REPORT

THE ECONOMIC VALUE OF THE AUSTRALIAN INNOVATION PATENT

The Australian Innovation Patent Survey

24 March 2013

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Verve Economics

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Key findings of the Australian Innovation Patent Study

- Innovation patents are a form of second tier patent protection that the World Intellectual Property Organization calls “utility models”. Utility model patents are available in 90 countries including mostly developing countries but also some developed economies such as Australia, Austria, Denmark, Italy and Germany.

- In Australia, small to medium business enterprises and individuals account for approximately 90 per cent of innovation patent filings. Large enterprises account for approximately 10 per cent of innovation patent filings.

- The main reasons inventors used innovation patents were to protect their invention and to enhance the reputation of their firm. There is only minor use of innovation patents for strategic reasons such as building a patent thicket.

- The faster grant time and lower cost of innovation patents were the main reasons inventors preferred innovation patents over standard patents. The lower inventive threshold of innovation patents was the least important reason for their use by inventors.

- Being first to market was nominated by inventors as the main alternate to innovation patents. Ensuring trade secrecy and the use of standard patents were also important alternatives to innovation patents.

- Existing research suggests that the economic effect of utility models decreases with the rise of technological capacity in industries and countries.

EXECUTIVE SUMMARY

Innovation patents were introduced in Australia in 2001 following an Advisory Council on Intellectual Property (ACIP) Review of the Petty Patent System which recommended that the system be replaced by a second tier patent protection system called the innovation patent system. Innovation patents were designed to be a relatively quick and inexpensive form of intellectual property protection with a lower inventive threshold than that required for a petty patent or standard patent. These features were expected to encourage Australian small to medium business enterprises to develop their incremental inventions and market them in Australia.

Innovation patents were taken up in greater numbers than were petty patents and two previous reviews (one by the Intellectual Property Research Institute of Australia and one by IP Australia) found that innovation patents were largely used by individuals and small to medium business enterprises. After reviewing available data on innovation patent use in different fields of technology, and by applicant type, both reviews concluded that the innovation patent system was largely meeting its objectives.

Despite these findings there has been growing concern of the possibility that the innovation patent system is being “abused”. Some observers have claimed that an innovation patent is overly difficult to invalidate and the remedies for infringement are overly generous. Observers have also noted recently that innovation patents are used to obtain a form of quick protection for higher level inventions while a standard patent is being simultaneously pursued.

Reflecting these concerns, two inquires have been initiated into the innovation patent system. ACIP is undertaking a review of the innovation patent system and its effectiveness in
stimulating innovation in Australian small and medium businesses. IP Australia is also undertaking a review titled “Innovation patents - raising the step”.

IP Australia engaged Verve Economics to assess the potential economic impacts of innovation patents. An important feature of the research was a survey of inventors that hold, or have held, innovation patents, entitled “Survey of Users of the Australian Innovation Patent System”.

The three broad components of this research report are:

- a review of data on the use of innovation patents;
- a review of available empirical and theoretical studies of the economic effects of innovation patents and other “second tier” forms of intellectual property protection; and
- the design and execution of the survey.

**Review of data**

Innovation patents are a form of second tier patent protection that the World Intellectual Property Organization calls “utility models”. Utility model patents are available in 90 countries including mostly developing countries but also some developed economies such as Australia, Austria, Denmark, Italy and Germany. The share of utility models of total patents varies across countries — in 2010, this share was approximately five per cent in Australia, 50 per cent in China, and over 20 per cent in some developed countries such as Germany and Austria.

Within Australia, innovation patents are used primarily by individuals and small to medium business enterprises. There is evidence, however, of increasing use of innovation patents by overseas firms.

Patent application data indicate that innovation patents are used more extensively than standard patents in complex product industries. A complex product industry is characterised by the fact that several pieces of technology (patents) are required to produce a good or service. If the patents required to advance innovation are owned by many inventors, it can be costly to amalgamate access to the required patents to enable innovation to proceed.

For instance, information technology is known to be a complex product industry with high growth in applications for innovation patents in the information technology field. IP Australia recently noted community concern that “the Innovation Patent system is being abused, particularly in the information technology industry”.¹

There are a number of patent strategies that are known to be used in such complex product industries, such as blocking access to technologies required for further inventions, building large and complex patent portfolios to aid negotiations around access to required technology, and using patent portfolios to limit patent infringement litigation.

Because patent portfolios can serve many functions in complex product industries, it is not possible to say, without further detailed analysis, whether an observed increase in patent

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numbers in a complex product industry has aided or retarded access to required technologies and hence aided or retarded innovation.

Review of previous studies

To gain insight into how innovation patents may affect innovation and growth in Australia, a review was undertaken of studies that have examined how innovation and growth are affected by the existence of second tier patent systems. Most of the studies reviewed examined the effects of utility model patents on various economic variables such as innovation, total factor productivity or economic growth.

These studies largely suggest that utility model patents stimulate innovation and growth in developing countries and in industries that are technologically lagging. As the technological capacity of industries and countries grows, utility model patents are found to have less of an impact on innovation and growth. In some studies, utility model patents are found to have no significant effect on innovation in developed economies.

This literature casts doubt on the role that innovation patents can play in an advanced economy such as Australia. However, the continued use of utility model patents in some developed countries (e.g., Germany, Italy, Denmark and Austria) suggests that these patents may, under some circumstances, have a role in innovation and economic growth even in developed economies. For example, developed countries that are large net importers of new technology, such as Australia\(^2\), may benefit from a utility model system that aided the absorption and/or adaptation of such technologies by local firms.

The Australian Innovation Patent Survey

To gain a better understanding of the factors driving the use of innovation patents in Australia, a survey of innovation patent holders was undertaken. The survey was sent to 3,195 inventors that had protected their innovations with innovation patents. Over a period of 11 weeks, 517 surveys were received which is a response rate of approximately 16.2 per cent. Such a response rate is considered reasonable based on response rates of other surveys of inventors in small firms.

The survey findings confirm some of the findings of previous reviews of the innovation patent system. For instance, innovation patents are predominantly used by individuals and small to medium sized firms.

The main reason inventors sought innovation patents was to protect their invention and to enhance the reputation of their firm. The survey results suggest that there is only minor use of innovation patents for strategic uses such as building a patent thicket.

The top two reasons inventors preferred innovation patents over standard patents included the faster grant time and the lower fees of innovation patents. These two factors were significantly more important than the size of the inventive step, expected enforcement costs, and the shorter term of innovation patents. Notably, the inventive step was significantly less important than all other factors tested.

Approximately 60 per cent of innovations protected by an innovation patent have been used in commercial applications. The main reason for the lack of commercial application of the remaining 40 per cent of inventions was the “young age” of the invention. Many inventors indicated they were still exploring potential commercial applications of their inventions. For more mature innovations, lack of finance was the main factor limiting commercial application of invention protected by innovation patents.

Conclusions

The survey provided inventors with an opportunity to provide comments on their use of the innovation patent or the system in general. Many inventors used this survey to comment on their perceptions of the use and value of innovation patents to their businesses. While not all these comments received portrayed innovation patents positively, the majority of comments portrayed innovation patents in a positive light. The survey findings reflect many of the comments made by inventors. That is, on average, inventors mainly use innovation patents for traditional purposes and the use of innovation patents adds value to their firms. This is also indicated by the value inventors placed on innovation patents in the survey.

These results do not imply that innovation patents are a net benefit to the Australian economy. Conversely, any negative effects of innovation patents on innovation that is protected by standard patents or other methods are not assessed here. It is thus not possible using the results of this study to calculate the net effects of innovation patents on Australia's level of innovation and growth.
1. INTRODUCTION

Innovation patents were introduced in Australia in 2001 following an Advisory Council on Intellectual Property (ACIP) Review of the Petty Patent System which recommended that the petty patent be replaced by a second tier patent protection system called the innovation patent. It was expected that innovation patents would be relatively quick and inexpensive to obtain, and require a lower inventive threshold than a petty patent or standard patent. These features were expected to encourage Australian small to medium business enterprises to develop their incremental inventions and market them in Australia.

The success of the innovation patent system in achieving these objectives, however, has been questioned increasingly over time. For example, the Department for Innovation, Industry, Science and Research\(^3\) noted that an innovation patent is overly difficult to invalidate and the remedies for infringement are overly generous. In addition, the Department noted that innovation patents were being used to obtain a form of quick protection for higher level inventions while a standard patent is being pursued. The Department also noted that the innovation patent system had not been comprehensively reviewed to assess whether it remained effective and appropriate for Australia in current circumstances and in the future.

Consequently, on 28 February 2011, the then Minister for Innovation, Industry, Science and Research requested that ACIP undertake a review of the effectiveness of the innovation patent system in stimulating innovation within Australian small to medium business enterprises.

In August 2011, ACIP released an issues paper related to its review of the innovation patent system\(^4\) and noted several concerns including the following:

- a significant proportion of innovation patents were being used to obtain a form of quick protection for high level inventions while a standard patent was being pursued;
- the \textit{Patents Act 1990} provides identical remedies for infringement for standard patents and certified innovation patents;
- innovation patents could be used to evergreen\(^5\) an innovation by filing innovation patents for the protection of different aspects of the original innovation just prior to the end of the term of an original patent; and

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\(^5\) As noted in the ACIP issues paper, evergreening “refers to the strategy adopted by patentees who seek to extend their period of patent protection by applying for secondary patents over related or derivative technologies”, p.23.
innovation patents can be used for tactical purposes. For example, a divisional innovation patent\(^6\) can be filed to fast track the grant and issue of a certificate of examination to place a patentee in a position to commence infringement proceedings. Such strategic use may result in a small to medium business enterprise competitor being driven from the market well before the merits of the parent standard patent are resolved.

IP Australia\(^7\) has also expressed concern that the Innovation Patent system has led to the grant of patents for innovations that are obvious and this has aided the strategic use of innovation patents by applicants:

\[
\text{to extend the patent life of their products, to tailor patents to target potential infringers, and to increase transaction costs for their competitors. (page 5)}
\]

Accordingly, IP Australia has proposed that the Patents Act 1990 be amended to effectively remove the existing ‘innovative step’ test for an innovation patent replacing it with the same ‘inventive step’ required for standard patents.\(^8\) This would “address community concerns that the Innovation Patent system is being abused, particularly in the information technology industry”.\(^9\)

To facilitate a full assessment of the issues relevant to the ACIP review, IP Australia engaged Verve Economics to undertake research to enable the possible economic impacts of innovation patents to be identified. In particular, the research involved:

- undertaking a survey of inventors who hold, or have held, innovation patents including collation of data and analysis of survey responses;
- reviewing available theoretical models on the effects of second tier patent systems on innovation; and
- reviewing available empirical studies that have examined the effects of second tier patent systems on innovation.

This report details the findings of the research undertaken for IP Australia. The report is structured as follows. Section 2 provides background data on the use of innovation patents in the Australian economy. Section 3 summarises available theoretical and empirical work on the economic effects of second tier patent systems. Section 4 provides an outline of the survey of innovation patent holders undertaken for this study. The findings from the survey are also detailed in Section 4. Section 5 provides concluding remarks.

2. BACKGROUND

According to the World Intellectual Property Organization (WIPO), Australia’s innovation patent is a form of patent known as a ‘utility model’.\(^10\) Utility Model patents are currently

\[^6\] A divisional patent is filed to divide a patent application (known as the parent application) into two or more applications.

\[^7\] IP Australia 2012, ‘Innovation patents - raising the step, Consultation paper’.

\[^8\] The full set of proposed amendments required to remove the existing ‘innovative step’ test for an innovation patent and replace it with the same ‘inventive step’ required for Standard patents are detailed in: IP Australia 2012, ‘Innovation patents - raising the step, Consultation paper’, Attachment A.


available in 90 countries\textsuperscript{11} and in 2010, the latest year for which data is available, there were approximately 1.23 million utility model patents in force worldwide. This compares to approximately 7.3 million standard patents in force worldwide for the same period.\textsuperscript{12}

Australia’s innovation patent system was meant to provide intellectual property rights for minor and incremental inventions (known as lower level inventions) that are more likely to be made by Australian small to medium business enterprises.\textsuperscript{13} A lower required inventive step and fewer examination requirements (see Box 1) result in innovation patents providing a relatively quick and relatively inexpensive form of protection for lower level inventions.

\begin{table}[h]
\centering
\begin{tabular}{|l|}
\hline
\textbf{Box 1 The main differences between innovation patents and standard patents} \\
\hline
\textbf{Standard patents must possess an ‘inventive step’. Innovation patents need only meet the lower requirement of possessing an ‘innovative step’.} \\
\hline
\textbf{Standard patents generally have a term of 20 years. Innovation patents have a term of eight years.} \\
\hline
\textbf{Standard patents are granted only after an application has been substantively examined, accepted and possibly opposed. Innovation patents are granted almost immediately after a formalities check and no substantive examination. However, an innovation patent is not enforceable until it is substantively examined and certified (optional). Additionally, an innovation patent cannot be opposed until after it is granted.} \\
\hline
\textbf{Standard patents may have unlimited claims defining the scope of the monopoly. Innovation patents are limited to five claims.} \\
\hline
\textbf{Standard patents may be granted for inventions related to plants, animals and the biological processes for their generation. Innovation patents cannot be granted for these (although microbiological processes and products of such a process are allowable).} \\
\hline
\end{tabular}
\end{table}


IP Australia fees for a standard patent and an innovation patent are given in Table 1. This table shows that fees for an innovation patent are below those applicable for a standard patent, especially if the innovation patent holder chooses not to have their patent examined and if the innovator undertakes the application process. In contrast, if agents are used to undertake the application, the savings in fees associated with the use of innovation patents are relatively marginal.\textsuperscript{14}

Some observers have noted, however, that individual applicants see their ability to undertake all of the required drafting and filing as an attractive feature of the innovation patent system.\textsuperscript{15} Applicants find self-filing more difficult with a standard patent application where they more often seek the advice of a patent attorney. Thus it is argued that the availability of innovation patents has encouraged self-filing, generating a significant cost advantage for self-filers using the innovation patent system rather than the standard patent system.

\textsuperscript{11} WIPO 2012, “Where can utility models be acquired?”.

\textsuperscript{12} Data for utility models in force and patents in force was obtained from WIPO. Patents in force data is available at: www.wipo.int/.../patents/xls/wipo_pat_in_force_by_office_table.xls. Data on utility models in force is available at:www.wipo.int/export/.../models/xls/wipo_um_inforce_by_origin_table.xls.


\textsuperscript{14} IP Australia noted that the cost saving was marginal for the 34 per cent of filings in which an agent was employed. See: IP Australia 2006, “Review of the Innovation Patent, Final Report”, July, p. 30.

\textsuperscript{15} ACIP roundtable discussions as related by Jeff Carl from the ACIP Secretariat.
In addition to potential cost savings, innovation patents in Australia are processed more quickly than standard patents. Representative times for key steps in the life of an innovation patent and standard patent are given in Chart 1. In this chart, it can be seen, for example, that as at 2006, it took approximately 15 months (currently approximately 10 months) to commence a requested examination of a standard patent, whereas examination of innovation patents occurs almost immediately after examination is requested.\(^\text{16}\)

Chart 1  Selected timeframes for innovation patents and standard patents (months)

Overall, the lower cost and faster processing times of innovation patents is expected to induce increased levels of lower level innovation in Australian small to medium business enterprises. In addition, the lower inventive step required of innovation patents would be expected to lower research costs associated with innovation patents relative to standard patents. This would also be expected to increase the level of innovation in small to medium business enterprises.

Cross country differences in the intensity of use of utility model patents may offer some insight into the importance of fees and the design of utility model patents on the use of these patents. As indicated previously, utility model patents are currently available in 90 countries.

\(^{16}\) Administrative arrangements are available to decrease the time taken to process a standard patent application.

**Table 1**  IP Australia fees for a standard patent and an innovation patent ($/filing)

<table>
<thead>
<tr>
<th>Fee</th>
<th>Standard patent</th>
<th>Innovation patent, certified</th>
<th>Innovation patent not certified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filed on line</td>
<td>370</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td>Examination requested</td>
<td>490</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td>1st anniversary</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2nd anniversary</td>
<td>0</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>3rd anniversary</td>
<td>0</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>4th anniversary</td>
<td>300</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>5th anniversary</td>
<td>300</td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td>6th anniversary</td>
<td>300</td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td>7th anniversary</td>
<td>300</td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,060</strong></td>
<td><strong>1,670</strong></td>
<td><strong>1,170</strong></td>
</tr>
</tbody>
</table>


INNOVATION PATENTS
Analysis of available application data available on WIPO’s website\textsuperscript{17} indicates that utility model applications can account for well over a quarter of all patent applications in many of these countries (Chart 2).

**Chart 2** Utility model patents as a share of total patents, selected countries (per cent of patents filed in 2010)

Source: WIPO Statistical Data Centre. Inclusion of a country in this chart was based on the data on utility models for the country being available from WIPO’s Statistical Data Centre.

\textsuperscript{17} WIPO Statistical Data Centre. Available at: http://ipstatsdb.wipo.org/ipstats/patentsSearch. Data extracted consisted of “total utility model utility model applications (direct and national phase PCT entries)” by total count by filing office. Patent data extracted consisted of “total patent applications (direct and national phase PCT entries)” by total count by filing office.
The design of utility models also differs across countries and this could affect the intensity of use of utility model patents across countries. Ladas and Parry\textsuperscript{18}, for example, indicate that in at least 16 countries that have utility models, “requirements for patent protection and for utility model protection” are similar. These countries are marked with blue bars in Chart 2. Ladas and Parry note that in several of these countries, the use of utility model patents is lower. Examination of Chart 2 reveals that this proposition holds for countries such as Malaysia, Guatemala, Argentina, Uruguay, Costa Rica and Brazil. In these countries, higher use of utility models could have been expected given the relative level of development in these countries and the implication is that the existence of similar requirements for utility models and standard patents dulls the use of utility models in these countries.

However, there are several countries with very high relative use of utility model patents even though requirements for patent protection and for utility model protection in these countries appear to be similar (e.g. Poland, Hungary, Thailand, Slovakia, Czech Republic and Ukraine). This result suggests that factors in addition to the requirements for a utility model patent, determine the intensity of use of utility model patents in particular countries.

The fact that a complex set of factors determine the intensity of use of utility model patents in particular countries is further evidenced by the fact that in several developed economies such as Denmark, Italy, Germany, Austria, Spain and Australia utility model applications are a significant share of total patent and utility model applications (marked as red bars in Chart 2 and Australia marked in gold). Lower use of utility model patents could have been expected given the level of development of these countries.

Thus it would seem that the intensity of use of utility model patents in a country is determined by factors in addition to the size of the required inventive step and/or level of development of the country. For example, Ladas and Parry note that applicants in Germany have a six month grace period prior to publication by the inventor and in some countries substantive examination is required prior to the grant of a utility model (see footnote 18, Table 2). This suggests that a complex set of factors contribute to cross country differences in the use of utility model patents.

Turning to an analysis of Australian data, one measure of the level of innovation is the number of patent applications. To examine the impact of the innovation patent system on innovation in Australian small business enterprises, we first consider the level of innovation patent applications.

2.1. ANALYSIS OF INNOVATION PATENT APPLICATIONS

The number of innovation patents filed in Australia has grown strongly since their introduction in 2001 (Chart 3).

Up until 2010, applications by individuals exceeded applications by companies. This trend reversed in 2011 (Chart 3). The relatively strong growth in applications by companies since 2010 was largely the result of growth in applications made by foreign owned companies (or non-residents) (Chart 4). After 2009, applications by foreign firms increased sharply and by 2012 almost matched application by Australian firms (Chart 4).

The strong growth in applications made by foreign owned firms in recent years is reflected in aggregate applications made by foreign entities (Chart 5). However, applications made by Australian entities still account for the majority of innovation patent applications made in recent years (Chart 5).
2.2. ANALYSIS OF INNOVATION PATENT APPLICATIONS BY IP AUSTRALIA FIELD OF TECHNOLOGY

IP Australia allocates patent applications to one of 31 fields of technology. Analysis of the innovation patent data indicated that over 60 per cent of applications are in five fields of technology (first pie chart in Chart 6).

A comparison with standard patent applications by fields of technology indicates that approximately 45 per cent of applications are covered by five fields of technology (second pie chart in Chart 6).

These data indicate there is little commonality between the top five technology fields for innovation patents and standard patents (compare first and second pie charts in Chart 6). For instance, the top two technology groups for standard patents are ‘organic fine chemicals’ and ‘Medical engineering’ and account for 25 per cent of all standard patent applications but just four per cent of innovation patent applications (see bottom pie chart of Chart 6).

In gaining a better understanding of differences in the usage of innovation patents across technology fields, Bronwyn Hall’s taxonomy of patent uses is reproduced in Chart 7.19 Hall divides industries into “Discrete” and “Complex”. Innovations in discrete industries are protected by relatively few patents, while innovations in complex product industries are protected by many patents.

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Chart 6  Innovation patent applications and standard patent applications by field of technology (share of patents filed 2001 to 2011, per cent)

Innovation patents: 2001 to 2011

- Consumer goods & equipment, 21
- Civil engineering, building, mining, 14
- Handling, printing, 6
- Transport, 8
- Information technology, 10
- Other, 41

Standard patents: 2003 to 2011

- Consumer goods & equipment, 6
- Medical engineering, 11
- Pharmaceuticals, cosmetics, 9
- Organic fine chemicals, 12
- Analysis, measurement, control, 6
- Other, 55

Innovation patents, selected technology fields, 2001-2011

- Consumer goods & equipment, 21
- Medical engineering, 4
- Pharmaceuticals, cosmetics, 1
- Other, 69
- Organic fine chemicals, 0
- Analysis, measurement, control, 5

Source: Data provided by IP Australia.
In Chart 7, the top five technology fields for standard patents applications are coloured yellow and the top five technology fields for innovation patents are coloured green. The top five technology fields for standard patents are more prevalent in discrete industries whereas the top five technology fields for innovation patents are more prevalent in complex product industries.

Analysis of IP Australia data on application for standard patents indicated that, over the period 2003 to 2011, standard patent applications in complex industries accounted for 27 per cent of all applications. In contrast, applications in complex technology fields accounted for 38 per cent of all innovation patent applications over the period 2001 to 2011.

As detailed by Hall (see last segment of Chart 7) patents are used in complex product industries primarily to improve outcomes from negotiations and to prevent litigation. Thus one explanation for the greater use of innovation patents in complex product industries could be that the lower cost of acquiring and maintaining innovation patents enables a lower cost implementation of strategies designed to enhance outcomes of negotiations and to prevent litigation.

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**Chart 7** Bronwyn Hall’s taxonomy of industries, technologies and patent uses

<table>
<thead>
<tr>
<th>Industries (based on Cohen et al. 2002, divided at ISIC 2900)</th>
<th>Discrete</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food &amp; tobacco, textiles &amp; apparel, Wood &amp; paper, chemicals including oil and plastics, pharmaceuticals, non-metallic mineral prods, metals, and metal products</td>
<td>machinery, computers, software, electrical equipment, electronic components incl. radio/TV, med &amp; sci instruments, and transportation equipment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technologies (from von Graevenitz et al. 2008, based on OST classes)</th>
<th>Discrete</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>measurement &amp; control, pharmaceuticals, medical, coatings, materials processing, organic chem, materials, mechanical elts, nuclear and chem eng, machine tools, biotech, ag &amp; food chem &amp; mach, environmental, thermal processes, space &amp; weapons, consumer goods, civil eng, mining</td>
<td>high complexity: audiovisual, telecommunications, semiconductors, Info technology, optics, electrical medium complexity: handling &amp; printing; engines, basic chemistry and petrol, polymers, transport</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patent strategy (from von Graevenitz et al. 2007)</th>
<th>Discrete</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio optimization</td>
<td>Portfolio maximization</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume of applications</th>
<th>used to exclude, and sometimes for licensing; also to prevent litigation</th>
<th>used in negotiations (cross licensing and other), and to prevent litigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>very high</td>
<td>High</td>
</tr>
<tr>
<td>Frequent</td>
<td>infrequent</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Above average</td>
<td>Below average</td>
<td>Average</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use for blocking only</th>
<th>High</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent</td>
<td>Infrequent</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Above average</td>
<td>Below average</td>
<td>Average</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of opposition</th>
<th>High</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent</td>
<td>Infrequent</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Above average</td>
<td>Below average</td>
<td>Average</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Applications with shared priorities</th>
<th>High</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrequent</td>
<td>Infrequent</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Above average</td>
<td>Below average</td>
<td>Average</td>
</tr>
</tbody>
</table>


Nevertheless, innovation patents are also used in discrete product industries and there would be characteristics of these industries that encourage the use of innovation patents in these discrete product industries. Christie and Moritz suggest that innovation patents may be more suitable than standard patents for products with short commercial lives such as the technology field ‘consumer goods and equipment’.21

2.3. ANALYSIS OF INNOVATION PATENT STATUS BY APPLICANT TYPE

The administrative steps that innovation patents can potentially go through from the point of filing to expiration at the end of their eight year term are detailed in Chart 8. Also detailed in Chart 8 are the numbers of innovation patents at various points in the administrative life cycle as at close of business 31 December 2012. These numbers are given as the white numbers in each administrative step which are depicted as the blue ovals.

As at close of business 31 December 2012, a total of 15,032 innovation patent applications had been filed at IP Australia (Chart 8). The shares of the 15,032 filings by their application status are graphed in Chart 9. Approximately 40 per cent of all innovation patents filed were still active (certified 8.6%, sealed 32.8%, filed 0.3%). Thus approximately 60 per cent of all innovation patents filed were inactive mainly due to the non-payment of renewal fees (ceased 42.7% and lapsed 8.2%), the patent reaching its term (5.8% expired), and a small percentage being withdrawn or converted (see Chart 9). Less than half of one per cent of all innovation patents filed has been revoked after formal examination (revoked 0.5%) (Chart 9).

Chart 8  The life cycle of an innovation patent

Source: IP Australia.

To explore in more depth the relationship between innovation patent status and type of application, data on the innovation patent status by applicant type was evaluated (see last row Table 2). Australian individuals account for approximately 50 per cent of the 15,032 innovation patent filings and foreign individuals account for a further seven per cent. Thus in total, individuals account for approximately 60 per cent of the 15,032 innovation patent filings. In contrast, Australian companies account for just under 30 per cent of all innovation patent filings and foreign firms account for a further 14 per cent of the 15,032 innovation patent filings (see last row Table 2).

Table 2 innovation patent status by applicant type as at 31 December 2012 (per cent of total innovation patent filings by applicant type)

<table>
<thead>
<tr>
<th>Patent status</th>
<th>Applicant type</th>
<th>Australian Individual</th>
<th>Foreign individual</th>
<th>Australian Company</th>
<th>Foreign company</th>
<th>All applicants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceased</td>
<td></td>
<td>52.2</td>
<td>43.0</td>
<td>36.2</td>
<td>19.4</td>
<td>42.7</td>
</tr>
<tr>
<td>Certified</td>
<td></td>
<td>5.0</td>
<td>5.7</td>
<td>13.8</td>
<td>13.2</td>
<td>8.6</td>
</tr>
<tr>
<td>Converted</td>
<td></td>
<td>0.6</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Expired</td>
<td></td>
<td>3.8</td>
<td>7.9</td>
<td>8.2</td>
<td>7.5</td>
<td>5.8</td>
</tr>
<tr>
<td>Filed</td>
<td></td>
<td>0.3</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Lapsed</td>
<td></td>
<td>12.8</td>
<td>2.2</td>
<td>4.6</td>
<td>0.8</td>
<td>8.2</td>
</tr>
<tr>
<td>Revoked</td>
<td></td>
<td>0.3</td>
<td>0.2</td>
<td>0.5</td>
<td>1.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Sealed</td>
<td></td>
<td>24.0</td>
<td>40.6</td>
<td>35.5</td>
<td>57.3</td>
<td>32.8</td>
</tr>
<tr>
<td>Withdrawn</td>
<td></td>
<td>0.7</td>
<td>0.2</td>
<td>0.7</td>
<td>0.1</td>
<td>0.6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Total of all applicants (%)</td>
<td></td>
<td>52.0</td>
<td>6.8</td>
<td>27.8</td>
<td>13.5</td>
<td>100</td>
</tr>
</tbody>
</table>

Data source: Data provided by IP Australia

The data in the main body of Table 2 suggest that innovation patents that have ceased or lapsed account for a greater share of innovation patents filed by individuals than they do for that of firms (see first and sixth rows in bold of Table 2). This result suggests the following hypothesis:

- other factors being equal, individuals are more likely to allow their innovation patents to lapse or cease compared to firms.
In contrast, certified patents account for a greater share of innovation patents filed by firms than they do for innovation patents filed by individuals (second row Table 2). In addition, expired innovation patents comprise a larger share of innovation patents filed by firms compared to the expired innovation patents filed by Australian individuals (fourth row Table 2). Taken together, these results suggest the following hypothesis:

- other factors being equal, firms are more likely than individuals to have their innovation patents examined and to maintain the patents till the patents expire.

This completes the analysis of the raw innovation patent data available from IP Australia. The following section provides a review of previous studies.

3. PREVIOUS STUDIES

This section presents a review of available studies that have examined the economic effects of utility model patents including Australia’s innovation patent. The review consists of three parts. Section 3.1 discusses two previous reviews of Australian innovation patents. Section 3.2 reviews economic insights derived from theoretical models used to analyse second tier patent systems. Section 3.3 documents results from empirical studies of the economic effects of second tier patent systems.

3.1. PREVIOUS REVIEWS OF THE INNOVATION PATENT SYSTEM

There have been two previous reviews of Australia’s innovation patent system. These include a 2004 review by Christie and Moritz and a review conducted in 2006 by IP Australia.

Christie and Moritz undertook their review by comparing and contrasting applications for innovation and petty patents against applications for standard patents. For each type of patent, the authors compared:

- applications by individuals against applications by companies;
- applications by foreign entities compared to Australian entities; and
- applications by field of technology.

Based on an analysis of the three years’ of innovation patent application data that was available at the time of the review, the authors found that, compared to standard patents, innovation patents appealed specifically to individuals and were more likely to be used by Australian entities relative to foreign entities. The authors also found that innovation patents were used in fields of technology other than those in which standard patents are sought. On the basis of their analysis, the authors concluded;

\[The \text{ analysis of the extent to which the objectives of the petty and innovation patent systems have been met suggests that the innovation patent system best}\]

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meets its objectives. Indeed, innovation patents appear to be serving the purposes of both the petty and innovation patent systems.

The authors noted that the technology fields for which petty patents were sought were almost identical to the technology fields for which innovation patents were sought. This led the authors to suggest that the differing threshold of inventiveness for innovation had little bearing on the use of second tier patents to protect innovation in particular fields of technology.

While this is a valuable insight, it needs to be qualified somewhat as data provided by IP Australia\textsuperscript{25} indicates that in the first full year when innovation patents were available (i.e. 2001-02) the volume of innovation patents was almost double the level of petty patents in the last full year of operation of petty patents (i.e.1999-2000).

The extra number of applications for innovation patents relative to petty patents may suggest that the lower threshold of inventiveness for innovation patents promoted increased use of innovation patents relative to petty patents. However, petty patents were also subject to compulsory examination whereas innovation patents are not. Thus, the extra number of applications for innovation patents could also reflect the fact that an innovation patent need not be examined.

IP Australia also undertook a review of the innovation patent system in 2006, drawing on data on patent applications by applicant type and also drawing on 10 public submissions made to the review.

The review concluded that the objectives of the innovation patent system were generally being met. The review further concluded that the higher use of the innovation patent system relative to the petty patent system suggested that low level innovation had been stimulated "to some degree" by the innovation patent system.

This view was supported by the submissions, which largely expressed the belief that the innovative step for an innovation patent had a lower threshold than that of a standard patent. The existence of the lower threshold was seen by the authors of most submissions as a main reason for the reasonable level of use of the innovation patent system.\textsuperscript{26}

However, the review highlighted several potential problems with the innovation patent system. First, there appeared to be inadequate knowledge of the system by both applicants and other parties. This had led some parties to misrepresent unexamined innovation patents as enforceable rights. Second, there was a possibility that the innovation patent system was leading to a proliferation of "trivial" patents which led the review to suggest that the "appropriateness of the innovation patent should be regularly reassessed". Finally, some applicants were believed to be using innovation patents to protect higher-level inventions rather than as an attempt to protect lower-level inventions.\textsuperscript{27} Analysis of a sample of patent applications indicated that about seven per cent of the innovation patent applications related to one or more standard applications.


\textsuperscript{27} Of course there may be legitimate reasons why innovation patents may be related to higher level inventions. For example, an innovation patent could be used to make good a perceived deficiency in the higher level patent.
Despite these concerns, the review concluded that there appeared to be no reason to alter the basic parameters of the innovation patent system — the innovative step, eight year term, five claim limit, and the retention of the subject matter eligible for an innovation patent.

Further insights into the effects of the innovation patent system can be obtained from theoretical models of innovation in which variables such as the length of the patent term, scope of patent claims and the level of the inventive threshold are varied. In the following section, insights obtained from these models are detailed.

3.2. ECONOMIC EFFECTS OF SECOND TIER PATENTS, INSIGHTS FROM THEORECTICAL MODELS

The effect on innovation of varying the length of the patent term, scope of patent claims and the level of the inventive threshold depends on the type of innovation. Scotchmer defines three types of inventive processes:

- isolated discoveries that did not benefit from past innovation nor have any impact on future innovation;
- cumulative innovation in which each innovation builds on prior developments and discoveries. These include:
  - basic research and applications in which one innovation spawns several further innovations; and
  - quality ladders in which innovators create successively better products or services improving on the previous one; and
- complimentary innovation in which innovation requires the simultaneous use of several innovations which may or may not have been invented previously.

There are two broad sources from which economic insights can be gained on the effects of patent design on research and development, innovation and economic welfare. These are models which have been used to examine the impact of patent characteristics on growth and research and development. These models have been reviewed by Chu. Economic models have also been developed to determine the optimal configuration of patents. These models have been summarised by Encaoua et al.

In the above types of studies, patents are characterised in terms of three parameters. These are:

- patent length, as determined by the maximum statutory term in years that a patent can be in force, which determines how long a firm be given monopoly power over an invention;

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• the height of the patent, which determines the minimum inventive step over the patented state of the art required for a new invention to be granted a patent; and

• the breadth of the patent, as measured by the number of claims allowed in a patent and how broad each claim can be, which determines the range of products competitors are prevented from selling due to patent enforcement.

Patent height and patent breadth can be combined to determine what is known as “lagging breadth” of a patent. The strength of lagging breadth determines how easy it is to imitate an invention.

Patent height and patent breadth can also be combined to determine the “leading breadth” of a patent. The strength of leading breadth determines the scope an existing patent holder has to acquire future inventions or enhancements to existing inventions.

Denicolò\textsuperscript{32} explains how patent breadth has been interpreted in studies of product innovation, process innovation and in terms of the number of applications of an innovation in independent markets. While the interpretation of patent breadth differs depending on the type of innovation under consideration, Denicolò succinctly summarises patent breadth as:

\begin{quote}
\textit{the degree of dissemination of technological knowledge allowed by the patent (p.253)}
\end{quote}

An innovation patent is likely to have lower breadth than a standard patent because the innovative step is lower and because a maximum of five claims are allowed, compared to unlimited claims in a standard patent application.\textsuperscript{33} The term of an innovation patent at eight years is also less than the term of a standard patent at 20 years.

In the following section, the effects of a reduced patent term and lower patent breadth on isolated discoveries are detailed.

3.2.1. Isolated discoveries

Isolated discoveries have the distinct characteristic that they do not benefit directly from previous innovations and they do not provide spillover benefits to further innovation. The effects of patent structure on isolated inventions and hence growth and innovative activity has been analysed in two strands of work. The first broad strand of work incorporates patent height and breadth into growth models to examine the effect of these variables on innovation and growth.

The second broad strand examines the effect of patent structure on innovation and growth. This work has been reviewed by Lampe and Niblett\textsuperscript{34} and more recently by Rockett.\textsuperscript{35}

Chu\textsuperscript{36} details several studies which examined the impact of lagging breadth on innovation and development in theoretical models of growth. In a study undertaken by Li,\textsuperscript{37} stronger

\textsuperscript{33} Excess claim fees are levied on standard patent applications that have more than 20 claims. This fee is currently set at $110 for each claim in excess of 20 claims.
\textsuperscript{35} Rockett, Katharine 2010, “Property rights and invention”, Chapter 7 in, Handbook of the Economics of Innovation, Volume 01, edited by Bronwyn Hall and Nathan Rosenberg, Elsevier B.V.
lagging breadth enhances innovation and growth in the theoretical model developed by the author. In other studies, stronger lagging breadth enhances innovation and growth in the short run, but not in the long run, due to induced changes in industry structure. In a study by Furukawa, the longer term reduction in growth is caused by a reduction of learning by doing. In a theoretical model developed by Horii and Iwaisako, the longer term reduction in growth is caused by the duplication of research efforts.

Denicolò also notes that the effect of strengthening lagging breadth on the number of isolated inventions and economic welfare depends on industry structure.

The second strand of theoretical work relates to the optimal design of the patent system. Hu and Jaffe note that earlier work in this area related to isolated innovations since:  

*this literature ignored the possibility that part of the social benefit of inventions is knowledge spillover to future innovators: it can thus be thought of as addressing the case where inventions are independent of each other on the supply side of invention (p.3)*

Chen et al note that the results generated from the earlier studies of isolated innovation undertaken, for example, by Gilbert and Shapiro, Klemperer and Gallini, indicate that increasing patent strength increases innovation and innovator profits at the cost of creating a deadweight consumption loss caused by higher prices on the patented good. The optimal mix of patent length and breadth in these models is found by setting these variables at levels that minimise the deadweight loss relative to the patent holder’s extra profit generated by the patent.

After reviewing the earlier studies on optimal patent design, Encaoua et al drew the following conclusions in relation to isolated innovations:

- the historical reduction in the patentability requirement in certain countries might have favoured industries where ideas arrive relatively slowly since patentability requirements are higher when innovative ideas arrive more frequently (p. 14);
larger breadth makes it more difficult to imitate an isolated invention, whereas increasing the duration of patent protection enhances the incentives to imitate the isolated invention (p.16);

- broad patents can lead to duplication and concentration of R&D efforts in some areas at the expense of insufficient investment in other areas where the return is lower (p.16);

- when the cost of imitation is sufficiently low, broader patent protection is required to deter imitation by competitors (p.17); and

- there is a strong presumption that a combination of narrow breadth and long protection is preferable for isolated inventions48 (p. 17).

As indicated previously, Australia's innovation patent system provides relatively narrow lagging breadth and short patent duration. Considering the conclusions drawn from Encaoua et al would suggest that innovation patents are likely to be used relatively more for isolated inventions that have relatively short commercial lives and are in industries where the arrival of new ideas is relatively slow but the cost of imitating products is relatively high.

Isolated inventions in industries characterised by low costs to imitate and/or long economic lives and/or in which new ideas arrive relatively frequently are more likely to seek protection of new innovations through the use of standard patents.

In the following section, the effect of patent design on continual innovation is explored.

3.2.2. Continual innovation

Continual innovation is characterised by the fact that current inventions build on previous inventions and without previous inventions, current inventions would not be possible. Thus previous inventions provide positive externalities to following inventions. If current inventing entities are different entities from previous innovating entities, then the positive externality needs to be internalised to ensure that the cumulative innovations take place.49

Rockett reviewed available studies that examined the impact of patent design on continual innovation (e.g. Scotchmer50, O'Donoghue51, Green and Scotchmer52 and Scotchmer53). The impact of patent design on continual innovation and welfare was found to depend heavily on the potential to license innovations. Based on the papers reviewed, it was concluded that:54

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48 In contrast, Scotchmer provides two examples of isolated inventions in which broad, short patents would be preferred. Price elasticities of demand for the patented good and its substitutes, if any, play a large role in determining the optimal patent structure. See, Suzanne Scotchmer 2004, "Innovation and Incentives", The MIT Press, Cambridge, Massachusetts, p. 111.


• there is a relatively strong argument for the need for strong lagging breadth to deter imitation and provide original innovators with sufficient returns to cover their research and development costs. This would ensure that required original innovations take place;

• if licensing is fully flexible and efficient, there is a strong case for strong leading breadth as this will assign property rights to original inventors and licensing will ensure that following inventions can still take place;

• strong inventive steps may be required when licensing does not function well. This is because firms involved in continual innovation under-invest in innovation because they may be eclipsed by followers. A large inventive step can correct this inefficiency by encouraging such innovators to target larger innovations; and

• high technology industries with frequent innovation require a higher inventive step to ensure that the invention is sufficiently rewarded given it is likely to have a short economic life due to frequent innovation.

These conclusions imply that the low lagging breadth and low leading breadth of innovation patents would deter the extensive use of innovation patents to protect continual innovation especially in industries where enhancements to existing goods and services are expected to have long economic lives and/or where the R&D costs associated with such enhancements are relatively large. In contrast, innovation patents may be a less costly way to protect the intellectual property inherent in goods that have short economic lives and cost relatively little to develop (e.g., consumer goods).

Also, because the inventive threshold of innovation patents is relatively low, and would thus not encourage innovators to target larger innovations, it would be expected that any improvements to existing products or services that are protected by innovation patents, would be relatively small.

Given that innovation patents were designed to encourage innovation in small to medium business enterprises, encouraging smaller innovations would not be inconsistent with this policy. Small to medium enterprises are less likely to have access to the resources to undertake the large quantum of research and development required to achieve large technical improvements to existing technologies.

It does not necessarily follow that innovation patents reduce the rate of continual innovation overall. Indeed, large technical improvements could still be protected with a standard patent. It is an empirical question, therefore, as to whether the opportunity to undertake a greater number of smaller technological improvements deters other innovators from undertaking research and development to achieve large technological advancements.

In the following section, the use of innovation patents in complimentary innovation is discussed.
3.2.3. **Complimentary innovation**

An innovation is said to be complimentary if there are synergistic benefits from the use of several patents. That is, if the value of several patents bundled together is greater than the sum of the value of the individual patents. When innovation is complimentary, there is a two-way flow of technology spillovers. Technology spills over from one owner of technology to other inventors. But the same patent owner also gains from technology spillovers from other patent holders.

It can be shown that uncoordinated sale of many technologies required to produce a complimentary innovation can result in costs of final products that disadvantage both consumers and the patent owners themselves. To avoid these sorts of problems, various mechanisms have developed to ensure required technologies are exchanged at economic prices. These include:

- horizontal merger amongst patent holders via the creation of patent pools;
- requiring required patents to be licensed at “reasonable and non-discriminatory” rates. So called RAND royalties;
- development of patent portfolios to enhance access negotiations to required technologies; and
- policy responses such as “lenient” treatment of patent pools or proposed mergers.

One difficulty that can arise when many technologies are required to produce a new good or service is that the transactions cost associated with combining the many required patents can be so large that it makes the innovation uneconomic. When this occurs, it is said to be a tragedy of the anticommons caused by a patent thicket.

Innovation patents may have encouraged the development of patents thickets because, compared to standard patents, innovation patents are less costly to file, have faster grant times and may be less costly to defend. If patent accumulation is sensitive to patent cost, which seems likely, the lower cost of innovation patents may have encouraged the development of patent portfolios. If this is the case, it is also possible that the development of patent portfolios could also have inadvertently created more or deeper patent thickets.

Thus, a consideration of the net effect of innovation patents on cumulative innovation would need to take into account the opposing economic effects that an increase in patent portfolios could have on complimentary innovation, compared to the cost generated through any increase in the number or size of patent thickets.

On the one hand, increased demand for innovation patents may have led, either intentionally or inadvertently, to the creation of an increased number of patent thickets or if innovation patents made existing thickets more impenetrable. If this occurred, innovation in complex

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56 This is known as the Cournot compliments problem.


product industries may have been slowed due to a patent thicket induced increase in the transactions costs associated with the assembly or patents required to expand innovation.

However, as detailed in Chart 7 on page 14, patents in complex product industries are not primarily used to block access to technologies. Blocking access to an original patent could increase profits received by the owner of the original patent. Blocking access to an original patent would also reduce spillovers that the owner of the original patent would obtain from other innovators using the original patent to build new inventions. If the spillover effect exceeds the increased profit effect, the owner of the original patent would not block use of the original patent by other inventors. Infrequent use of patents to block access to technologies in complex product industries indicates that the spillover effect is significant for many inventions in these industries.

Nevertheless as detailed in Chart 7 on page 14, patents can be used to block access to technologies in complex product industries, although such action is described as “infrequent”. Innovation patents would reduce innovation in complex product industries if blocking access to technologies were the primary use of innovation patents in these industries.

Because patent portfolios can serve many functions in complex product industries, it is not possible to say, without further detailed analysis, whether an observed increase in patent numbers in a complex product industry has aided or retarded access to required technologies and hence aided or retarded innovation.

On an empirical note, Marengo and Valente\textsuperscript{59} build a simulation model of industry dynamics with product innovation and differentiated demand in complex product industries. The authors note that the ability to imitate products in complex product industries can have both positive and negative effects on innovation because:

\begin{quote}
on the one hand we can expect imitation to hinder innovation because the limited time span of technological superiority is likely to put a strong pressure on prices, and consequently on profits and R&D investment. However, imitation of successful components may increase the number of combinations experimented by producers, therefore increasing the probability of discovering high quality products. \textup{(page 14)}\end{quote}

The authors then report simulation results from their model in which product development is assumed to take place in an environment where imitation is difficult and an environment in which imitation is easy. In less complex industries, easier imitation is found to reduce innovation. However, as industry complexity is increased, easier imitation is found to generate relatively more frequent and diffused product quality improvements.

In contrast to this result, Marengo, Pasquali, Valente and Dosi\textsuperscript{60} report results from what they call a “simple simulation model” in which innovation in complex product industries is simulated in the presence of patents. In their model, the authors find that:

\begin{quote}
when complexity is high innovative paths are fewer and far between because components have to be combined in specific ways: thus an innovative path may not have any viable alternative in its vicinity and blocking it may considerably slow down further innovation \textup{(page 23)}\end{quote}


\textsuperscript{60} Marengo, Luigi, Corrado Pasquali, Marco Valente, and Giovanni Dosi 2009, “Appropriability, Patents, and Rates of Innovation in Complex Products Industries”, LEM working paper 2009/5, Laboratory of Economics and Management, Sant’Anna School of Advanced Studies, April.
The slowdown in innovation is simulated to more than halve consumer welfare (see Figure 8 in the author’s paper). However, such a large reduction in consumer welfare suggests that the model developed by the authors is reflective of an environment in which licensing of required technologies is very inefficient. Thus the large simulated reduction in consumer welfare cannot be ameliorated through licensing and so innovation is slowed.

Building on previous work Vakili builds a theoretical model that allows for the development of patent portfolios and varying degrees of product complexity. Vakili then tests conclusions drawn from the theoretical model using data on the patent activity of 78 public companies in the semi-conductor industry over the period 1980 to 1999. The author examines the effects product complexity as measured by the overlap of patents held by firms and also the degree of patent fragmentation faced by firms, controlling for other factors that affect firm innovation. The author’s results suggest that as overlap of ownership of required patents increases, innovation as measured by patent applications, declines. However, up to some point, these effects can be diminished by firms building patent portfolios (patent fragmentation) but beyond this point, patent portfolio building (patent fragmentation) reduces innovation.

The implication of these results is that modest to moderate levels of patent fragmentation can enhance innovation by neutralising the effect of product complexity. However, excessive fragmentation dulls innovative activity in complex product industries.

This completes an analysis of the economic insights of the effects of innovation patents that can be drawn from theoretical models. In the following section empirical studies that have examined the impact on innovation and economic welfare are detailed.

3.3. ECONOMIC EFFECTS OF SECOND TIER PATENTS: INSIGHTS FROM EMPIRICAL STUDIES

There have been numerous studies which have examined the impact of patent design on innovation and welfare. These studies can be broken down into those that examined the effect of intellectual property rights on particular industries in particular countries, and those that examined the effects of intellectual property rights on industry development and productivity in particular countries or across countries.

3.3.1. Industry case studies

The earliest industry case study found in the literature was a 1982 study that examined the effects of utility models on the development of industry in the Philippines. Utility patents were found by Medella, Mikkelsen and Evenson to have stimulated innovation in light engineering industries, especially agricultural machinery, leather and footwear, furniture manufacturing and electrical equipment. The authors suggested that these industries were part of a group of industries where there was considerable scope in the Philippines for adaptive innovation. This result is in accord with an analysis by Mikkelsen which found that

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utility models had facilitated adaptive innovation of rice threshers by local machine
manufactures in the Philippines.\textsuperscript{63,64}

Dahab is also reported to have found that utility models were an important factor that enabled
domestic producers of farm machinery in Brazil to achieve a significant market share in that
country.\textsuperscript{65,66}

A shorter patent term has been found by Kumar\textsuperscript{67} to be a major factor contributing to the
development of the pharmaceuticals and chemicals industries in India. India does not have a
utility patent.\textsuperscript{68} However, as noted by Kumar, India introduced a new Patents Act in 1970
that implemented process patents that had a term of seven years. Almost any chemical can
be produced through a process. Consequently, the adoption of process patents in 1970
effectively removed product patents on chemicals and pharmaceuticals in India. Kumar
indicated that the shorter patent term applying to process patents is widely accepted in India
as driving the development of local technological capability in India’s chemicals and
pharmaceutical industries. Kumar concluded:

\begin{quote}
the rapid evolution of Indian pharmaceutical industry since the mid-1970s
highlights the fact that weak IPRs regime could be instrumental in building local
capabilities even in a poor country such as India (page 28)
\end{quote}

Holger\textsuperscript{69} analysed the effect on firm performance of patent quality using data on 50 German
tool manufacturing firms over the period 1984 and 1992. Higher quality patents filed at the
European Patent Office were found to have a greater impact on sales of machine tools than
did lower quality patents filed at the German Patent Office which includes petty patents.
These results should however, be treated with caution as the joint effect on machine sales
of patent applications at the European Patent Office and patent applications to the German
Patent Office do not appear to have been jointly tested by Holger.

In summary, the limited number of available case studies of the effects of utility model
patents on industry activity and development suggest that such models facilitated industry
development particularly in the early stages of development of a country or a firm.

\subsection*{3.3.2. Country case studies}

Country case studies of the effects of utility models on innovation, productivity and welfare
mainly focus on South East Asian countries largely because many South East Asian

University, New Haven, CT.

\textsuperscript{64} As reported in: Maskus, Keith E. 2000, “Intellectual Property Rights and Economic Development”, Paper
prepared for the series “Beyond the Treaties: A Symposium on Compliance with International Intellectual
Property Law”, organized by Fredrick K. Cox International Law Center, Case Western Reserve University, draft
of February 6, 2000.

\textsuperscript{65} Dahab, S.1986, “Technological change in the Brazilian agricultural implements industry”, Unpublished PhD
dissertation, Yale University, New Haven, CT.

\textsuperscript{66} As reported in: Maskus, Keith E. 2000, “Intellectual Property Rights and Economic Development”, Paper
prepared for the series “Beyond the Treaties: A Symposium on Compliance with International Intellectual
Property Law”, organized by Fredrick K. Cox International Law Center, Case Western Reserve University, draft
of February 6, 2000.

\textsuperscript{67} Kumar, N., 2002, “Intellectual property rights, technology and economic development: Experience of Asian
countries”, RIS Discussion Paper no. 25/2002, Research and Information System for the Non-Aligned and Other
Developing Countries (RIS), New Delhi.

\textsuperscript{68} India is currently investigating the feasibility of introducing a utility patent similar to the Australian innovation

\textsuperscript{69} Holger, Ernst 2001, “Patent applications and subsequent changes of performance: evidence from time-series
countries have employed utility models and also have achieved significant economic growth. Thus these countries provide ideal case studies to examine the impact of utility models on growth and other economic variables.

Ordover\(^70\) examined the characteristics of the Japanese patent system as it applied in the early 1990s and concluded that the objectives of the patent system at that time were designed to promote the diffusion of technology. This was achieved through a narrow patent breadth, weak novelty requirements and the requirement to "lay open" the application for 18 months after filing. According to Ordover these features reward:

\[
\text{those who reverse engineer and modify, often in minor ways, the existing inventions and penalizes those who wish to protect their major technological breakthroughs (page 48)}
\]

The fact that the post war Japanese patent system encouraged technology diffusion was confirmed in a study by Maskus and McDaniel.\(^71\) The authors examined the role standard patent applicants and utility patent applications had on Japanese total factor productivity growth over the period 1960 to 1993, controlling for patent and utility model grants and also controlling for technology creation and diffusion. At traditional levels of significance, the authors found that utility model applications directly increased total factor productivity growth. Domestic invention patent applications indirectly increased total factor productivity growth by stimulating utility model applications.

The authors noted that their results were consistent with Japan being in a "technological `catch-up' phase" in which diffusion and imitation were more important than pure invention. However, the authors warned that the promotion of imitative forms of research and development:

\[
\text{could also inhibit incentives for fundamental invention and reduce long-run growth (page 572)}
\]

Another study of utility patents in Japan by Sankaran\(^72\) claimed utility models had led to large numbers of filings of narrowly defined claims that build on the more substantive contributions of patent grants. This, it is claimed, has led to patent flooding with the prospect of an anticommons being created.

Chinese patent law makes allowance for invention patents, utility model patents and design patents.\(^73\) Li\(^74\) examined the impact of applications for the above patent types on a measure the author calls total productivity defined as real gross domestic product per unit of workforce, or labour productivity, over the period 1985 to 2009. Using a methodology very similar to that used by Maskus and McDaniel (see footnote 71), Li finds that invention patents fostered growth in utility model patents. In turn, utility model patents increased labour productivity growth by facilitating the acquisition of new technologies and through the protection of propriety innovation.

---


Li’s results confirm results from previous studies (Liu75, Sue, Shen and Song76 and Huang and Yu77) which indicated that utility model patents had a greater impact on China’s growth than did invention patents.

However, it would appear that the effect of utility model patents on productivity growth in China depends very much on industry technological capacity. Zhao and Liu78 examined total factor productivity growth across regions of China over the period 1988 to 2009. The authors also divided their data base into a period prior to and including 1998 and a second period between 1999 and 2009. The break point of 1998 was chosen as it represented the point in time when the authors indicated that significant economic and scientific reforms commenced in China.

In the period 1988 to 1998, the authors found that utility model patents had a significant impact on productivity in China but invention patents were found to be insignificant at traditional significant levels. However, in the latter data period analysed by the authors, both invention patents and utility model patents significantly impacted on productivity in China but invention patents had the greater impact.

The authors concluded that the reasons the economic effect of patents changed through time were:

*industry development, promotion of firm’s status in technology innovation and innovation policy enforced by the government (page 17)*

Kim, Keun and Choo79 analysed patent activity in The Republic of Korea using time series data covering the period 1965 to 2001 and firm level data between 1970 and 1995 for 3,635 firms. The authors examined the impact of utility models on patent activity by firms and firm performance, controlling for industry type, research and development expenditure, firm characteristics and a time trend. The authors found that firms build upon the knowledge acquired through utility models and use this knowledge as a stepping stone to achieve higher level development as measured by the number of standard patents applied for. These effects declined as economic development increased. Furthermore, firms that had utility patents were associated with better performance especially in the early years of firm development. The authors conclude that:

*the design and strength of IPR systems should be tailored to the level of the local technological capabilities of a country to provide appropriate incentives for incremental or adaptive innovation. In particular, the utility model system (second-tier IPR) is the correct device for developing countries to encourage incremental innovation, which may be more suitable for local needs and provide a stepping stone to further technological progress (page 38)*


76 Sui, G. and G. Shen and J. Song 2005, “The industrialization of China’s high-tech industry based on the region regional differences of patent level”, Management World,8, pp.87-93 (in Chinese). Zhao and Liu (footnote 78) make reference to the results of this study.

77 Huang, Z. and P. Yu 2007, “The effects of technical innovation to economic growth of our country in recent years: an empirical study based on panel data models”, Science and Technology Management Research, 8, pp.74-77 (in Chinese). Zhao and Liu (footnote 78) make reference to the results of this study.


A study of the effect of utility model patents on Korean firms by Kim, Lee, Park and Choo reinforces previous findings that the role of utility model patents varies as industry develops. Using a panel dataset of over 70 countries, the authors found that patents contributed to innovation and growth in developed countries but not developing countries. However, utility model patents were found to increase innovation and growth in developing countries, controlling for other factors.

The authors also undertook an analysis of firm performance using the same firm level data set used in the study by Kim, Keun and Choo (see footnote 79). The authors noted that the mid 1980s were a turning point for technology development in Korea. Consequently they split the data base into a period between 1970 and 1988 when Korean industry was technologically lagging and a period between 1987 and 1995 when Korean industry had acquired greater technological capabilities and research and development skills.

In the period when Korean industry was technologically lagging, utility model patents were found to improve firm performance while patents had no effect on firm performance, controlling for other variables. However, in the period in which Korean firms had acquired greater technological skills, patents were found to have increased firm performance but utility model patents did not, controlling for other factors. The authors conclude:

*The implication here is that utility model innovations are likely to be quite appropriate for companies that are resource-poor or below the technological frontier. Patent protection is likely to be more conducive to innovation after companies have reached some critical technological capability; that is, once they have the capacity and wherewithal to produce innovations with sufficient inventive steps to qualify for patent protection. (page 372)*

Turning to studies of more developed economies, Khan noted that Germany introduced petty patents in 1891. Khan indicated that petty patents were effective in allowing German residents to participate in the patent system and to provide an incentive for follow-on inventions. In 2010, petty patents accounted for approximately 20 per cent of all patents filed in Germany (see Chart 2, page 9) indicating that utility model patents may still be an important component of some German firm’s business strategy.

Breitwieser and Foster provide a brief history of the development of intellectual property rights regimes across countries including western European countries and the United States. While these countries did not have utility models, the authors conclude that in these countries patent law:

*played an important role in their industrialisation. One should keep in mind that these early versions of patent laws normally did not protect foreign intellectual property, and in reality the patent law was used to acquire foreign technologies to spur technology transfer at an early stage of industrialisation. (page 14)*

---

Dolmar and Gruen\textsuperscript{84} note that in Australia, as a small country, most of the new technology put into production is first developed overseas. Consequently the ability to absorb new technologies is a key factor that determines firm performance in Australia. When commenting on the contribution of improvements in technical efficiency to the performance of Australian firms, the authors note:

\textit{What usually distinguishes leading organisations is not so much their ability to create knowledge, but rather their ability to absorb technology developed elsewhere and apply it to their own circumstances (page 7)}

Innovation patents may aid the absorption of new technologies by Australian firms by allowing firms to more easily adapt technologies developed overseas to Australian conditions. Thus it would seem that country characteristics may significantly influence the impact utility model patents could have on the technical efficiency of firms and hence growth rates of countries.

3.4. CONCLUSIONS DRAWN FROM PREVIOUS STUDIES

Overall, it would be tempting to conclude that the empirical evidence indicates that utility model patents spur innovation in countries or firms that are technologically lagging or in a technological ‘catch up’ phase. Most of the empirical evidence supports such a conclusion. On the other hand, as previously noted (see Chart 2), the continued strong use of utility models in several developed economies including Germany, Italy, Denmark and Austria suggests that utility model patents may, under some circumstances, contribute to innovation and growth in developed economies. For example, developed countries that are net importers of new technology, such as Australia, could benefit from a utility model system that aided the absorption and/or adaptation of such technologies by local firms.

To shed further light on the role innovation patents play in the Australian economy, a survey of inventors that hold, or have held, innovation patents was undertaken as part of this study. The design of the survey and the preliminary results generated from the survey are detailed in the following section.

4. THE AUSTRALIAN INNOVATION PATENT SURVEY

To gain a deeper understanding of the factors driving the use of innovation patents by Australian individuals and firms, a survey of innovation patent holders was undertaken. This section details the survey and the results.

4.1. SURVEY SAMPLE SIZE

IP Australia provided details on all innovation patents filed in Australia as at end August 2012. The data included details of the patent number, a brief description of the invention, the status of the innovation patent and various details such as filing date, date of examination, expected date of expiry and a description of the technology field the innovation patent had been allocated to by IP Australia.

The IP Australia data indicated that 14,442 innovation patents had been filed in Australia as at end August 2012. Of these filings, just over half had been lapsed, ceased, surrendered or

\textsuperscript{84} Dolman, Ben and David Gruen 2012, “Productivity and Structural Change”, invited address to the 41st Australian Conference of Economists, Victoria University, Melbourne, 10 July.
revoked. Thus, as at end August 2012, there were approximately 7,000 innovation patents that were either certified, sealed, filed or had reached their term and had expired.

It was decided to sample inventors/owners of certified, sealed, filed or expired innovation patents. For a population of 7,000, a sample size of approximately 360 inventors/owners would be required to generate 95 per cent confidence intervals of population parameters with a margin of error of five per cent.

IP Australia advised that in previous surveys that had been undertaken of inventors/owners of patents in Australia, response rates as low as five per cent to 10 per cent had been observed. Based on this potential response rate, it was decided that a sample of approximately 4,000 inventors would be sufficient to generate a required response from approximately 360 inventors/owners.

An initial sample of 4,035 innovation patent inventors/owners was selected, consisting of all inventors/owners of innovation patents with current status of either filed, expired or certified plus a random sample of 2,000 inventors/owners of sealed innovation patents.

The selected sample was then analysed and adjusted to ensure that an inventor/owner received only one survey form related to an invention they had undertaken and protected with an innovation patent. Requiring individual inventor/owners to provide details on only one invention was designed to encourage participation in the survey by minimising the time inventors would require to respond to the survey. These procedures resulted in a final sample of 3,195 inventors/owners of innovation patents.

IP Australia arranged for the printing and distribution of the survey which was dispatched to the selected sample in the week ending 14 September 2012. A survey period of approximately four weeks ending 12 October 2012 was specified in a covering letter from IP Australia that accompanied the survey. A reminder letter, including a copy of the survey was circulated in the week ending 12 October 2012.

IP Australia staff also constructed an online version of the survey using a proprietary tool called “Survey Monkey”. Survey Monkey is an easy-to-use tool for the creation of online surveys, the analysis of collected responses and the exporting of collected data. The covering letter that accompanied the survey made reference to the fact that respondents could submit completed surveys using the online survey available at Survey Monkey.

As at close of business on Monday 4 December 2012, there were 517 responses to the survey of which 106 had been received online via Survey Monkey and 411 through the mail (Chart 10). The survey had a completion date of 12 October 2012 which represented a four week survey period. However, survey respondents did not feel constrained by this deadline and continued to provide responses via Survey Monkey and mailed returns up to and including week 11 of the survey period (Chart 10).

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85 The margin of error is the bound that can be confidently placed on the difference between an estimate and its true value.


87 A cut-off date of Monday 4 December was set for responses that would be used to prepare this report. Subsequently a further 5 completed surveys were received which took the total survey responses to 522 which is a survey response rate of approximately 16.3 per cent.
Looking at Chart 10, it can be seen that survey responses peaked in week two of the survey period and then remained steady at approximately 65 responses per week until week seven when responses dropped to 29. From week eight to week 11, single digit responses were received.

A record was also kept of surveys that were returned unopened. A total of 292 returned survey forms had been received as of close of business Monday 4 December 2012. The 292 returned surveys represent less than 10 per cent of inventors surveyed.

The 517 inventors that responded to the survey is a response rate of approximately 16.2 per cent which compares favourably to other surveys of inventors. For example, Sichelman and Graham\(^8^8\) report that “The 2008 Berkeley Patent Survey: Entrepreneurial Companies and the Patent System” achieved a response rate of 9.8 per cent from inventors residing at the address the survey form was sent to.

The overall response rate of 16.2 per cent hides quite a variety of response rates by patent status and between Australians and foreigners. A response rate of 23 per cent was achieved on innovation patents recently filed but this fell to eight per cent on expired innovation patents (Chart 11). The response rate from Australian inventors at 19 per cent was more than treble the six per cent response rate by foreign inventors (Chart 11).

An analysis of response rates by IP Australia technology fields was also undertaken and the results are reported in Table 3. Response rates were generally greater than 15 per cent of inventors sampled. However, there were seven fields of technology where the response rate was below 10 per cent (Table 3).

Table 3  Response rates by technology field in the Australian Innovation Patent Survey (% of inventors surveyed)

<table>
<thead>
<tr>
<th>Technology field</th>
<th>Sampled</th>
<th>Responses</th>
<th>Response rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural &amp; food machinery</td>
<td>135</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>Agriculture, food</td>
<td>29</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>Analysis, measurement, control</td>
<td>135</td>
<td>25</td>
<td>19</td>
</tr>
<tr>
<td>Audio-visual</td>
<td>69</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Basic chemical processing, petrol</td>
<td>29</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>Biotechnology</td>
<td>5</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Civil engineering, building, mining</td>
<td>511</td>
<td>81</td>
<td>16</td>
</tr>
<tr>
<td>Consumer goods &amp; equipment</td>
<td>604</td>
<td>98</td>
<td>16</td>
</tr>
<tr>
<td>Electrical devices &amp; engineering</td>
<td>165</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>Engines, pumps, turbines</td>
<td>38</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Environment, pollution</td>
<td>28</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>General processes</td>
<td>70</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>Handling, printing</td>
<td>223</td>
<td>29</td>
<td>13</td>
</tr>
<tr>
<td>Information technology</td>
<td>280</td>
<td>53</td>
<td>19</td>
</tr>
<tr>
<td>Macromolecular chemistry, polymers</td>
<td>7</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Material processing</td>
<td>31</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Materials, metallurgy</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mechanical elements</td>
<td>103</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>Mechanical tools</td>
<td>46</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Medical engineering</td>
<td>101</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Misc., not yet classified</td>
<td>130</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Nuclear engineering</td>
<td>2</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>Optics</td>
<td>22</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Organic fine chemicals</td>
<td>7</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Pharmaceuticals, cosmetics</td>
<td>41</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Semiconductors</td>
<td>4</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>Space technology, weapons</td>
<td>12</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Surfaces, coatings</td>
<td>20</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>63</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Thermal techniques</td>
<td>50</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Transport</td>
<td>225</td>
<td>48</td>
<td>21</td>
</tr>
<tr>
<td>Unknown</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3,195</strong></td>
<td><strong>517</strong></td>
<td><strong>16.2</strong></td>
</tr>
</tbody>
</table>

Overall, the response rate of 16.2 per cent is considered a satisfactory response rate when judged against response rates achieved in other surveys of inventors.
In the following section, the design of the survey is outlined.

4.2. DESIGN OF THE SURVEY

A draft of the survey was prepared drawing on previous surveys of inventors including the PATVAL survey of European inventors\(^9\) and the Georgia Institute of Technology Inventor Survey.\(^9\) IP Australia staff indicated that the length of the draft survey, while comprehensive, would most likely deter many inventors from completing and returning the survey. The survey was revised down in size and the final survey consisted of five sections with 17 questions in total. The sections in the survey included:

- A: Inventors and patent details (four questions);
- B: Firm characteristics (three questions);
- C: The invention process (seven questions);
- D: Commercialisation (two questions); and
- E: Value of the innovation patent (one question).

The survey also contained a section in which respondents could provide feedback on the survey. Most comments received, however, related to respondents thoughts on the advantages and disadvantages of innovation patents, aspects of the administration of innovation patents and government policy towards innovation in Australia. Relatively few comments were received regarding the survey itself.

In the time available, it was not possible to undertake a pilot survey to gather information that could have been used to refine the survey or to refine the sample design.

In terms of responses to the questions in the survey, most respondents answered all questions where answers were required (Chart 12). The low response rates for some questions given in Chart 12 reflect questions that only required an answer if a particular occurrence had taken place. Thus, for example, the response rate for question C6 of 12.8 per cent reflects the fact that 12.8 per cent of responses were from inventors that had taken out a divisional innovation patent. Similarly, 61.5 per cent of inventors sampled had not had their innovation patent examined (Question C7) and 59.8 per cent of respondents indicated no commercial applications of their innovation patent as at the time the survey was undertaken (Question D2).

Overall, as can be seen from Chart 12, there was a reasonably high completion rate for most questions in the survey which vindicates the strategy suggested by IP Australia of keeping the survey short and uncomplicated.


In the following, the preliminary results from the survey are documented.

4.3. ANALYSIS OF SURVEY RESPONSES

As detailed in Section 4.2, the survey was split into five sections including: A - Inventors and patent details; B - Firm characteristics’ C - The invention process; D - Commercialisation; and E - Value of the innovation patent. In this section, the results obtained for the sample as a whole are reported and broken down into the above topics.

4.4. FIRM CHARACTERISTICS

Question B1 in the survey asked respondents to nominate one of four full time employment categories for the “firm” the inventor worked in. In considering these questions, inventors were advised to treat the term “firm” as an inventor’s:

*normal place of work. If you are self-employed, work for a large multinational firm, a small domestic firm or a university, we want you to think of this workplace as ‘your firm’ when you are answering questions.*

Four employment categories were specified including 0 – 4 employees, 5 – 20 employees, 21 to 200 employees and 200 plus employees. As well as data on employment levels obtained from the survey, data was also available from IP Australia on the applicant type broken down into Companies/Firms and individuals.
A respondent was classified as an “Individual” if the respondent specified a firm employment rate of nil - four employees and the respondent was specified as an “Individual” in IP Australia’s data on applicant types, otherwise such a respondent was classified as a small “Company/firm”.

The numbers of Medium sized companies/firms were then calculated as the sum of companies/firms nominated by inventors as having between five – 20 full time employees and 21 – 200 employees. Large companies/firms were classified as those with 200 plus full time employees.

Based on these definitions of firm size, it was found that 45 per cent of respondents were individuals, about half the respondents were either small or medium companies/firms and only 10 per cent of respondents were large firms (Chart 13). The estimated proportions of inventors/owners of innovation patents are significantly different from one another at traditional significance levels.

**Chart 13  Survey respondents by firm size (per cent of 513 responses)**

Source: Survey response data. Data does not sum to 100 due to rounding.

Respondents were also asked to nominate the broad industry group that best describes the area of business the firm operates in. The responses to this question indicate that most inventors/owners that held innovation patents were located in the manufacturing sector, other services and the wholesale trade (see Table 4).

**Table 4  Response rates by technology field in the “The Value of Australia’s Innovation Patent Survey” (% of inventors that answered this question)**

<table>
<thead>
<tr>
<th>Technology field</th>
<th>Survey Respondents that answered question</th>
<th>Responses</th>
<th>Response rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, Forestry and Fishing</td>
<td>515</td>
<td>27</td>
<td>5.2</td>
</tr>
<tr>
<td>Mining</td>
<td>515</td>
<td>12</td>
<td>2.3</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>515</td>
<td>190</td>
<td>36.9</td>
</tr>
<tr>
<td>Electricity, Gas, Water and Waste Services</td>
<td>515</td>
<td>7</td>
<td>1.4</td>
</tr>
<tr>
<td>Construction</td>
<td>515</td>
<td>31</td>
<td>6.0</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>515</td>
<td>40</td>
<td>7.8</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>515</td>
<td>25</td>
<td>4.9</td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>515</td>
<td>7</td>
<td>1.4</td>
</tr>
</tbody>
</table>
Data provided by IP Australia enabled each innovation patent to be allocated to a field of technology. Analysis of this data indicated there was very little relationship between an industry group an inventor operated in and the field of technology their innovation patents were allocated to. Thus, it is more informative to view responses by fields of technology rather than the industry an inventor/owner operates in (see Chart 14).

When the responses received are allocated to a field of technology approximately 70 per cent of responses were allocated to seven technology fields (see Chart 14).

Chart 14  Survey respondents, by IP Australia technology field (per cent of 517 responses received)

Source: Survey response data.

4.5. THE INVENTION PROCESS

Section C of the survey sought detail on the type of invention protected by the innovation patent and also sought information on the reasons firms sought to protect their invention via the use of innovation patents. Data was also sought on why innovation patents were preferred relative to standard patents. Inventors/owners were also asked to detail how they would protect the invention if innovation patents were unavailable.

Turning to the type on invention protected by innovation patents the survey allowed respondents to nominate that either a new product or new process could be protected or improvements to either type of invention (Chart 15).
Chart 15  Type of invention protected by the innovation patent (responses received from 505 inventors)

Source: Survey response data.

It is not possible to be certain how, when answering the survey, inventors determined if an invention was a new product or service as opposed to an improvement to an existing product or service. For this reason the results reported in Chart 15 should be treated with caution. Bearing this qualification in mind, the survey results suggest that innovation patents are used primarily to protect products or enhancements to products rather than services. In contrast innovation patents appear to be much less likely to be used to protect either a new service or an improvement to an existing service (Chart 15).

Turning to a discussion of why innovation patents are used by inventors, the survey used a Likert scale to measure inventor’s assessment of the importance various factors played in the inventor’s choice of an innovation patent. The Likert scale had four categories starting at not important, incrementing to slightly important, then moderately important through to very important. Following Sichelman and Graham a response of not important was given a score of one, incrementing by one up to a score of four for very important.

A review of the distribution of responses, measured via Likert scales, indicated that most distributions of responses were not normally distributed. In these circumstances, a median score would provide a better measure of the central tendency of responses than would a mean Likert score.

Comparing the median Likert scores, it can be seen that preventing copying of the patented invention was the main reason inventors cited for seeking an innovation patent (Chart 16). Sichelman and Graham report a similar finding from previous surveys of inventors located in

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91 Bertram defines a Likert scale as “A psychometric response scale primarily used in questionnaires to obtain participant’s preferences or degree of agreement with a statement or set of statements”. See: Bertram, Dane 2012, “Likert Scales”, Available at: http://poincare.matf.bg.ac.rs/~kristina/topic-dane-likert.pdf


93 Kruskal-Wallis tests were undertaken on the response data for each question broken down into responses by patent status (expired, certified, sealed, and filed). These tests indicated that the distribution of responses for each type of patent status did not, in general, differ significantly from each other. The response data was therefore treated as having been derived from a random sample of innovation patents.
small firms. Enhancing firm reputation was the second most important factor for seeking an innovation patent (Chart 16).

Chart 16 Reasons for seeking an innovation patent (median Likert score)

![Chart 16 Reasons for seeking an innovation patent (median Likert score)](image)

Source: Survey response data. Note: 1 indicates not important, 2 indicates slightly important, 3 indicates moderately important and 4 indicates highly important. A median score of 3.5 indicates that there were two equal median scores, 3 and 4, and the reported median is the simple average of these scores.

The strategic objectives of preventing patent infringement litigation and improving outcomes from negotiations were moderately important factors (Chart 16). Other strategic objectives of patenting such as building a patent thicket via the protection of the intellectual property in another patent was considered by inventors as only a slightly important reason for seeking an innovation patent (Chart 16).

Enhancing the firm’s chance of securing finance and investment was also seen by inventors as a moderately important factor for seeking an innovation patent (Chart 16).

Finally, assisting in the acquisition of other firms or going to the market with an initial public offering were not seen by inventors as important reasons for seeking innovation patents (Chart 16).

In terms of the relative importance of the factors, preventing copying was significantly more important than all other factors. Enhancing firm reputation was also significantly different from all other factors other than protecting the innovation. Enhancing firm finances, improving outcomes from negotiations and preventing patent infringement litigation were significantly more important that assisting the firm in a public offering or acquiring other firms, but generally these three variables were equally important factors in inventors seeking innovation patents.

Inventors were also asked why they chose an innovation patent over a standard patent based on five factors assessed via a Likert scale: the inventive step was insufficient for a standard patent, the lower cost of acquiring an innovation patent, the lower expected cost of

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95 A Kruskal-Wallis test indicated there were significant differences in the median response across the factors considered (Kruskal-Wallis Statistic KW = 1151.1 [corrected for ties], with a P value of less than 0.0001). All statistical tests reported in this section were undertaken using the InStat statistical package.

96 A test for significant differences between factors was conducted using Dunn’s test.
enforcing an innovation patent, and the eight year term was a suitable term of protection. An “Other” category was also included.

The Likert scale had four categories starting at not important, incrementing to slightly important, then moderately important through to very important. The calculated median Likert scores are given in Chart 17.

Chart 17 Reasons for preferring an innovation patent (median Likert score)

<table>
<thead>
<tr>
<th>Reason for preferring an innovation patent</th>
<th>Median Likert Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>The faster grant time for an innovation patent</td>
<td>4</td>
</tr>
<tr>
<td>The lower costs of acquiring an innovation patent</td>
<td>4</td>
</tr>
<tr>
<td>The 8-year term of an innovation patent was expected to be sufficient for the invention</td>
<td>3</td>
</tr>
<tr>
<td>The lower expected cost of enforcing an innovation patent</td>
<td>3</td>
</tr>
<tr>
<td>The inventive step was insufficient for a standard patent</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Survey response data. Note: 1 indicates not important, 2 indicates slightly important, 3 indicates moderately important and 4 indicates highly important.

As detailed in Chart 17, the main reasons inventors preferred innovation patents over standard patents was the faster grant time and the lower cost of innovation patents. These factors were significantly more important than the size of the inventive step, expected enforcement costs and the eight year term of innovation patents. In order to determine whether one factor was significantly more important than all other factors, further statistical tests were conducted. These tests revealed that the inventive step was significantly less important than all other factors tested.

Inventors were also asked to consider the hypothetical question of what form of protection they would use should innovation patents be unavailable in Australia. Inventors were asked to assess eight factors using a Likert scale that ranged from “Don’t know”, through “Would not use” to “May use” up to “Highly likely to use”. Three factors scored the highest (a three way tie) as the most likely alternate form of protection: ensure trade secrecy; get new products or services to market quickly; and/or apply for a standard patent (Chart 18).

In order to determine whether one factor was significantly more important than all other factors, further statistical tests were conducted. Those results suggest that first to market was significantly more important than all other factors (including trade secrecy and applying for a standard patent). Second most important was trade secrecy. Making the product more complex was the least preferred alternate strategy (Chart 18).

97 The Kruskal-Wallis Statistic was calculated to be 124.9 (corrected for ties), with a P value of less than 0.0001.
98 A test for significant differences between factors was conducted using Dunn’s test.
99 A test for significant differences between factors was conducted using Dunn’s test.
Chart 18  Alternate forms of protection to innovation patents (median Likert score)

Source: Survey response data. Note: 1 indicates “Don’t know”, 2 indicates “Would not use”, 3 indicates “May use”, 4 indicates “Highly likely to use”.

Following the question on alternate form of protection to innovation patents the survey asked inventors if their innovation patent was a divisional patent. As detailed in the survey glossary a divisional patent is:

filed to divide a patent application (known as the parent application) into two or more applications. For instance, you would file a divisional application if you wanted to have some of the subject matter in the parent application protected by its own patent.

Seventy four inventors, or approximately 15 per cent of respondents, indicated their innovation patent was a divisional patent. These inventors were then asked to detail the main reasons for dividing the parent patent into two or more patents. A total of 66 of the 74 inventors provided an answer to this question. Responses to this question indicate that divisional innovation patents are primarily used by inventors to prevent others copying the invention and to help protect intellectual property in the parent patent and (Chart 19). Divisional innovation patents are also directed at overcoming perceived deficiencies in the parent patent. Factors related to the parent patent were significantly different from other factors.

Chart 19  Reasons for using a divisional innovation patent (number of reasons provided by 66 inventors)

Source: Survey response data.

Divisional patents were also used by a small but significant number of inventors to increase royalty payments and to support the sale of the firm (Chart 19).

There is the possibility that divisional patents were used by inventors for strategic reasons. As indicated in Chart 19, some 19 inventors indicated divisional patents were used for
protection around intellectual property in a patent other than the parent patent. Such protection is consistent with the divisional patent being part of a patent thicket.

Supporting the sale of the firm or assisting in raising finances were not significant uses of divisional innovation patents (Chart 19)

The final question in the Invention process section of the survey related to the reasons why inventors had not had their innovation patents examined. A total of 318 out of 517 inventors who returned their surveys indicated their innovation patent had not been examined although their recollections of the examination status of their innovation patent were not accurate in a significant number of cases.  

A total of 66 out of 318 inventors indicated that their innovation patents were currently being examined. Thus on net, 251 inventors indicated that their innovation patents had not been or were not currently being examined. Those 251 inventors were asked about the reasons for the lack of examination. The principle reason was the inventor’s assessment that there was no need for examination. Some of the answers in the “Other” category detailed various factors indicating that examination was not needed at present. Thus the lack of need for examination was by far the most significant factor leading to lack of examination of innovation patents. This factor was also a significantly more important factor than was the cost of examination which was the second ranked factor (Chart 20). Concern that the invention may not pass examination was a less important factor (Chart 20).

Chart 20 Reasons for lack of examination of innovation patents (per cent of 318 reasons provided by 66 inventors)

Source: Survey response data.

The third section of the survey asked for details on the commercialisation of products or services derived from the use of innovation patents. Responses to the questions in the “Commercialisation” section of the survey are detailed in the following section.

4.6. COMMERCIALISATION

In the “Commercialisation” section of the survey, inventors were asked to indicate the current and/or possible future commercial applications of the invention. If an innovation patent had

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100 IP Australia data indicates 143 of the 517 inventions for which responses were received had had the innovation patent protecting the invention certified. In contrast 318 inventors indicated their patent had not been certified which implies that 199 innovation patents in the 517 responses had been certified (517 – 318 = 199).
not been used in a commercial application, inventors were also asked to list the reasons for
the lack of commercial application of the innovation patent.

Most respondents suggested that their innovation patent has or could be used in a product,
process or service. A lesser number of respondents indicated that their innovation patent has
or could be licensed to a third party or could or has been used to start a company (Chart 21).

Chart 21  Existing and potential uses of innovation patents (number of uses identified by 503
inventors)

<table>
<thead>
<tr>
<th>Use Description</th>
<th>Number of Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>The innovation patent can be used in a product,</td>
<td>466</td>
</tr>
<tr>
<td>process or service</td>
<td></td>
</tr>
<tr>
<td>The innovation patent can be licensed to a third</td>
<td>348</td>
</tr>
<tr>
<td>party</td>
<td></td>
</tr>
<tr>
<td>The innovation patent can be used to aid the start</td>
<td>257</td>
</tr>
<tr>
<td>of a new company</td>
<td></td>
</tr>
<tr>
<td>The innovation patent can be cross licensed</td>
<td>222</td>
</tr>
</tbody>
</table>

Source: Survey response data.

In hindsight, asking inventors to add future possible commercial applications of their
innovation patents clouded the conclusions that could be drawn from the collected responses
as the question does not distinguish between actual commercial applications to date and
potential applications. If inventor’s perceptions of potential applications dominate actual
applications, the data given in Chart 21 would provide a misleading picture of the actual
scope for commercial application of inventor’s innovation patents.

Fortunately, the last question in the Commercialisation section of the survey asks inventors if
their innovation patent had not been used in a commercial application, to detail why this is the
case. Thus, if answers are received to this question, it can be inferred that the inventor’s
innovation patent has not been used to date in a commercial application. On this basis, 309
of the 517 inventors indicated that there had been no use of their innovation patent in a
commercial application.

However, one of the possible reasons for lack of commercial application of the innovation
patent was its use solely within the inventor’s firm. In reality, use within an inventor’s own
firm is a commercial application. A total of 92 inventors indicated that the innovation patent
was used within their firm. Thus it can be calculated that 217 inventions protected by
innovation patents have not as yet been used in a commercial application, including own use
within a firm. This represents approximately 40 per cent of inventions for which survey
responses were received.

The main reason for lack of commercial application was the short time span since the
invention took place as indicated by the fact that inventors were still exploring possible
application (Chart 22). Apart from time required to find applications of new technologies, the
lack of finance is the key factor driving the inability of inventors to commercialise their inventions (Chart 22). Factors such as the risk of infringing someone else’s patent, the availability of required technologies and the inability to find commercial applications were relatively unimportant, but significant, deterrents to commercialisation of inventions protected by innovation patents (Chart 22).

Chart 22 Reasons for lack of commercial exploitation of innovation patents (per cent of 316 reasons provided by 217 inventors)

![Chart showing reasons for lack of commercial exploitation of innovation patents]

Source: Survey response data.

The final section of the survey covered the value inventors place on their innovation patents. The responses received covering innovation patent value is considered in the following section.

4.7. VALUE OF THE INNOVATION PATENT

The final section of the survey asked inventors to place a value on their innovation patent. It was recognised that estimating the value of patents is a difficult exercise. Consequently, the survey asked:

“At the time your innovation patent was filed, assuming that you knew everything you now know about your innovation patent (how it has been used, any commercial applications etc.), for what amount would you have been willing to sell your innovation patent to a competitor? (Please indicate the value range that best reflects your assessment.)

As indicated in the question, inventors were aided in answering this question through the specification of broad value ranges for the innovation patent. These value ranges were:

- Less than AUD $1,000;
- AUD $1,000 – $10,000;
- AUD $10,001 – $100,000;
- AUD $100,001 – $1,000,000; and
- More than AUD $1,000,000

Despite specifying very broad value bands, a value of the innovation patent was supplied by approximately 94 per cent of responding inventors which was the lowest response rate to any question requiring a response by all inventors (see Chart 12, page 8). The low relative response rate reflects the difficulties inventors faced when valuing their innovation patents.
Bearing in mind the obvious difficult valuation task faced by inventors, Chart 23 details the innovation patent valuations provided by inventors.

Chart 23  Inventors’ valuation of their innovation patents (number of inventors)

Source: Survey response data.

This distribution of innovation patent values is similar to distributions of patents values obtained in other surveys, except that the distribution in Chart 23 is missing the large right tail that has been found in previous surveys. However, a long right hand tail also exists in innovation patents. Two respondents who provided a mail response to the survey wrote next to the value ranges in the survey their estimate of the actual market value of their innovation patent. One inventor valued the innovation patent at $10,000,000 and the second at $3,000,000 to $4,000,000.

These valuations imply a right hand tail to the distribution given in Chart 23 but the tail would not be as large as was found in the distribution of European patent values referred to previously (see footnote 101).

4.8. COMMENTS RECEIVED IN THE SURVEY

As indicated in Section 4.2, the survey contained a section in which respondents could provide comments on the survey and other matters. Approximately 160 inventors provided comments related to 190 matters (Chart 24). The main comments related to the merits of innovation patents and the design of the innovation patent including administration arrangements. Other comments included felicitations to IP Australia for various aspects of its administration of the innovation patent, government innovation policy and numerous other topics which have been lumped together in an “Other” category in Chart 24. A total of eight comments related to the survey itself (Chart 24).

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Of the 65 comments related to the merits of innovation patents, approximately 47 were supportive of innovation patents. However a small but significant number of inventors questioned the value of innovation patents.

5. CONCLUDING REMARKS

The survey findings indicate that, on average, inventors mainly use innovation patents for traditional purposes and the use of innovation patents adds value to their firms. This is indicated by the significant value inventors placed on innovation patents in the survey.

These results do not necessarily imply that innovation patents provide a net benefit to the Australian economy as a whole. For instance, the effects of innovation patents on innovation protected by standard patents or other forms of protection have not been assessed here. It is thus not possible using the results of this study to calculate the net effects of innovation patents on Australia’s level of innovation.