survey, unweighted.

E Factors associated with copying and enforcement

The foregoing descriptive results only tell us about the relation between one patent characteristic and enforcement behaviour. It is difficult to know how superficial the relation is between the two variables using a bivariate analysis. For example, as discussed above, the positive relationship between grant and copying is most likely to be due to an underlying third factor (the economic value of the invention).⁴⁷ Achieving a grant and being copied do not cause each other.

To investigate analytically the effects of single characteristics of the application on the propensity to take, or not take, certain actions to enforce a patent, we undertook a regression analysis. Regression analysis is essentially a statistical technique which is used to estimate what effect one factor has on the issue being examined, *while holding constant other factors*. In particular, we examined how the various patent application characteristics affect the propensity to be aware of copying (say) when multiple characteristics are taken into account. This technique enables us to estimate the effect, say, being an SME inventor has on the propensity to have your invention copied, once we remove the effects of differences in technology and invention value, *inter alia*. This process is called economic modelling.

In our model, we estimate the effects of five categories of 'explanatory' factors on our three issues (copying, sending a letter and filing court proceedings).⁴⁸ These explanatory five categories comprise:

- the size of the (technological) inventive step. We measure this through responses to a mail-out survey question which asks inventors whether the invention was an incremental or a radical improvement;⁴⁹

⁴⁷ See the discussion of Table above.

⁴⁸ These characteristics are not comprehensive: there are others we could have looked at, such as the complexity of the patent or the number of claims. There are also factors which are no doubt relevant to decision-making on enforcement but which cannot be measured: the personality of people within the firm, for example. However, we have chosen to test what we saw as the most important measurable variables: the nature of the invention, grant status, ownership, technology, and value.

⁴⁹ The specific question was: Relative to the 'state of the art' at the time of the patent application, was the invention...(with the options)...an incremental improvement? A

- the grant status of the application at April 2007. These comprise granted, withdrawn (lapsed before examination or withdrawn before grant), rejected and still pending;⁵⁰
- the ownership of the patent – whether the applicants were large firms, SMEs, public research organisations or individuals. While these options are not mutually exclusive, they are nearly so and we exclude the variable 'individuals' from the estimated equations to make the interpretation of the estimates easier. We expect that public research organisations will have less motivation to detect infringement and individuals, and to a lesser extent SMEs, will lack the financial resources to detect infringement;⁵¹
- the invention's major technology area (defined in Appendix 2) on the basis that opportunities for imitation are likely to vary by technology;⁵²
- the economic value of the underlying invention. Economic value is arguably the most important explanatory variable since it should drive both the incentive for competitors to copy an idea and for the owner to actively police imitation. To measure economic value, we factor together three different types of variables. First, whether or not the application was made through the Patent Cooperation Treaty ('PCT') route. Secondly, a series of six questions from the mail-out survey comprising whether or not attempts have been made to develop, license, spin-off, 'make and sell', mass produce or export the embodied invention. Thirdly, a survey measure of the sales revenue received from products and processes using the invention.⁵³

radical improvement? Unsure? The *Radical* variable was =1 if the inventor indicated 'a radical improvement'; and =0 otherwise.

50 The patent examination variables are defined as *Grant* (=1 if the patent application was granted; =0 refused or pending) and *Refused* (=1 if the patent application was refused; =0 granted or pending).

51 We classified the invention's applicant according to four organisational types: *Large Company*, *SME*, *Public Research Organisation ('PRO')* and *Individual*. As organisational type is not mutually exclusive (several organisations may be party to one application), these variables are included separately into the regression. For each variable, the value was =1 if one of the parties to the application was of that organisational type; and =0 otherwise.

52 For each variable, the value was =1 if the invention was classified under that technology area; and =0 otherwise.

53 If the applicant is planning to file the patent application in four or more countries, then it is cheaper to use the PCT route rather than the standard national route. Since there is likely to be a positive correlation between the number of countries an application is filed in and its economic value, we use the PCT variable as an indicator of underlying commercial value. For the *PCT* variable, the value was =1 if the application was PCT; and =0 otherwise. We also used mail-out survey information on whether or not a number of different commercialisation stages were attempted including: development (proof of concept, testing and validation, prototype, other), license, spin-off pre-manufacture (gathering market intelligence, validating commercial opportunity and trialling the manufacturing process, market launch); mass production and export. For each variable, the value was =1 if the activity was attempted; and =0 otherwise. To measure sales revenue, the inventor was asked to nominate one of 6 categories: 0<\$100 000; \$100 000 to \$500 000; \$500 000 to \$1m; \$1m to \$2m; \$2m to \$10m or >\$10m. The mid point of each range (\$15m in the case of the last category) was used to construct a value.

To accommodate the fact that some of these questions are truncated — that is, more recent applications will not have had the same opportunity to make sales and spend time in-force as earlier applications — we included a measure of the number of days since the application was made. By definition, the longer the invention has been in existence, the more potential it has to be copied and enforced. Also, as previously indicated we use a Heckman selection estimation technique for the equation where the dependent variable is the probability of copying to account for bias in the response rates by year, grant status, *inter alia*. However, it should be noted that the selection equation was not significant. The equations were also estimated as a 'systems of equations' but the results were found to be essentially the same and accordingly we only present and discuss one set of estimates. A full definition of the variables can be found in Appendix 3.

The results from the three regression estimations are presented below in Table 16. The first column of estimated coefficients (that is, numbers) presents the estimated importance of the factors on the propensity to be copied. Coefficients with asterisks indicate whether the estimated coefficient is statistically significant (the more asterisks, the more significant). A positive coefficient means that as that a variable increases, it increases the probability that the event being modelled will occur. So for example, in the first column of numbers we find that being a radical rather than an incremental invention will raise the index which mimics the probability of the inventor being aware of copying by 0.153 percentage points. From a mathematical point of view, an index is formed from an algorithm that connects the factor (that is, being radical versus incremental) and whether or not the inventor is aware of being copied. We cannot place a literal interpretation on the size of the coefficient. As such, we confine our interpretation to whether the coefficient was significant or not and whether it is positive or negative.

Essentially, the results from this regression show that the perception of being copied is related to the size of the technological inventive step (the higher the step, ie, the more radical or innovative the invention, the more detected copying); the technological area (instruments, chemicals and pharmaceuticals have the lowest rate of detected copying); and the value of the underlying invention (the greater the value the more likely the invention is to apparently be copied).⁵⁴ Interestingly, ownership status — that is, the type of firm or entity which owns the patent — does not appear to matter, once other factors are accounted for. In other words, we did not find evidence that SMEs are more likely to experience copying of their inventions. Nor did we find that grant status mattered.

The finding that chemicals and pharmaceuticals had relatively low rates of copying is perhaps counterintuitive, given the reputation of pharmaceutical firms as aggressive enforcers of their patents. A number of explanations are possible. On the one hand, it could be that our results for copying of these patents are artificially low. This might be, for example, because questions of infringement and litigation of patents in this area arise, and are dealt with, overseas and so are not known to the Australian inventors who were the subjects of our survey. However, it is worth noting that a study of patent litigation in Germany also found low litigation rates for pharmaceuticals and chemicals

⁵⁴ In a separate estimation, we found that whether or not an attempt was made to licence the invention was related to the probability of being aware of copying and sending a letter but not filing in court.

Table 16: Regression estimates of factors determining copying, sending a letter and filing in court, patent applications lodged between 1986–2005

| Factors | Aware of copying | Sent letter claiming infringement | Filed court proceedings claiming infringement |
|--|--------------------------|-----------------------------------|---|
| Inventive step | | | |
| ▪ radical invention | 0.153*** (2.890) | 0.099 (0.961) | 0.175 (0.954) |
| Patent status (April 2007) | | | |
| ▪ grant | 0.166 (1.561) | 0.039 (0.196) | -0.116 (-0.330) |
| ▪ withdrawn | 0.126 (1.177) | -0.653*** (-2.883) | 0.415 (0.935) |
| ▪ reject | 0.137 (1.194) | -0.265 (-1.142) | 0.472 (1.172) |
| Organisational type | | | |
| ▪ large | -0.147 (-1.596) | 0.370** (2.418) | 0.241 (0.949) |
| ▪ SME | 0.066 (0.918) | 0.310*** (2.857) | 0.013 (0.074) |
| ▪ public research organisation | -0.056 (-0.506) | -0.002 (-0.006) | 0.173 (0.339) |
| Technology area | | | |
| ▪ electricity and electronics | 0.078 (0.826) | -0.378** (-2.182) | -0.941** (-2.439) |
| ▪ instruments | -0.277*** (-2.974) | -0.553*** (-3.077) | -0.903** (-2.251) |
| ▪ chemicals, pharmaceuticals | -0.253** (-2.389) | -0.625*** (-2.830) | -0.505 (-1.128) |
| ▪ process engineering | -0.119 (-1.331) | 0.128 (0.803) | -0.179 (-0.751) |
| ▪ mechanical engineering | -0.099 (-1.484) | -0.314*** (-2.595) | -0.113 (-0.587) |
| <i>Ex post</i> estimates of value (factor) | 0.348*** (10.416) | 0.342*** (5.569) | 0.226** (2.110) |
| Time since application | 0.272*** (3.745) | 0.143 (1.446) | 0.097 (0.569) |
| Constant | -1.144*** (-3.727) | -0.459** (-2.132) | -1.160*** (-2.991) |
| Observations | 30 661 | 789 | 361 |
| Censored observations | 27 593 | | |
| Uncensored observations | 3 068 | | |
| Estimation method | ML Probit with selection | Probit | Probit |

Notes: Absolute value of z statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1%. The LR test indicated that the selection effects are not significant at the 5 % level.

Selection variables: year (5-year groups), OST technology (7 groups), organisational type (3 groups), patent grant status (grant, non-grant), number of years patent in-force (at end 2007). LR test of indep. eqns. (rho = 0): chi2(1) = 0.20 Prob > chi2 = 0.6520.

as compared to mechanical patents.⁵⁵ While this is not directly comparable (it was a study of filed proceedings for patent infringement, rather than a study of detected copying) it is suggestive that perceptions of high patent dispute rates in pharmaceuticals may not reflect reality, or may be based on evidence from the US where rates in pharmaceuticals and biotechnology are higher than average.⁵⁶ On the other hand, it could be that the rate is in fact low, and it is the anecdotal beliefs about the extent of disputes in this area that are exaggerated. This is possible: the rates of infringement in these technologies (which include biotechnology), may have been over emphasised relative to other technologies, perhaps because pharmaceutical patent infringement cases attract attention due to their size, expense, and impact.

It is also generally accepted that at least some patents in the area of chemicals and pharmaceuticals are extremely valuable: why would there not be high rates then of detected infringement and subsequent enforcement? Bearing in mind that chemicals and pharmaceuticals were less likely to be aware of copying, even when we did not control for the value of the invention, there are a few possible reasons. First, parties in this field may be more aware of patents and thus risk infringement less often and only with good reason. Secondly, if claims (for example, to chemical formulae) can be more clearly defined then infringement is easier to prove and thus external parties will be more certain about whether or not they are infringing and thus less likely to infringe inadvertently. Thirdly, chemical and pharmaceutical companies' reputation for enforcement may be formidable enough to prevent copying or infringement in itself.

The second column of numbers gives estimates of factors affecting the propensity to send a letter claiming infringement *given* that the inventor is aware that infringement may be occurring. This reveals that whether or not the owner sends a letter is still influenced by technology area and the economic value of the invention. Applications in the area of process engineering are most likely to have sent a letter and chemicals and pharmaceuticals the least, given the perception of infringement. More valuable patents are also more likely to give rise to a letter where infringement is detected.⁵⁷ In addition, we find that large firms and SMEs are more likely than public research organisation and individuals to send a letter given the perception of infringement. As

⁵⁵ Cremers, above n 7, 15, 25 (Table 4).

⁵⁶ Jean Lanjouw and Mark Schankerman, 'Protecting Intellectual Property Rights: Are Small Firms Handicapped?' (2004) 47 *Journal of Law and Economics* 45. The pattern of enforcement found here (in terms of sending letters) is closer to the German pattern (with a higher patent litigation rate for mechanical patents; and lower rates for pharmaceuticals and chemicals) than for the US (where drugs and biotechnology, inter alia, experienced higher rates). The kinds of patent disputes that occur in a jurisdiction are likely to be related to the nature of the industries operating in that country. It is perhaps not surprising that the US sees high rates of pharmaceutical patent litigation given that many pharmaceutical companies are based, or have significant operations in, the US. 8 of the top 15 pharmaceutical firms (by sales) in 2005 were based in the US: see Arthur Daemrlich, 'Where is the Pharmacy to the World? International Regulatory Variation and Pharmaceutical Industry Location' (Working Paper No 09-118, Harvard Business School, 2009) 4 <<http://www.hbs.edu/research/pdf/09-118.pdf>> at 30 March 2010.

⁵⁷ The importance of invention quality echoes the characteristics of patent litigation in the US and Germany, where the likelihood of litigation rises with the value of the invention or patent: Lanjouw and Schankerman, above n 56; Cremers, above n 7.

expected, applications that eventually are withdrawn or lapse are less likely to be the subject of a letter of infringement, even though their inventors believed copying was occurring.

Finally, the last column of numbers shows what factors determine whether or not the owner filed court proceedings, *given* they had already sent a letter to desist. The asterisked coefficients indicate that the economic value (as measured by estimated sales to date) and technology area were most significant. Proceedings were least likely to have been filed in relation to inventions in electricity and electronics, and instruments compared with other areas, once other factors are accounted for. Owner type (SME, large company, public research organisation or individual) was not a statistically significant factor once we controlled for other factors including the value of the underlying invention.

F Pulling it all together: just how much of a problem is patent enforcement?

As we noted at the outset, the goal of the patent system is to enhance the incentive to invest in innovative activity. For the system to achieve this end, the prospective patentee must have confidence that the patent will enhance their ability to appropriate profits from innovation. The efficacy of the legal system in delivering just decisions on disputes, at a proportional cost to both parties, is a cornerstone of this confidence.⁵⁸ Outcomes from disputes, public or otherwise, colour the expectations of businesses and influence their decision-making. If the use of the patent system is biased towards those with market power and the most resources, then the patent system will support prices that are over and above those needed to stimulate the innovation.

Given this, it is useful to estimate the number of inventions that were not protected as intended due to the cost of enforcement. From a policy perspective, the key, it seems to us, is to identify the set or sets of cases where non-trivial copying occurred but where action/follow up did not occur owing to some factor which should not, in an ideal system, prevent enforcement, such as cost or the relative size of the parties.

⁵⁸ As Intellectual Property Advisory Committee ('IPAC') noted, an important issue in costs is proportionality: we expect more to be spent when more is at stake: IPAC, *The Enforcement of Patent Rights* (2003) 17. We note that policymakers are only able to address the issue of litigation costs in part: much depends on the behaviour of the parties: see generally Ian Starr, 'Great Britain', in André Boujou (ed), *Patent Infringement Litigation Costs: A Practical Worldwide Survey* (1987) 75. The traditional 'accusatorial' litigation system in the UK, where litigation is led by the parties, which decide what issues are relevant, and what evidence should be investigated, is partly responsible for the high costs of patent litigation in the UK: David Llewellyn and William Cornish, 'The Enforcement of Patents in the United Kingdom' (2000) 31 *International Review of Intellectual Property and Competition Law* 627, 630; see also *Research in Motion UK Ltd v Visto Corporation* [2008] EWHC 819 (Pat) 15. In that case one side (Research in Motion) outspent the other by a factor of four or five.

Table 17 shows that of the total 38 000 Australian applications over the period 1986–2005, 29 900 were granted or pending. Of these, the inventor believed that copying had occurred, or was occurring, for an estimated 8800. Of these, letters alleging infringement were sent in relation to 4800 inventions. In just over a third of these instances, the letter was successful as either a licensing agreement was reached or the other party stopped copying. Of those applications where copying did not cease, there were an estimated 1200 applications where the inventor assessed the situation as non-trivial but believed that they were too small to make a credible threat. These are the cases of concern: we should not be worried about instances where the inventor themselves thought the copying was trivial, or that the copyist might believe the patent was invalid. Such reasons do not imply a deficiency in the patent enforcement system.

Table 17: Number of inventions subject to copying and enforcement processes by reason

| | Approx. number ^a | % of granted or pending applications |
|--|--------------------------------|--|
| Total Australian inventions 1986–2005 | 38000 | |
| Granted or pending (by April 2007) | 29900 | 100 |
| Aware of copying | 8800 | 30 |
| Sent a letter | 4800 | 16 |
| Licensed or stopped copying | 1900 | 6 |
| Not stop copying | 3000 | 10 |
| Think too small ^b | 1200 | 4 |
| Think patent invalid / not think infringing | 1400 | 5 |
| Don't know | 300 | 1 |
| Not send letter | 4000 | 13 |
| Thought it would be too costly/infringer too big ^c | 3200 | 11 |
| Infringement trivial/used other enforcement strategy | 700 | 2 |
| Other | 60 | 0 |

Note: ^a All numbers multiplied by 1.214 to account for applications with no recorded inventor names. See n 16 ^b Where multiple reasons were given, we have only allocated the invention to 'Think too small' if they did not indicate 'Think patent invalid/ not think infringing'. ^c Where multiple reasons were given, we have only allocated the invention to 'Thought it would be too costly/infringer too big' if they did not indicate 'Infringement trivial/used other enforcement strategy'.

There were a further 4000 applications where copying was believed to have taken place but a letter was not sent. For 700 patent applications, this was because the degree of copying was trivial – again, in such cases the optimal response from a social welfare perspective is to ignore the copying (as stopping the copying is unlikely to have a positive effect on the inventive to innovate). However, in 3200 applications, a letter was not sent for reasons of cost. While this may look like a cost of enforcement issue, one can question whether the patent system is a suitable vehicle for an entity which cannot afford the cost of a lawyers' letter. We note that the firm, or individual, may be entirely rational in this situation, in deciding not to follow up a non-trivial infringement, having made their own cost-benefit analysis of doing so. Nevertheless,

there is still reason to be concerned about these instances from a policy perspective: they still represent situations where the cost of accessing enforcement has prevented the patent from fulfilling its role of providing actual exclusivity; they also raise the question whether the original decision to apply for the patent was rational.⁵⁹

In sum, for about 1900 applications, the initial step of sending a letter was sufficient to either stop the perceived copying or bring about licensing. However, in about 1200 instances, the infringement was not trivial but the patentee was not able to pursue their monopoly right, beyond sending a legal letter, because of the further costs. Taking the numbers at their highest, there are a further 3200 inventions whose owners did not even send a letter of infringement due to cost concerns. While these were mainly individual inventors (see Table 7), a substantial minority were companies and public research organisations. Add this 3200 to the 1200 and we have an upper bound estimate of 4400 inventions over the course of the period studied where patents do not appear to be doing their job of providing exclusivity, not including situations where infringement has gone undetected. Given a total of 29 900 granted or pending Australian patent applications, these numbers as a proportion of the total of patent applications are not insignificant; quantitatively, however, this number is relatively small, reflecting the fact that Australia is a small country with a small population and market. The policy implications are discussed in the next section.

IV WHAT ARE THE POLICY IMPLICATIONS?

Issues of patent enforcement, and the desire to make enforcement more accessible, particularly to SMEs, are constantly reiterated subjects in patent policy circles, and a range of bodies: ACIP, and the Australian Law Reform Commission have all made a number of proposals in recent years to address concerns about accessibility. These suggestions have included extending jurisdiction over patent disputes to lower levels of the court hierarchy;⁶⁰ the adoption of more active case management methods by the

⁵⁹ We acknowledge that there are many possible complicating factors here that could operate in particular cases. It is possible that patents hold a deterrent effect on copying/infringement, such that it is worthwhile obtaining a patent for its deterrent effect even if a firm is aware that it could not afford or would not pay to enforce the patent. That is, the firm may be acting rationally in choosing to pay a certain amount in the hope that it will reduce the chance of infringement. How frequently firms have been deterred from a particular course of development by the existence of a patent is not susceptible to simple measurement. Alternatively, a firm may hope to be approached for a license without ever having to actively enforce or write a letter first. Further, circumstances may have changed between when the patent was applied for and the time enforcement issues arise: an invention previously important to the firm may have become less so if development trajectories or commercial activities of the firm have changed. We cannot categorically say, on the basis of our survey, that these firms who chose not to enforce or even send a letter were acting irrationally when they applied for the patent. Nevertheless, these findings raise the question whether the firm was well-advised in seeking expensive legal rights that it did not subsequently take steps to enforce.

⁶⁰ Proposed by ACIP, *Review of the Petty Patent System* (1995) 56; also the IPCRC, *Review of Intellectual Property Legislation under the Competition Principles Agreement*, above n 30, 177–8. Similar proposals have been raised overseas: see for example the Gowers Committee, *Gowers Review of Intellectual Property*, Final Report (2006) 8 (Recommendation 44).

courts to reduce delays that cause additional expense;⁶¹ the encouragement of mediation and arbitration (by IP Australia and by the courts);⁶² the appointment or training of specialist judges (to provide more certainty to the law, thus avoiding the need for litigation in more cases);⁶³ the encouragement of insurance schemes to cover the cost of patent litigation;⁶⁴ and the provision of dispute resolution, such as through low-cost 'umpires decisions' or 'advisory opinions' by the Patent Office.⁶⁵ These proposals, however, have been made largely in the absence of objective evidence as to the extent of the problem. One of the benefits of our survey is to provide an objective basis for assessing these proposals. A further interesting aspect of the survey is the way it highlights the problems facing Australia, as a small jurisdiction, in making patents effective.

One of the most striking findings of the survey is the large set of 3200 inventors who were aware of non-trivial copying, but who did not even send a letter to the alleged infringer, because they thought it would be too costly, or that the infringer was too large to take on. This figure, and the further 1200 inventors or owners who did not pursue potential infringement beyond the stage of a letter owing to reasons of cost and/or size, raise an important question of policy: why are people expending their resources in applying for patents if they cannot (or do not find it worthwhile to) extend their resources to enforce the patent – even to the first stage of sending a letter?⁶⁶ There are, broadly, two possible kinds of responses to such a situation: make enforcement more accessible, or target policy interventions at the application stage to inform people about the costs and benefits of patenting.

⁶¹ IPAC, *Practice and Procedures for Enforcement of Industrial Property Rights in Australia* (1992).

⁶² Proposed by IPAC, *ibid*; ACIP, *Post-Grant Patent Enforcement Strategies – Final Report*, above n 41; see also the *Gowers Review of Intellectual Property*, above n 60, Recommendation 43; IPAC, *The Enforcement of Patent Rights* (2003) 30. The UK IPO offers a mediation service: Ministry of Justice, *The Annual Pledge Report 2007/08: Monitoring the Effectiveness of the Government's Commitment to using Alternative Dispute Resolution* (2009) 10.

⁶³ Proposed by Advisory Council on Industrial Property, above n 4.

⁶⁴ Proposed by the Industrial Property Advisory Committee, *Patents, Innovation and Competition in Australia* (1984) 8 (Recommendation 34). But see the Australian Law Reform Commission, *Gene Patenting and Human Health* (2004) [9.101]–[9.103] (litigation insurance is a commercial matter); also Advisory Council on Industrial Property, above n 4, 27–28 (while a commercial matter, litigation insurance should be part of patent law information campaigns).

⁶⁵ The need for some mechanism for 'umpires decisions' (quick rulings not necessarily having legal force) was discussed both in ACIP's *Review of the Petty Patent System*, above n 60 and by the IPCRC, above n 60, but have foundered due to doubts about their constitutionality: see IPCRC, above n 61, 177; ACIP *Review of the Petty Patent System*, above n 61, 57–8. In the UK, the Patent Office has the power to issue 'advisory opinions' on both validity and infringement: *Patents Act 1977* (UK) ss 74A, 74B. ACIP has recently proposed instead the creation of an IP Dispute Resolution Centre within IP Australia which would keep a register of experts for expert assessment of issues including validity: ACIP *Post-Grant Patent Enforcement Strategies – Final Report*, above n 41, Recommendation 2. There is also a proposal for the creation of a Patents Tribunal empowered to give non-binding determinations in private disputes: at Recommendation 3.

⁶⁶ It is of course possible that at least some of these inventors are uninterested in enforcement – for example, because they obtained a patent for its prestige value. Further, as noted above n 59, *individual* decisions not to enforce may be rational on a cost-benefit analysis. This does not detract from the broader policy issue, given the numbers involved.

A frequent proposal for enhancing access to enforcement is to give jurisdiction over patents to a lower court such as the (current) Federal Magistrates Court of Australia ('FMCA').⁶⁷ This proposal has been resisted by the profession, on the basis that the lower courts lack the expertise to handle the legal and scientific complexity of patent cases.⁶⁸ At least in theory, this concern could be addressed by creating a specialist patent lower court, as in the UK,⁶⁹ or, given the expense of establishing a whole new court apparatus,⁷⁰ by appointing specialist judges, for example, patent experts with a scientific background, to an existing lower court.⁷¹ There are, of course, debates over such a proposal. The Federal Court has questioned whether a lower court would be cheaper;⁷² and more generally, there is an ongoing debate about the benefits and costs of judicial specialisation.⁷³

The results of our survey put proposals for a specialised court or judge in perspective, by confirming that the caseload would not be there to occupy even one such judge on a full-time basis. We have calculated that there were, between 1986–2005, 1200 cases where the inventor/firm detected copying, was concerned enough to write a letter, but abandoned efforts thereafter due to concerns about cost. Now

⁶⁷ At present, the Federal Court has the power to transfer trade mark, design, or patent matters to the FMCA on request: *Jurisdiction of the Federal Magistrates Court Legislation Amendment Act 2006* (Cth); *Federal Court of Australia Act 1976* (Cth) s 32AB(8A). No transfers have yet occurred, no doubt due to professional scepticism. While it is not clear that the FMCA will continue to exist, given the recommendations of the Semple Review accepted by the Attorney-General, even under current proposals there will continue to be a lower division of the Federal Judiciary: see Attorney-General's Department, *Future Governance Options for Federal Family Courts in Australia: Striking the Right Balance* (2008); Attorney General Robert McClelland, 'Rudd Government to reform Federal Courts' (Press Release, 5 May 2009). At the time of writing, plans are on hold following the opposition from the profession and from the Liberal Opposition: Commonwealth, *Parliamentary Debates*, Senate, 13 May 2009, 2592–2594 (Senator George Brandis), and following the decision of the High Court in *Lane v Morrison* (2009) 239 CLR 230.

⁶⁸ IPRIA, *Submission to the Advisory Council on Intellectual Property in Response to its Issues Paper: Post-Grant Patent Enforcement Strategies* (2007).

⁶⁹ In 1989 a Patents County Court ('PCC') was established with concurrent jurisdiction with the High Court Patents Court. Commentators assert that most cases are still filed with the High Court and that '[t]here is now little difference in the cost or speed of litigating in either the PCC or the Patents Court': Llewellyn and Cornish, above n 58, 629.

⁷⁰ Discussed in Justice Michael Kirby, 'Hubris Contained: Why a Separate Australian Tax Court Should be Rejected', Speech delivered at the Challis Taxation Discussion Group, 3 August 2007, available at <http://www.hcourt.gov.au/speeches/kirbyj/kirbyj_3aug07.pdf> at 30 March 2010.

⁷¹ Recommended by ACIP, *Should the Jurisdiction of the Federal Magistrates Service be Extended to Patent, Trade Mark and Design Matters* (2004). The government chose in the end not to extend specific jurisdiction even in trade mark or design matters to the FMCA.

⁷² This view is expressed in a submission in relation to the Interim Report of ACIP, *Post Grant Patent Enforcement: Interim Report* (2009), available at <<http://www.acip.gov.au/enforcesubsinterim.html>>. There may be some basis for this view, given the UK experience: see above n 69.

⁷³ For example, Kirby, above n 70; Rochelle C. Dreyfuss, 'The Federal Circuit: A Continuing Experiment in Specialization' (2004) 54 *Case Western Reserve Law Review* 769; Rochelle C. Dreyfuss, 'In Search of Institutional Identity: The Federal Circuit Comes of Age' (2008) 23 *Berkeley Technology Law Journal* 787.

assume (in a 'back of the envelope' way) that 20 per cent of these *might* have gone to a lower court if an expert decision-maker were available and it was genuinely less expensive than the courts. That would only give rise to 12 cases being filed per year.⁷⁴ Assume however that this number would be higher: because there would be overseas companies using the system, because some inventors/owners of the 3200 who did not send a letter might take steps to use a realistically priced court process, and because some cases move from the Federal Court.⁷⁵ For the sake of argument, then, assume that these factors would *triple* the number of cases being filed in the court to 36 each year. This number would then be reduced by settlement of as many as 85 per cent.⁷⁶ This caseload (36 new cases a year, of which only five will go to trial) is not enough to occupy even one full-time wholly specialised lower court judge.⁷⁷ The caseload would be insufficient even if 50 per cent of our unserved innovators chose the lower court. And although in theory, it might be cost-effective to appoint a full-time specialist lower court patent judge who had very few cases,⁷⁸ from a practical perspective, no government could justify a largely idle judge, and no specialist who could inspire the profession's confidence would take on such a role.⁷⁹

If our numbers are right, the patent caseload for would be at best part-time. But responding by appointing a part-time specialist judge to a lower court is difficult for a variety of practical reasons. One way this can be done is to appoint people who have experience across a range of areas, and have them undertake the patent work which arises and supplement this caseload with proceedings in other areas of the court's jurisdiction. This is the practice in the Federal Court,⁸⁰ but would be more difficult in the FMCA, most of whose caseload is in areas unrelated to patent like family law. Another option would be part-time specialised appointments. While part-time

⁷⁴ We have surveyed all patent applicants in the period 1986–2005, in relation to events occurring up to the date of the survey in April 2007. This means that our responses do not correlate to any kind of 'per year' litigation rate.

⁷⁵ Approximately 22 contentious proceedings are filed in the Federal Court each year: Rotstein and Weatherall, above n 6.

⁷⁶ Based on settlement rates for patent litigation in the Federal Court: Rotstein and Weatherall, above n 6.

⁷⁷ During 2007–08, 84 173 matters overall were filed in the FMCA and 82 689 matters were finalised: *Federal Magistrates Court Annual Report 2007–2008* (2008) 24. The overwhelming majority of these cases relate to family law. There are 53 Federal Magistrates: at 14.

⁷⁸ In theory, a judge with time on his or her hands could actually encourage people to bring their disputes in the confidence that they would be dealt with quickly, thus making the patent system and its enforcement more effective, and perhaps justifying the expense of the salary.

⁷⁹ Justice Kirby, above n 71 (on the importance of job satisfaction in attracting and retaining good jurists).

⁸⁰ In the Federal Court, patent matters go to a judge who is a member of the Patents panel, and who hence has a patent speciality: see Federal Court of Australia, *Practice Note IP 1: Proceedings under the Patents Act 1990 (Cth)* (2009). The FMCA since 2000 has not been conducive to this kind of appointment, because the overwhelming majority of its work is in family law. If the proposal to merge the FMCA into the Family Court and Federal Court, creating a lower division of the Federal Court with general jurisdiction were to occur, this might make possible the creation of lower court positions with a patent speciality and a broader commercial jurisdiction: see above n 67.

appointments *can* be made,⁸¹ they are controversial,⁸² and in areas of private law like patent are difficult because part-time judicial work cannot be coupled with maintaining a private practice,⁸³ which reduces the pool of potential appointees.⁸⁴

Even if these problems can be overcome, creating a lower court which is more accessible to patentees will be of limited use if alleged infringers can drag out proceedings by appealing through several levels of the court hierarchy, or hold the small patentee *in terrorem* by threatening to do so. Policymakers would therefore need to consider mechanisms which might be used to limit or discourage appeals. For example, the legislation could require leave of the higher court as a precondition for an appeal,⁸⁵ generally or where the amount at stake was below a certain sum.⁸⁶ Or, the legislation could strictly limit the costs recoverable on appeal in cases where the amount at stake is lower than some fixed sum,⁸⁷ or even require the costs of the appeal to be borne by the party bringing the appeal regardless of result.⁸⁸

For impecunious patentees, however, it is probably the delay in receiving payment or obtaining an injunction caused by appeal, rather than the legal costs, which are most

⁸¹ *Federal Magistrates Act 1999* (Cth) s 9 and sch 1.

⁸² See generally Senate Legal and Constitutional Affairs Committee, *Parliament of Australia Inquiry into Australia's Judicial System and the Role of Judges, Final Report* (2009).

⁸³ Private practice would compromise judicial independence, disinterestedness and integrity, and public confidence in same, since the requirement of lawyers to act in the interests of clients might prove embarrassing to the impartial hearing and determination of cases: *Grollo v Palmer* (1995) 184 CLR 348, 364–7; *Wilson v Minister for Aboriginal and Torres Strait Islander Affairs* (1996) 189 CLR 1; see *Federal Magistrates Act 1999* (Cth) sch 1 cl 4.

⁸⁴ A part-time appointment of someone with a young family, a person taking extended leave from private practice, an academic or a person otherwise employed in a law reform commission would be possible. Many current Federal Court Judges teach in universities or act on law reform bodies: see, eg, *Federal Court of Australia: Annual Report 2007–2008* (2008) 3–6. But appointment of an academic would likely not satisfy the profession (and thus would not attract a sufficient caseload): Law Council of Australia: Business Law Section, Intellectual Property Committee, *Submission of the Law Council of Australia to the Advisory Council on Intellectual Property in response to its Issues Paper: Post-Grant Patent Enforcement Strategies* (2007). And appointment of younger candidates has significant implications since they cannot be removed or appointed for a limited term (*Constitution*, s 72; *Waterside Workers Federation v J.W. Alexander Ltd* (1918) 25 CLR 434, 461, 487), and will accrue very expensive superannuation entitlements under current arrangements which assume more senior appointees.

⁸⁵ As happens currently in relation to appeals on interlocutory questions: *Federal Court of Australia Act 1976* (Cth) s 24(1A).

⁸⁶ This would limit appeals in smaller claim cases while allowing the full panoply of appeal rights for cases where large sums are at stake: see, eg, *Smith Kline & French Laboratories (Australia) Ltd and Others v Commonwealth of Australia and Others* (1991) 103 ALR 117. There might be some difficulties where the key remedy sought is an injunction, but it is a valuable exercise to put a value on the litigation.

⁸⁷ Order 62, r 36A of the *Federal Court Rules* (Cth) already limits the costs recoverable in a trial by a third where a party is awarded judgment for less than \$100 000. Admittedly the marginal costs of launching an appeal are a small part of the costs of litigation, so a rule directed only at the costs of the appeal would not be much of a disincentive.

⁸⁸ Courts are reluctant to impose the full costs of an appeal on a successful appellant, so any provision would have to be very clearly drafted: see *Tamawood Ltd v Paans* [2005] 2 Qd R 101, 113.

problematic. Another option, therefore, might be to learn from the dispute settlement system in construction disputes. Under that system, if progress payments are disputed, once a contractor-claimant receives a favourable adjudicator's ruling, the respondent must pay immediately, even if seeking review of the decision and the 'clawing back' of that payment.⁸⁹ Our present patent law gives no automatic right to a stay of orders pending appeal in the current system,⁹⁰ but they are readily granted.⁹¹ It would be a relatively simple change of language to create a presumption or even rule against a stay of orders.⁹² For smaller patent owners, the payment of money or obtaining of an injunction following a first judgment could radically change their negotiating position. An infringer who has made a payment or had to cease production is less likely to delay proceedings through multiple appeals, and may be more amenable to settlement.

If the practical difficulties in making part-time judicial appointments are insurmountable, another part-time option to address the small number of cost-conscious patentees not currently taking enforcement action, is the creation of an administrative Patents Tribunal. This is the favoured option of ACIP in its 2010 report on post-grant enforcement.⁹³ Inevitably, such a tribunal would face the same caseload issues that specialised courts or judges would. Assuming our numbers accurately reflect the number of potential disputes, and even taking into account that the power to engage in arbitrations might increase the caseload, still, the Patent Tribunal proposed by ACIP would not be very busy. Not only is this a potential resources issue, it could mean that the system would take a long time to build up any set of precedents and, importantly, any trust in the patent profession. However, at least such a tribunal could have part-time appointments of specialists without the complications that arise from part-time judicial appointments.⁹⁴

⁸⁹ See, eg, the *Building and Construction Industry Payments Act 2004* (Qld) s 29.

⁹⁰ *Federal Court Rules* (Cth) O 52, r 17.

⁹¹ A party may obtain a stay if they show reason, which need not be exceptional or special: *Powerflex Services Pty Ltd v Data Access Corporation* (1996) 67 FCR 65-67; in patent cases a stay has been ordered where undertakings are given and it is shown that execution of the judgment would cause disruption to the infringer's business: *Esco Corporation v PAC Mining Pty Ltd* [2008] FCA 1018 (Unreported, Tamberlin J, 4 July 2008).

⁹² A presumption could be created by requiring a party to show 'exceptional circumstances'. A rule prohibiting the granting of a stay would be inadvisable as it might cause injustice or render an appeal nugatory.

⁹³ ACIP, *Post-Grant Patent Enforcement Strategies – Final Report*, above n 41, 7 (Recommendation 3); see also above n 65 for further detail. ACIP's 2006 Report on post-grant enforcement strategies discussed the possibility of a part-time administrative patent tribunal to make decisions concerning technical matters in a patent infringement case: ACIP, *Post-Grant Patent Enforcement Strategies – Issues Paper* (2006) 17–19. This slightly roundabout structure was a result of the constitutional requirement discussed in Charles Lawson, 'Revisiting Merits Review of Patent Application, Grant and Validity Decisions under the *Patents Act 1990* (Cth)' (2007) 14 *Australian Journal of Administrative Law* 178, 192–3. The ACIP Final Report abandons the idea of having a Tribunal capable of making binding 'decisions' in favour of a tribunal with the power to make non-binding determinations and conduct binding arbitrations.

⁹⁴ Non-presidential members of the Administrative Appeals Tribunal may be appointed if they have 5 years experience 'at a high level in industry, commerce, public administration, industrial relations, the practice of a profession or the service of a government or of an authority of a government'; hold a degree in 'law, economics or public administration' or

On the downside, such a tribunal would not have the power to make binding determinations except in arbitrations,⁹⁵ meaning that cases would need to be argued again (*de novo*) in situations where one party chose to take the matter to court.⁹⁶ Knowing this, practitioners may hesitate to expend any 'ammunition' they have in the tribunal. It would be possible to create costs disincentives for such 'appeals', but doing so risks making the tribunal even less attractive: as a rule, dispute settlement without appeal rights is risky and unattractive to most lawyers.⁹⁷

Clearly, a full discussion of the options raises issues of constitutional law and judicial administration beyond the scope of this paper. The general point, however, is that proposals for specialisation must be realistically framed in light of the size of the jurisdiction and the number of cases. The results from our survey give us a sense of what these numbers might be.

Other alternatives for addressing the costs of enforcement suggested in the literature are potentially unavailable for Australia given our numbers. For example, Reichman has suggested a compensatory liability regime with a centralised collecting society, perhaps limited to small innovations.⁹⁸ Such a system would grant automatic licences and entitle owners to some compensation (royalty) for the use by others of their inventions. This proposal is not realistic for Australia given our findings. The results of our survey suggest that we are talking about a small set of inventors: perhaps 3200 over the course of 20 years, plus some group of inventors who would join such a system. Secondly, there would be no way to enforce an obligation to pay against

another relevant field, or hold 'special knowledge or skill' in a relevant area: *Administrative Appeals Tribunal Act 1975* (Cth) s 7(2).

⁹⁵ Section 71 of the *Australian Constitution* requires that the judicial power of the Commonwealth shall be exercised by the High Court, federal courts and courts invested with federal jurisdiction only: *Nicholas v The Queen* (1998) 193 CLR 173, 206 (Gaudron J). On the application of this rule to patent disputes, see Lawson, above n 93, 192–3; Chris Dent, 'Patent Opposition and the Constitution: Before or After?' (2006) 17 *Australian Intellectual Property Journal* 217, 222–5.

⁹⁶ Dent, above n 96; see also Law Council of Australia, above n 85; *Brandy v Human Rights and Equal Opportunity Commission* (1995) 183 CLR 245. In some areas the High Court has been willing to allow a fair degree of latitude in establishing administrative tribunals with powers to make determinations subject to judicial review: see, eg, *A-G (Cth) v Alinta Ltd* (2008) 233 CLR 542 (concerning the Takeovers Panel). However, the Takeovers Panel makes decisions on the fairly broad questions of policy not usually within the purview of a court (for example, what constitutes 'unacceptable circumstances' in relation to a takeover under the *Corporations Act 2001* (Cth) s 657A): this is not directly comparable to a finding of infringement of a patent.

⁹⁷ Cutting off appeal rights can tend to lead parties to reject a forum for dispute resolution. One example is the re-examination system in the US. *Inter partes* re-examination, when introduced in 1999, did not have any provision for a re-examination petitioner to appeal. This was generally acknowledged to act as a disincentive to use the system: there were no *inter partes* cases filed in 2000, only 1 in 2001 and 4 in 2002). The bar on appeals was removed effective November 2002: see Stephen Merrill, Richard Levin and Mark Myers, *A Patent System for the 21st Century* (2004) 96. Numbers have climbed since.

⁹⁸ Jerome Reichman, 'Of Green Tulips and Legal Kudzu: Repackaging Rights in Subpatentable Innovation' (2000) 53 *Vanderbilt Law Review* 1743; see also Pamela Samuelson, Randall Davis, Mitchell Kapor, and Jerome Reichman, 'A Manifesto Concerning the Legal Protection of Computer Programs' (1994) 94 *Columbia Law Review* 2308 (similar suggestion differently labelled).

companies and individuals said to be infringing overseas, and as we have seen, the overseas location of the infringer is a significant factor tending against enforcement, particularly by corporate patent holders (one in four cited this as an issue).⁹⁹

If these attempts to fix the formal enforcement system are put into question by the numbers, it follows that other mechanisms for supporting these innovators need to be considered. One interpretation of our results is that people are taking out patents when it may not, in fact, be the best option for them.¹⁰⁰ If so, then better education, from a disinterested source, about other means for appropriating innovation (trade secret, lead-time advantage)¹⁰¹ and advice which steers them away from patents where they are not a suitable vehicle may be part of an answer. Perhaps, too, some of these inventors should be using the innovation patent system, which provides shorter-term patents without upfront examination (examination only occurs in the event that enforcement action is to be taken). In addition, or in the alternative, the results may point to a need for better education about exploiting patents (via licensing and the like) and support for global exploitation (by subsidising advisors and means for introducing venture capitalists and smaller innovators) or direct support for innovation and research in the form of government grants and subsidies, reducing reliance on the incentives provided by local patents.

Two further specific policy issues are raised by the results of this survey. First, contrary to the assumptions of reports like the 1999 Advisory Council on Industrial Property report¹⁰² we did not find evidence that uncertainty about the validity of a patent was a significant factor in decision-making over whether to enforce the patent or not. This research suggests that recommendations aimed at increasing certainty in litigation, for example, by presuming a patent to be valid, are less important than other issues, and that the government may have been right not to act on an Advisory Council on Industrial Property recommendation that patents be given a presumption of validity in litigation.¹⁰³

Second is the question of overseas copying. We have found that the fact that an infringer is based overseas is a commonly cited reason for not taking enforcement action (see above, Table 7). Overseas copying which stays overseas is not a matter for Australian patent policy and is hence beyond the scope of this discussion (although it may be a question for trade facilitation policy).¹⁰⁴ Overseas infringement, however, which impacts on the *Australian* market – for example by the importation of infringing products – *is* a matter for Australian patent policy: the key question is

⁹⁹ There is also a question of how such a system would overlap with the innovation patent system. It would not seem to be an efficient use of government resources to support both a compensatory liability system and an innovation patent system aimed at, in essence, the same set of innovations and inventions.

¹⁰⁰ Another possibility is that patents are being granted more broadly than the innovators in fact need or want to use. From a policy perspective that is also undesirable, since the broader rights may be blocking developments by other parties.

¹⁰¹ Wesley Cohen, Richard Nelson and John Walsh, 'Protecting their Intellectual Assets: Appropriability Conditions and Why US Manufacturing Firms Patent (Or Not)', (Working Paper No W7552, National Bureau of Economic Research, 2000).

¹⁰² See generally above n 30.

¹⁰³ See generally Advisory Council on Industrial Property, above n 4, 16–17 (Recommendation 3).

¹⁰⁴ See also ACIP, *Post-Grant Patent Enforcement Strategies – Final Report*, above n 41, 47–50.

whether it is worth introducing some system to stop such goods at the border. Both copyright and trade mark law in Australia have provisions to enable Customs officers to detain (alleged) infringing goods.¹⁰⁵ Copyright and trade mark owners can lodge Notices of Objection to the importation of goods which they claim infringe their rights. The Australian Customs Service ('Customs') detains the goods, giving rights-holders the opportunity to file legal proceedings with the Federal Court. An Australian patent holder has the right to prevent importation of patented products,¹⁰⁶ but there is no equivalent system under the *Patents Act 1990* (Cth). We note that the consideration of such provisions was recommended by the Advisory Council on Industrial Property in 1999 – a recommendation actually accepted by the government but not acted upon.¹⁰⁷ It was again canvassed in an ACIP issues paper published in 2006 on post-grant enforcement of patents;¹⁰⁸ and the final report of that inquiry has again recommended their introduction.¹⁰⁹

Australia is not unusual in lacking a system of border detentions and seizures for patent-infringing products; many other developed countries also draw this distinction between trade mark and copyright on the one hand and patent on the other, in part because it is more difficult to apply such procedures for patent.¹¹⁰ Many copyright- and trade mark-infringing goods caught by Customs are likely to be counterfeit: where the infringing nature of the goods is clear on the face of the goods in question, and where a significant part, if not the whole, of the value of the good is due to the (infringing) IP embodied in the good. Patent infringement will usually be less obvious on the face of the goods, and may involve infringement in relation to only part of a good (for example, where the alleged infringing part is one component of a complex good).¹¹¹ In a recent submission to ACIP, the Customs expressed a range of concerns about being required to intercept and detain alleged patent infringements: that it would require considerable technical expertise presently not available in Customs staff, that it would take resources away from other important issues such as counterterrorism and organised crime, and impose high costs as a result of the need to store and dispose of such goods.¹¹²

¹⁰⁵ *Copyright Act 1968* (Cth) pt V, div 7; *Trade Marks Act 1995* (Cth) pt 13.

¹⁰⁶ The patent owner has the exclusive right to exploit their invention: see *Patents Act 1990* (Cth) s 13. 'Exploit' includes 'import' under the definition in Schedule 1 to the *Patents Act 1990* (Cth).

¹⁰⁷ Advisory Council on Industrial Property, above n 4, 27. The Advisory Council on Industrial Property noted that 'provisions such as these would be difficult to administer, and that further consideration would need to take place with customs officers and others on how the process would work in practice': at 27.

¹⁰⁸ ACIP, *Post-Grant Patent Enforcement Strategies – Issues Paper*, above n 94, 26–7.

¹⁰⁹ ACIP, *Post-Grant Patent Enforcement Strategies – Final Report* above n 41, 51–2.

¹¹⁰ International IP treaties also draw this distinction, requiring customs procedures for interception of infringements only in the case of 'counterfeit trademark or pirated copyright goods': *Agreement on Trade-Related Aspects of Intellectual Property Rights*, opened for signature 15 April 1994, [1995] ATS 38 (entered into force 1 January 1995) art 51.

¹¹¹ We thank an anonymous referee for the latter observation.

¹¹² These concerns were raised in the submission of the Australian Customs Service in response to ACIP, *Post-Grant Patent Enforcement Strategies – Issues Paper*, above n 94: Australian Customs Service, *Customs Submission: Advisory Council on Post-Grant Patent Enforcement Strategies* (2007) <<http://www.acip.gov.au/enforcesubs.html>> at 30 March 2010.

However, in the European Union,¹¹³ a patent owner (or owner of other specified IP rights) may lodge a written application with the Customs authorities, including an accurate and detailed technical description of the goods in question, any information concerning the nature of the alleged fraud and the name and address of the contact person appointed by the right-holder;¹¹⁴ Customs officers may then detain the goods on importation and notify the rights-holder, giving them a chance to institute proceedings to prevent the importation permanently. In effect, such a system does not expect Customs authorities to identify infringements of their own motion (which would be unreasonable), but rather enables rights-holders to obtain assistance from customs authorities in circumstances where they know about the infringements and perhaps their likely source.¹¹⁵ Nor are Customs authorities required to determine whether there is in fact infringement; under the European system, in the event of a seizure the patentee must commence legal proceedings within a set time limit, or reach agreement with the importer for the abandonment and destruction of the goods (that is, the importer can choose not to contest the seizure and destruction).

We do not underestimate the challenges in administering such a system; the concerns raised by Customs are far from frivolous, and in some incarnations the European system has generated considerable controversy.¹¹⁶ Whether the costs and difficulties of instituting such a system in patent are worthwhile is not something which we can determine from our survey: the results are insufficiently detailed. We can, however, say that the overseas location of infringers is important and hence this is an area where policy intervention might usefully be considered. Creation of such a system perhaps has the potential to constitute an effective means to address one of the more important enforcement barriers cited by inventors working in a corporate environment.

For obvious reasons, this policy discussion has focused on that set of cases where patents have not, it would appear, served their stated role. There is, however, another take-away message from this study: that in many cases, inventors are able to enforce their rights, at relatively low cost and without involving the courts. In fact, they seem to be surprisingly successful in doing so, which means that the mere presence of patent or patent applications is, in some cases, operating as a deterrent to copying. Whether

¹¹³ As a result of *Council Regulation (EC) No 1383/2003 of 22 July 2003 Concerning Customs Action Against Goods Suspected of Infringing Certain Intellectual Property Rights and the Measures to be Taken Against Goods Found to Have Infringed Such Rights* [2003] OJ L 196/7. For an incorporation of these provisions into domestic law see the UK: *Goods Infringing Intellectual Property Rights (Customs) Regulations 2004* (UK).

¹¹⁴ *Council Regulation (EC) No 1383/2003 of 22 July 2003 Concerning Customs Action Against Goods Suspected of Infringing Certain Intellectual Property Rights and the Measures to be Taken Against Goods Found to Have Infringed Such Rights* [2003] OJ L 196/7, 10 (art 5.5).

¹¹⁵ Nor, incidentally, are Customs authorities liable for failing to stop or detect shipments: *Council Regulation (EC) No 1383/2003 of 22 July 2003 Concerning Customs Action Against Goods Suspected of Infringing Certain Intellectual Property Rights and the Measures to be Taken Against Goods Found to Have Infringed Such Rights* [2003] OJ L 196/7, 13 (art 19.1).

¹¹⁶ The controversy mostly relates to transshipment – that is, the seizure of (mostly) drugs in transit (that is, not about to enter the European market but on their way to some other market, such as India) on the basis of patents in the transit (European) country. As to the legality of this, see Frederick Abbott, 'Seizure of Generic Pharmaceuticals in Transit Based on Allegations of Patent Infringement: A Threat to International Trade, Development and Public Welfare' (2009) 1 *World Intellectual Property Organization Journal* 43.

the set of instances where this happens is sufficient (together with any other benefits the patent system offers) to justify all the costs of the system is not something we can answer here. But we do hope that we have been able to offer some window into the extent to which the patent system contributes to the prevention of copying of innovation 'out there', beyond the court system.

V CONCLUSIONS

We have, through the inventor survey reported in this article, sought to fill a gap in our knowledge about a pivotal issue in the IP system: the extent of infringement, and the extent and general success rates of informal and formal enforcement of patent rights. As this is the first time such a study has been attempted anywhere in the world, we cannot draw any general comparative conclusions regarding whether the rates are higher or lower than elsewhere.

We found that 28 per cent of inventions were subject to some level of perceived copying. In half of these cases, a letter alleging infringement was issued. We estimated a court filing rate of about 0.5 per cent (filings per stock of patents in-force in any year). This confirms what we knew anecdotally – that a great deal of copying and enforcement activity occurs outside the court system, and it varies both by technology area and by the value of the invention. Other findings, such as the comparative success of letters in asserting rights to an invention, were more surprising. We have also explored, through a smaller survey, some of the factors which motivate decision-making in this context. Here, some of our findings are intuitive: decisions not to enforce were influenced by a range of factors including costs, the size of the infringer and whether they were overseas or not. There is also some evidence to suggest that where patents are held by SMEs they are more important to the business than, for example, where a patent is held by a larger company. Other findings were contrary to the common view. For example, uncertainty about the validity of patents may be less important in people's decision-making than is generally assumed in the law reform literature.

From a policy perspective, there are two parts to the story reported in this article. There is a sizeable group of inventors who are obtaining patents at some considerable expense, but who do not feel able to take even basic steps to enforce those patents owing to the cost. This suggests that education is needed: to put inventors in a position where they can wisely choose between patents and other, less expensive options. The second part of the story reported here lies in the extrapolation from percentages to raw numbers, and what it tells us about the policy options available to improve the patent enforcement system in a small jurisdiction like Australia. Much of the discussion in the patent policy and law reform field occurs in larger jurisdictions (the US and UK). The options available to a large jurisdiction, however, which can support specialist patent judges at various levels of the court system, may not be available to Australia given the numbers of disputes which arise. At one level, the numbers reported here leave us in something of a bind. While the numbers of patent holders who feel unable to avail themselves of enforcement options is large enough to be of concern from the perspective of the goals of the patent system, they are too few to support specialised enforcement systems targeted at the low cost end of the spectrum. This suggests that our policymakers will need to think creatively to address the needs of the innovation system and our inventors.

APPENDICES

Appendix 1: Australian Inventor Survey

The Australian Inventor Survey was mailed out in two waves between July and December 2007 by the Intellectual Property Research Institute of Australia at the University of Melbourne. The recipients of the survey constituted the population of Australian inventors who filed a patent application at the Australian Patent office – IP Australia – during the period 1986–2005 and had a valid postal address. The survey recipients were identified by the address of the first named applicant (Australia) and the postal address of the inventor (Australia).

The inventor-invention relationship is a many-to-many relationship. That is, one inventor can have many patent applications, and one patent application can have many inventors. In total, there were 43 200 inventor-application pairs in the population with a complete inventor name and Australian address.¹¹⁷ Of the 31 313 applications, 76.2 per cent had only one inventor and almost all (99.3 per cent) had 5 or less inventors (see Table 18). Of the 31 947 inventors, the vast majority (82.5 per cent) had only filed one application between 1986 and 2005 (see Table 19). To avoid administrative burden, inventors were asked about each invention, up to a maximum of 5 patent applications.

Table 18: Number of inventors per application, 1986–2005

| Inventors per application | Number of applications | % |
|---------------------------|------------------------|-------|
| 1 | 23 866 | 76.2 |
| 2–5 | 7225 | 23.1 |
| 6–10 | 218 | 0.7 |
| >10 | 4 | 0.0 |
| Total applications | 31 313 | 100.0 |

Table 19: Number of applications per inventor, 1986–2005

| Applications per inventor | Number of inventors | % |
|---------------------------|---------------------|-------|
| 1 | 26 360 | 82.5 |
| 2–10 | 5506 | 17.2 |
| 11–20 | 66 | 0.2 |
| >20 | 15 | 0.0 |
| Total inventors | 31 947 | 100.0 |

There was no initial screening of survey recipients and 47.0 per cent of surveys were returned to us (as 'return to sender') unopened, presumably because the address was no longer valid. To estimate the number of non-responses which also had invalid addresses, we selected a random sample of 600 non-respondents (both those from the 'return to sender' and 'no response' groups) and manually looked the applicant up by name and address in both the telephone book and on the internet. People with a valid

¹¹⁷ 8413 applications did not have an inventor name and 37 did not have an address.

telephone number were then called to confirm that they were the correct person. This search revealed that only 11.7 per cent of the sample of non-respondents had a complete address and were still at the listed address (some had moved while others had apparently disappeared). Assuming that this is representative of all non-respondents, we can infer that we had a valid inventor address for 5446 of our original population of inventions. We received completed questionnaires for 3736 inventions.

The following four tables show the pattern of survey response by year of application across various characteristics. According to Table 20, there is a clearly defined rise in the percentage of completions over time. Response rates also varied according to whether the inventor was employed by a large company (63.6 per cent), SME (64.6 per cent), PRO (70.6 per cent), or filed as an individual (73.4 per cent), as demonstrated in Table 21.

Table 20: Number of patent applications with a complete survey response by year, 1986–2005

| Number of patent applications | | | | |
|-------------------------------|----------|--|------------------------|--------|
| Year | Complete | Est. address valid ^a and not complete | Est. address not valid | Total |
| 1986–1990 | 254 | 245 | 3705 | 4204 |
| 1991–1995 | 553 | 385 | 5832 | 6770 |
| 1996–2000 | 1124 | 541 | 8187 | 9852 |
| 2001–2005 | 1805 | 538 | 8144 | 10 487 |
| Total | 3736 | 1710 | 25 867 | 31 313 |

Note: ^a Excludes surveys that were returned as 'return to sender' and the estimated 88.3 per cent of non-responses which we estimated, through a post-enumeration survey, to have had an invalid address.

Table 21: Number of patent applications with a complete survey response by organisation type, 1986–2005

| Number of patent applications | | | | |
|-------------------------------|-----------------------|--|------------------------|--------|
| Organisation | Complete (response %) | Est. address valid ^a and not complete | Est. address not valid | Total |
| Large company ^b | 588 (63.6%) | 337 | 5097 | 6022 |
| SME ^b | 1175 (64.6%) | 643 | 9727 | 11 545 |
| Public sector research | 269 (70.6%) | 112 | 1697 | 2078 |
| Individual | 1704 (73.4%) | 618 | 9346 | 11 668 |
| Total | 3736 (68.6%) | 1710 | 25 867 | 31 313 |

Notes: ^a Excludes surveys that were returned as 'return to sender' and the estimated 88.3 per cent of non-responses which we estimated, through a post-enumeration survey to have had an invalid address.

^b A company is 'Large' where it, or its highest Australian-located parent company, has a turnover greater than A\$50m per annum. Otherwise the company is defined as an SME.

The grant rate (as of April 2007) for the entire population of applications lodged at the Australian Patent Office between 1989 and 2005 was 54.9 per cent.¹¹⁸ In Table 22, a simple comparison of the patent application outcomes for survey respondents and non-respondents is presented. This shows that inventors whose applications were still pending were more likely to respond, followed by inventors whose applications were granted, rejected and withdrawn respectively.¹¹⁹ Table 23, which presents the distribution of responses by technology area, shows that there is a modest level of variation in the response rate across technology groups: there was a slightly lower response rate from the electricity and electronics area and 'Other'.

Table 22: Number of patent applications with a complete survey response by patent application outcome, 1986–2005

| Patent grant status | Number of patent applications | | | |
|---------------------|-------------------------------|--|------------------------|--------|
| | Complete (response %) | Est. address valid ^a and not complete | Est. address not valid | Total |
| Withdrawn | 572 (63.3%) | 331 | 5006 | 5909 |
| Pending | 731 (81.4%) | 167 | 2535 | 3433 |
| Rejected | 382 (62.2%) | 232 | 3512 | 4126 |
| Granted | 2051 (67.7%) | 979 | 14 815 | 17 845 |
| Total | 3736 (68.6%) | 1710 | 25 867 | 31 313 |

Note: ^a Excludes surveys that were returned as 'return to sender' and the estimated 88.3 per cent of non-responses which we estimated, though a post-enumeration survey to have had an invalid address.

¹¹⁸ We exclude applications lodged between 1986 and 1988 as the high percentage of grants suggests that some non-granted applications are missing from the database.

¹¹⁹ However, this is partly due to the fact that recent applications have not yet been examined. For applications lodged between 1989 and 2000, the response rate is 12.6 per cent for non-grants and 18.6 per cent for granted applications.

Table 23: Number of patent applications with a complete survey response by technology area, 1986–2005

| OST technology area ^b | Number of patent applications | | | Total |
|----------------------------------|-------------------------------|--|------------------------|--------|
| | Complete | Est. address valid ^a and not complete | Est. address not valid | |
| Electricity and electronics | 329 (64.5%) | 181 | 2739 | 3249 |
| Instruments | 440 (71.5%) | 175 | 2654 | 3269 |
| Chemicals, pharmaceuticals | 410 (71.2%) | 166 | 2516 | 3092 |
| Process engineering | 447 (70.5%) | 187 | 2825 | 3459 |
| Mechanical engineering | 1061 (69.0%) | 476 | 7204 | 8741 |
| Other | 1048 (66.7%) | 524 | 7927 | 9499 |
| Total | 3736 (68.6%) | 1710 | 25 867 | 31 313 |

Notes: ^a Excludes surveys that were returned as 'return to sender' and the estimated 88.3 per cent of non-responses which we estimated, though a post-enumeration survey to have had an invalid address.

^b OST refers to the Office of Science and Technology classification which is based on the International Patent Classification system

Finally, Table 24 presents a breakdown of the main characteristics of respondents to the survey. It reveals that nearly two thirds of inventors believe their invention was radical rather than incremental; two thirds of inventions are for products rather than 'ways of manufacture'; two thirds of inventions are for 'simple' technologies that do not require multiple patents for completeness and just over half of the inventors came from organisations that had applied for a patent at least once before since 1986.

Table 24: Characteristics of respondents

| Characteristic of invention | Freq. | % |
|---|-------|-------|
| Relative to state of art at time of application, the invention was | | |
| Incremental improvement | 1158 | 31.3 |
| Radical improvement | 2240 | 60.5 |
| Unsure | 307 | 8.3 |
| Did the invention underlying the patent relate to a new or improved | | |
| Good or product | 2189 | 59.1 |
| Way of manufacture | 1016 | 27.4 |
| Both | 499 | 13.5 |
| PCT status | | |
| Paris Convention (non-PCT) | 2306 | 61.7 |
| Patent Cooperation Treaty (PCT) | 1430 | 38.3 |
| Number of other patents also used to develop product | | |
| None | 2476 | 66.8 |
| 1 to 5 | 1101 | 29.7 |
| 6 to 10 | 86 | 2.3 |
| 11 to 20 | 22 | 0.6 |
| 20+ | 23 | 0.6 |
| Number of prior patent applications by organisation since 1986 | | |
| None | 1688 | 45.5 |
| More than none to 10 | 1349 | 36.4 |
| More than 10 to 50 | 344 | 9.3 |
| More than 50 to 100 | 68 | 1.8 |
| More than 100 | 259 | 7.0 |
| Total | 3736 | 100.0 |

Note: The sum of each section may not add to 3736 if some observations are missing a reported characteristic.

Appendix 2: OST Technology and IPC

| OST Code | OST Technology class | IPC Sub-class |
|----------|---|---|
| | I Electricity – Electronics | |
| 1 | Electrical devices – electrical engineering | F21; G05F; H01B,C,F,G,H,J,K,M,R,T;H02; H05B,C;F,K |
| 2 | Audiovisual technology | G09F,F;G11B;H03F,G,J; H04,-003,-005,-009,-013,-015,-017,R,S |
| 3 | Telecommunications | G08C; H01P,Q;H03B,C,D,H,K,I,M; H04B,H,J,K,L,M; H04B,H,J,K,L,M,N -001,-007,-011,Q |
| 4 | Information technology | G06; G11C; G10L |
| 5 | Semiconductors | H01L |
| | II Instruments | |
| 6 | Optics | G02; G03B,C,D,F,G,H; H01S |
| 7 | Analysis, measurement, control | G01B,C,D,F,G,H,J,K,L,M,N,P,R,S,V,W;G04; G05B,D; G07; G08B,G;G09B,C,D; G12 |
| 8 | Medical engineering | A61B,C,D,F,G,H,J,L,M,N |
| | III Chemicals, pharmaceuticals | |
| 9 | Organic fine chemicals | C07C,D,F,H,J,K |
| 10 | Macromolecular chemistry, polymers | C08B,F,G,H,K,L; C09D,J |
| 11 | Pharmaceuticals, cosmetics | A61K |
| 12 | Biotechnology | C07G; C12M,N,P,Q,R,S |
| 13 | Materials, metallurgy | C01; C03C; C04; C21,C22,B22 |
| 14 | Agriculture, food | A01H; A21D; A23B,C,D,F,G,J,K,L;C12C,F,G,H,J; C13D,F,J,K |
| | IV Process engineering | |
| 15 | General processes | B01B,D (without -046 to -053), F,J,L; B02C; B03; B04; B05B; B06; B07; B08,B81B,C,B82B,F25J; F26 |
| 16 | Surfaces, coatings | B05C,D;B32;C23; C25; C30 |
| 17 | Material processing | A41H; 143D; A46D; B02B; B26; B28A-Z,B29; B31; C03B; C08J; C14;D01; D02; D03; D04B,C,G,H,J,L,M,P,Q; D05B,C;D21 |
| 18 | Thermal techniques | F22; F23B,C,D,H,K,L,M,N,Q; F24,F25B,C,J;27; F28 |
| 19 | Basic chemical processing, petrol | A01N; C05; C07B; C08C; C09B;C,F,G,H,K; C10B,C,F,G,H,J,K,L,M,N; C11B,C,D |
| 20 | Environment, pollution | A62D; B01D -046 to -053; B09; C02;F01N; F23G,J77 |
| | V Mechanical engineering | |
| 21 | Mechanical tools | B21; B23; B24; B26D,F;B27; B30 |
| 22 | Engines, pumps, turbines | F01B,C,D,K,L,M,P; F02; F03; F04; F23R |
| 23 | Mechanical elements | F15; F16,F17,G05G |
| 24 | Handling, printing | B25J; B41; B65B,C,D,F,G,H; B66; B67 |
| 25 | Agriculture/food machinery | A01B,C,D,F,G,J,K,L,M; A21B,C;A22; A23N,P; B02B; C12L; C13C,G,H |
| 26 | Transport | B60; B61; B62; B63B,C,H,J; B64B,C,D,F |
| 27 | Nuclear engineering | G01T; G21; H05G,H |
| 28 | Space technology, weapons | B63G; B64G; C06; F41; F42 |

| OST Code | OST Technology class | IPC Sub-class |
|-----------------|-------------------------------------|---|
| VI Other | | |
| 29 | Consumer goods & equipment | A24; A41B,C,D,F,G; A42; A43B,C; A44;A45; A46B;A47; A62B,C; A63; B25B,C,D,F,G,H; B26B; B42; B43; B44; B68; D04D; D06F,N; D07; F25D; G10B,C,D,F,G,H,K |
| 30 | Civil engineering, building, mining | E01; E02; E03; E04; E05; E06; E21,78 |
| 99 | Misc | |

Appendix 3: Description of the variables

| | |
|-----------------------------------|---|
| Radical invention | <i>Radical</i> =1 if the inventor described the invention as radical versus incremental. |
| Patent status | <i>Grant</i> =1 if the patent application was granted, <i>withdrawn</i> =1 if the application had been withdrawn, lapsed or was filed before 2003 and not examined, <i>Pending</i> =1 if filed on or after 2003 and not granted or rejected, <i>Rejected</i> =1 if rejected. Information on the status of the patent was extracted from the official patent office database in April 2007 |
| Patent ownership | <i>Large Company</i> =highest Australian-located parent company, has a turnover greater than A\$50m per annum. Otherwise the company is defined as an <i>SME</i> , <i>Public Research Organization</i> =applicant has institute, department, university or Commonwealth in its name and <i>Individual</i> =identified on the patent office database. |
| Technology area | See Appendix 2 above. |
| <i>Ex post</i> estimates of value | A single variable created by factoring 5 dummy variables and one continuous variable. These components comprise <i>PCT</i> =1 if the application was PCT, <i>License or spin-off</i> = 1 if the inventor said that there had been an attempt to licence, sell or transfer the patent to a spin-off company, and 0 otherwise. <i>Make and sell</i> =1 if the inventor indicated that either gathering market intelligence, validating commercial opportunities, trialling the manufacturing process or market launch had been attempted and 0 if otherwise. <i>Mass production</i> =1 if the inventor indicated that an attempt had been made to mass produce the invention and 0 otherwise. <i>Export</i> =1 if the inventor indicated that the invention was exported and 0 otherwise. Estimated sales revenue to date as described by the inventor. |
| <i>Time since application</i> | Number of days between lodgement and mid-2007 when the survey results were collected. |
