

INTELLECTUAL
PROPERTY OFFICE



Patent Backlogs and Mutual Recognition

**An economic study by
London Economics**

Economic Study on Patent Backlogs and a System of Mutual Recognition

Final Report

To the Intellectual Property Office

Prepared by

London Economics



January 2010

Contents

Page

Glossary	vi
Executive Summary	vii
1 Introduction and study objectives	1
1.1 Introduction	1
1.2 Scope of the study	2
1.3 Sources of information	3
1.4 Contents of this report	3
2 Background to the study	5
2.1 Introduction	5
2.2 Patenting regimes across the main international patent offices	6
2.3 Trends in patenting activity	12
2.4 Existing schemes for mutual recognition and work sharing	21
3 Literature review	32
3.1 Introduction	32
3.2 The benefits and costs of patents	32
3.3 The impact of patents on innovation	34
3.4 Motives for patenting	35
3.5 Understanding the surge in patent applications	37
3.6 Drivers of patent backlogs	39
3.7 Impacts of patent backlogs	42
3.8 Backlogs and other trends affecting patent quality	44
4 Analysis of patent backlogs	46
4.1 Introduction	46
4.2 Trends in patent office backlogs	46
4.3 Trends in patent office pendency	53
4.4 Cost of patent backlogs	58
5 Possible future trends in patent office backlogs	68
5.1 Introduction	68
5.2 Modelling patent office backlogs	68
5.3 Projected future trends in patent office backlogs	75
5.4 Potential impact of a system of mutual recognition	76

Contents

Page

5.5	Discussion	83
	References	86
Annex 1	Data sources	90
Annex 2	Procedure and trends at the EPO	92
Annex 3	Procedure and trends at the JPO	101
Annex 4	Procedure and trends at the USPTO	111
Annex 5	Procedure and trends at IP Australia	121
Annex 6	Procedure and trends at the CIPO	128
Annex 7	Procedure and trends at the SIPO	138
Annex 8	Procedure and trends at the DPMA	143
Annex 9	Procedure and trends at the UKIPO	150
Annex 10	Procedure and trends at the IIPO	159
Annex 11	Procedure and trends at the KIPO	164

Tables & Figures

Page

Table 1: Outline of patent procedure in different patent offices	8
Table 2: Summary of patent activity 1996-2007	13
Table 3: PPH requests at different patent offices	29
Table 4: Ranking of the significance of motives to patent in recent empirical studies	37
Table 5: Estimated cost of foregone innovation due to increased pendency	64
Table 6: Additional non-patentable applications due to increased pendency	65
Table 7: Estimated cost of monopoly power due to increased pendency	67
Table 8: Scenarios for annual growth in patent applications	74
Table 9: Outcomes of application growth scenarios	74
Table 10: Estimated number of duplicate patent applications	81
Table 11: Outline of patent procedure at the EPO	92
Table 12: Outline of patent procedure at JPO	101
Table 13: Outline of patent procedure at USPTO	111
Table 14: Outline of patent procedure at IP Australia	121
Table 15: Outline of patent procedure at CIPO	128
Table 16: Outline of patent procedure at SIPO	138
Table 17: Outline of patent procedure at DPMA	143
Table 18: Outline of patent procedure at UKIPO	150
Table 19: Outline of patent procedure at IIPO	159
Table 20: Outline of patent procedure at KIPO	164
Figure 1: Comparison of patent grant procedures at four patent offices	6
Figure 2: Number of worldwide patent applications	12
Figure 3: Number of patent applications by year, 1995-2007	14
Figure 4: Growth in patent applications, 1997-2007	15
Figure 5: Number of patent grants by year, 1996-2007	16
Figure 6: Proportion of applications made by domestic applicants, 1996 and 2007	17
Figure 7: Second filings to the UKIPO 1996-2007	18
Figure 8: Applications to other offices by applicant's country of origin, 1997-2007	19
Figure 9: Patent grants by technology field, 1997-2007 – all patent offices	20
Figure 10: Overview of work-sharing schemes	22
Figure 11: Proportion of applications from the PCT, 1998-2007	25

Tables & Figures

Page

Figure 12: International searches, 1996-2007	26
Figure 13: International Preliminary Examination Reports, 1996-2007	27
Figure 14: USPTO pending applications by type 1995-2008	49
Figure 15: Pending applications 1996-2007	50
Figure 16: Number of patent examiners, 2001 and 2007	51
Figure 17: Pending applications per examiner, 1996-2007	52
Figure 18: Pending applications / work completed, 1996-2007	53
Figure 19: Reported average first action pendency	55
Figure 20: Reported average total pendency	56
Figure 21: Total pendency (granted patents)	57
Figure 22: Historic growth in domestic patent applications in the Republic of Korea, China and India	70
Figure 23: Number of patent applications originating in the Republic of Korea, China and India 1995-2007	71
Figure 24: Number of patent applications to the USPTO, originating from Korea, China and India	72
Figure 25: Projected trends in patent office backlogs	76
Figure 26: Impact of mutual recognition on projected patent office backlogs	82
Figure 27: Trends in patent activity at the EPO 1995-2007	95
Figure 28: Origin of patent applications and grants 1997-2007	96
Figure 29: Patent grants by technology field 1997-2007	97
Figure 30: EPO reported patent pendency 1996-2007	98
Figure 31: EPO pending applications by type 1996-2007	99
Figure 32: EPO workload 1996-2007	100
Figure 33: Trends in patent activity at the JPO 1995-2007	105
Figure 34: Origin of patent applications and grants 1995-2007	106
Figure 35: Patent grants by technology field 1997-2007	107
Figure 36: JPO patent pendency 1996-2007	108
Figure 37: JPO pending applications by type 1998-2007	109
Figure 38: JPO workload 1998-2007	110
Figure 39: Trends in patent activity at the USPTO 1995-2008	115
Figure 40: Origin of patent applications and grants 1995-2007	116
Figure 41: Patent grants by technology field 1997-2007	117
Figure 42: USPTO reported patent pendency 1996-2008	118
Figure 43: USPTO pending applications by type 1995-2008	119

Tables & Figures

Page

Figure 44: USPTO workload 1996-2007	120
Figure 45: Trends in patent activity at IP Australia 1995-2007	124
Figure 46: Origin of patent applications and grants 1995-2007	125
Figure 47: Patent grants by technology field 1997-2007	126
Figure 48: Trends in patent activity at the CIPO 1995-2007	131
Figure 49: Origin of patent applications and grants 1995-2007	132
Figure 50: Patent grants by technology field 1997-2007	133
Figure 51: CIPO reported patent pendency 2003-2008	134
Figure 52: CIPO pending applications by type 2002-2008	135
Figure 53: CIPO workload 2002-2007	136
Figure 54: Trends in patent activity at the SIPO 1995-2007	140
Figure 55: Origin of patent applications and grants 1995-2007	141
Figure 56: Patent grants by technology field 1997-2007	142
Figure 57: Trends in patent activity at the DPMA 1995-2008	146
Figure 58: Origin of patent applications and grants 1995-2007	147
Figure 59: Patent grants by technology field 1997-2007	148
Figure 60: DPMA workload 1999-2008	149
Figure 61: Trends in patent activity at the UKIPO 1995-2007	153
Figure 62: Work carried out at the UKIPO, 2003-2008	154
Figure 63: Origin of patent applications and grants 1995-2007	155
Figure 64: Patent grants by technology field 1997-2007	156
Figure 65: UKIPO pending applications 2003-2008	157
Figure 66: UKIPO workload 2003-2008	158
Figure 67: Trends in patent activity at the IIPO 1995-2006	161
Figure 68: Origin of patent applications and grants 1995-2006	162
Figure 69: IIPO workload 1995-2002	163
Figure 70: Trends in patent activity at the KIPO 1995-2008	166
Figure 71: Origin of patent applications and grants 1995-2007	167
Figure 72: KIPO pendency 1997-2007	168
Figure 73: KIPO workload 1995-2006	169

Glossary

Acronym	Name of patent office	Graph code
CIPO	Canadian Intellectual Property Office	CA
DPMA	Germany Patent and Trademark Office (Deutsches Patent- und Markenamt)	DE
EPO	European Patent Office	EP
IIPO	Indian Intellectual Property Office	IN
IP Australia	IP Australia	AU
JPO	Japanese Patent Office	JP
KIPO	Korean Intellectual Patent Office	KR
SIPO	State Intellectual Property Office of the People's Republic of China	CN
UKIPO	United Kingdom Intellectual Property Office	GB
USPTO	United States Patent and Trademark Office	US
WIPO	World Intellectual Property Office	N/A
Trilateral patent offices	The EPO, the JPO and the USPTO	N/A

Executive Summary

In recent years, the world patent system has come under increasing strain as patent offices have struggled to cope with, in some cases, dramatic increases in the number of applications. Major patent offices have built up extensive and growing backlogs of patents awaiting processing, while applicants face increased waiting times to receive a patent.

The purpose of this study is to analyse the recent evolution of patent backlogs, identify respective trends and drivers, and assess the impact that patent backlogs may have on the patent system, incentives to innovate and the economy. Further, given that patent examination and grant is performed at the national level, such that an applicant must apply for protection separately in different jurisdictions, we consider also the possible impact of a system of mutual recognition of patents.

As emerging Asian economies, such as China and India, continue to grow at a rapid rate, it is expected that they will contribute increasing numbers of patent applications to the main patent offices worldwide. The idea of mutual recognition of patent work done by the different patent offices has been much discussed as a way to curtail the resulting increases in workload expected at some patent offices.

Key findings

Measuring backlogs

- The concept of patent “backlogs”, although frequently referred to, is not clearly defined. It is inherent in the nature of the patent system that there is always work awaiting processing. As such, it is necessary to relate the level of workload at a given patent office to a measure of respective disposal capacity.
- The measure that we propose is thus “backlog months”, defined as the number of pending applications (for which work has been requested) divided by the rate at which applications are disposed of by the patent office. This accounts for both the stock of pending work and the ability of patent offices to cope with that work. In this way, the measure allows direct comparison across time and across patent offices.

Trends in patent office backlogs

- Growth in applications has varied considerably across the ten patent offices focused on in the report¹. The SIPO, the IIPO and the KIPO have experienced extremely high rates of growth, while other offices (such as the JPO and the UKIPO) have seen a slight decline in application numbers.
- Backlogs at the Trilateral offices have, in aggregate, increased over the last five years (although declining over the past two years at the JPO). Backlogs have declined at the KIPO and the CIPO, while little data is available at the other patent offices.
- Using a simple model, we project that, under current trends, backlogs will rise considerably over the next five years. The overall backlog at seven patent offices (for which data was available) is anticipated to increase from 35 backlog months to 48 backlog months in a base case scenario.

Costs of patent backlogs

- Backlogs may impose several types of cost both on users of the patent system and, through effects on incentives to innovate, on the wider economy. Increases in backlogs translate into longer pendency times, i.e. the time it takes for a patent application to be processed (from filing to grant). Longer pendency time reduces the value of patents to applicants, and reduces incentives for innovation. Non-grantable applications may remain unexamined, and hence gain temporary monopoly power for a longer period. Backlogs may also lead to declines in patent quality as patent offices' resources are stretched. Uncertainty over the scope of granted patent rights may deter investment and hence slow down, or prevent, valuable innovation.
- Backlogs are projected to grow by around 13 backlog months over the next 5 years. This is likely to lead to similar increases in pendency times. An additional year of pendency at the three Trilateral offices is estimated to impose costs of **£7.6 billion** per annum on the global economy. Although this estimate necessarily relies on a number of assumptions, it does provide an indication of the order of magnitude of the potential costs associated with patent backlogs.
- This cost estimate includes the detrimental impact on incentives for innovation, the wasted resources associated with additional non-

¹ The ten patent offices included the USPTO, the EPO, the JPO, the CIPO, the DPMA, the IIPO, IP Australia, the KIPO, the SIPO, and the UKIPO. A full list of the patent offices is included in the glossary.

patentable applications and the cost of increased monopoly power. Importantly however, due to measurement difficulties, it excludes any cost associated with the fact that growing pendency leads to a longer period of uncertainty relating to the scope of patent rights. This uncertainty may deter investment in productive areas by third parties, and was considered the most important cost of backlogs by several patent office representatives.

Mutual recognition

- We estimate that around a third (34%) of the 1.6 million applications to the ten patent offices in the study are duplicate applications.
- If a mutual recognition system allowed patent offices to reduce the amount of time that they spend on duplicate applications by 25%, a simple model projects that backlogs across seven patent offices would be reduced by 9 backlog months (from 48 months under current trends) after 5 years. If a “pure” system of mutual recognition were introduced (under which processing time on duplicate applications is zero), backlogs would fall by 37 backlog months.

Methodology

The objective of this study is to provide an economic analysis of the costs of patent backlogs, and the likely impact of introducing a system of mutual recognition so as to inform future UK policy in this area. The research programme involved three major elements:

- A literature review which looked at the economic rationale for patents, factors driving patent application trends and the potential impact of backlogs on the effectiveness of a patent system.
- An analysis of the available worldwide patent data, in order to identify drivers of trends in patent offices’ workload and backlogs, in parallel with a series of interviews with representatives from major patent offices, to add a qualitative perspective to our analysis and interpretation of the data.
- The design of a model containing the potential and measurable economic impacts of patent backlogs and application of this model to the estimation of the costs of current and foreseeable patent backlogs and the expected benefits of a system of mutual recognition.

Main Findings

Literature review

Patent systems are designed with the main objectives of incentivising innovation; incentivising development and commercialisation of inventions; inducing disclosure of an invention; and enabling orderly development of broad prospects.

The question, in the context of this study, is therefore the extent to which an increasing workload for patent offices and large volumes of patent backlogs can interfere with the performance of the patent system against that set of objectives.

The clearest driver of growing patent backlogs is the surge in patent applications which has occurred over the past twenty years. This is due to a number of factors, including:

- increases in innovation, and a move to a more technologically intensive society, particularly growth in R&D in firms in the electrical and computing technology sectors (a driver but not, empirically, the major driver of increased patenting)
- changes in patenting legal regimes
- globalisation of patent application strategies with firms needing patent protection in more than one country
- changes in firm patenting strategies ('patents arms races')
- the emergence of patents as assets against which firms can gain access to funding

However, a number of other factors are also important drivers of backlogs:

- the size and the complexity of patent applications due to a combination of: growing technical complexity; patents from emerging sectors (such as biotechnology and computer science); "export" of different drafting styles
- patent strategies involving applying for large, unfocused patents
- applicants' preference for lengthy pendency times - a pending application is better than no patent at all and the longer the application is outstanding the more uncertainty for competitors and the more possibility of obtaining financing and licensing based on the invention

- patent offices' incentive structures may also contribute to backlogs if they do not sufficiently discourage strategic delay of substantive examination

Backlogs can reduce the effectiveness of a patent system in a number of ways:

- Costs to the applicant – uncertainty about validity of the claims takes longer to be resolved complicating planning, investment decisions and access to funding
- Impact on patent quality – if the backlogs stretch patent offices' resources and patent quality decreases: more applicants are encouraged to 'try their luck'; infringement and litigation will increase; the balance of costs and benefits inherent to any patent system is heavily tilted towards costs
- Costs to other innovators – if the patent is ultimately not granted, the extra pending period (due to backlogs) can delay or deter innovations that use ideas contained in the pending claims
- Costs to competitors and consumers – may result from the lengthy pendency of an application that is finally dismissed resulting in lower product variety and higher prices

Data analysis and interviews

Global patenting activity increased significantly in the period 1996-2007, across the ten offices included in the study, from under 900,000 applications per year to over 1.6 million. Growth was particularly strong at patent offices in emerging markets. The share of IIPO, SIPO and KIPO applications of the total in these ten offices grew from 15% in 1996 to 28% in 2007.

In order to measure the potential impact of this surge in applications on patent offices' backlogs, we look at the evolution of the stock of pending applications divided by the number of examination disposals carried out each year.

Patent offices' representatives believe in the benefits of work-sharing arrangements and there are a number of these already in place - although it is felt that there is scope to extend them further. On the other hand there was significant reticence in relation to a system of straight mutual recognition. A number of difficulties in implementing such a system were highlighted. Further, patent offices are keen to keep a 'veto' option according to which they will have the final word in terms of recognition of patents granted elsewhere.

Estimating the costs of additional patent pendency

Growing patent backlogs increase examiner workload and lead to delays in patent examination and issuance, resulting in longer pendency times. As such, to give an indication of the possible costs of future growth in backlogs, we estimate the financial cost of an additional year of pendency at the three Trilateral patent offices. This is done in three steps, which we outline below.

1) Reduced incentives to innovate

During pendency, patent rights are less effectively enforceable and applicants in some offices need to pay 'maintenance fees' on their applications during this time. Further, some applicants may have difficulty in accessing investment to further develop their product during this period. We estimate the cost of a given pendency period based on the assumption that the value of a patent is proportionally spread over its lifetime.

In estimating the impact on innovation, it is important to understand that not all applications will be affected by increased pendency. Many applications relate to inventions which have lead times longer than the pendency period. Further, although patent offices tend to offer low cost options to accelerate examination, few applicants take this option. To adjust for this, we limit the cost estimates to applications in high tech sectors (where we expect products to have shorter lifetimes) and those by SMEs (who may be unable to accelerate examination due to the up-front cost or who may be unaware of the option to accelerate).

Based on these assumptions, and average patent values from the PATVAL survey², we estimate that an additional year of pendency at the Trilateral patent offices could have a cost of **£6 billion** per annum through lost innovation. Importantly, this cost does not account for the fact that additional pendency extends the period during which the scope of the patent rights which will be granted is unclear. This may deter R&D activity and expenditure by third parties and may, as a result, lead to new products and technologies being delayed or abandoned. This factor was felt by patent offices to be the major cost of growing pendency; however we were unable to quantify its effects.

² The PATVAL survey involved a survey of European patents with priority date 1993-1997 granted at the EPO in eight countries including Denmark, France, Germany, Hungary, Italy, Netherlands, Spain, and UK. See Gambardella et al (2006) for further details.

2) Incentivising applications for non-patentable applications

Increasing pendency increases the value of pending patent protection, through extending the time period between filing and disposal. This may encourage additional applications and hence diverts resources away from productive uses. In total, we estimate that an additional year of pendency at the Trilateral patent offices would lead to an additional **£359 million** in application costs per annum.

3) Granting of monopoly power on non-patentable applications

Increasing pendency will have a further cost through providing temporary monopoly power to 'non-deserving' patent applications. The monopoly or quasi-monopoly granted to the filers of unmeritorious pending applications has the associated monopoly welfare cost (higher prices, lower product availability) but none of the benefits.

Although the direct transfer from consumers to the applicants is not an economic cost (as it benefits the firms), the imposition of monopoly prices also implies a deadweight loss. We estimate these costs as **£1.2 billion** per annum.

Conclusions

The evidence collected in the study has highlighted that patent backlogs have the potential to impose significant costs on the patent system and on the economy more generally. Backlogs, and hence delays in processing patents, can reduce incentives to innovate through reducing the value of patents to applicants, and through creating uncertainty over the exact nature of the patent rights that will be granted. They may also negatively affect patent quality, through straining patent office resources.

Despite the potential for these costs, the evidence suggests that, at current levels, there are few noticeable effects. Most applicants, for instance, choose not to accelerate the processing of their applications, while patent offices remark that there has been little impact on quality. In particular, many patent offices have undertaken extensive recruitment to mitigate any impact of growing workloads.

However, while the impact to date has been limited, this may change if backlogs, and hence pendency times, continue to increase. An additional year of pendency at the Trilateral patent offices is estimated to impose costs of £7.6 billion per annum on the global economy. Further, a simple model of patent office backlogs suggests that such growth in workload is likely, given continued growth in application numbers. In a base scenario, backlog is projected to increase from 35 to 48 backlog months. In a scenario with stronger growth assumptions, particularly in relation to growth of

applications originating in China, backlog is projected to increase from 35 to 50 backlog months.

Given this, there is a clear need to consider actions to mitigate these impacts. Patent offices are already engaged in a number of measures, such as recruitment and efficiency improvements, to help address backlogs. This study indicates that mutual recognition has the potential to considerably reduce backlogs, through reducing the amount of time examiners need to spend examining duplicate applications. A mutual recognition system which reduces the amount of time spent on duplicate applications by 25% is projected to reduce the backlog by 9 backlog months (19%) after 5 years. Where 60% of the work is saved, backlog is reduced by 23 backlog months (48%) and, if all work on duplicate applications is rendered unnecessary, backlog is reduced by 37 backlog months (77%).

These reductions in backlog are likely to lead to similar declines in pendency times and, as a result, we estimate that mutual recognition could achieve savings of between £6 billion and £23 billion per annum. While this is an indicative estimate and there are a number of clear practical issues in implementing such a system, this provides an indication of the potential benefits that could be achieved if these problems could be overcome.

1 Introduction and study objectives

1.1 Introduction

The protection of intellectual property rights is key to promoting the development of new ideas, through providing inventors and creators with an economic incentive to undertake costly research and development activities. Patents, as the form of intellectual property right concerned with new inventions³, allow inventors to gain a short-term exclusive right over their invention, such that no other entity can exploit it commercially for a limited period.

In recent years, the world patent system has come under increasing strain as patent offices have struggled to cope with, in some cases, dramatic increases in the number of applications. Major patent offices have built up extensive and growing backlogs of patents awaiting processing, while applicants face increased waiting times to receive a patent.

The granting of patent rights is a necessarily complex task, involving the detailed examination of claimed inventions, in order to identify whether they meet the required criteria for patentability, such as representing an “inventive” step. Patent examination and grant is performed at the national level, such that an applicant must apply for protection separately in different jurisdictions. As emerging Asian economies, such as China and India, continue to grow at a rapid rate, it is likely that they will contribute ever larger numbers of patent applications to the main patent offices worldwide, further increasing the pressure on the more established patent offices.

In response to these issues, the idea of mutual recognition of patent work done by the different patent offices has been much discussed. Under one extreme version of such a mutual recognition system, for instance, any patent application that receives a patent in any one of the accredited offices would automatically receive patent protection in all accredited jurisdictions. However, in practice designing such a system is difficult, given differences between national legislation, patent grant procedures and other issues.

³ An invention can be defined as a “new solution to a technical problem”. However, most laws dealing with the protection of inventions do not actually define the notion of an invention (WIPO, 2008a).

1.2 Scope of the study

London Economics was commissioned by the Intellectual Property Office in November 2008 to provide an economic analysis of the costs of patent backlogs, and the likely impact of introducing a system of mutual recognition. The research programme involved three major elements: a review of the economic literature surrounding the patent system in general, and the impact of growing patent office workloads in particular; an analysis of the available data relating to the patent system worldwide in order to identify drivers of trends in workload and patent backlogs; and a series of interviews with representatives from major patent offices.

The study focuses on ten patent offices, selected as being of particular interest to the Intellectual Property Office⁴. These include:

The Trilateral patent offices:

- European Patent Office (EPO)
- United States Patent and Trademark Office (USPTO)
- Japanese Patent Office (JPO)

Other major OECD patent offices:

- IP Australia
- Canadian Intellectual Property Office (CIPO)
- German Patent and Trademark Office (DPMA)
- United Kingdom Intellectual Property Office (UKIPO⁵)

Major emerging market patent offices:

- State Intellectual Property Office of the People's Republic of China (SIPO)
- Intellectual Property Office, India (IIPO⁶)

⁴ A glossary of patent office acronyms, as well as the two letter codes used to refer to each office in graphs and tables, is included at the beginning of this report.

⁵ The United Kingdom Intellectual Property Office is now known as the Intellectual Property Office. However, we designate it as "UKIPO" throughout the report for purposes of clarity.

⁶ Similarly to the United Kingdom, the relevant body is generally designated as the "IPO". We use the acronym IIPO for the purposes of clarity.

- Korean Intellectual Property Office (KIPO)

1.3 Sources of information

At the initiation of the project, London Economics undertook a review of the available data relating to patenting activity in general, and patent backlogs in particular. This identified the following data sources, which are used as the basis of the analysis of patent trends throughout the report:

- EPO Worldwide Patent Statistical Database (PATSTAT);
- patent office annual reports and statistics;
- WIPO statistical data; and
- Trilateral Statistical Reports.

A more detailed description of each of these datasets is contained in Annex 1.

In addition to the statistical data sources above, information was also gathered through a number of interviews with patent office representatives. In particular, interviews were undertaken with representatives from the CIPO, the EPO, IP Australia, the JPO, the UKIPO, and USPTO. In addition, the DPMA provided a number of comments through a written submission. The interviews provided qualitative insight into the issues examined in the report, as well as serving to refine and verify the information gathered through desk research. In a few cases, data were provided to London Economics following the interview, which have been incorporated into the analysis where relevant.

1.4 Contents of this report

The remainder of the report is structured as follows. In Section 2 we provide an overview of some of the key issues underlying the study, including the grant procedure used at each of the patent offices, recent trends in global patenting activity, and current proposals and programmes for work sharing between patent offices. In Section 3, we then summarise the available economic and policy literature in relation to patent backlogs and mutual recognition. Section 4 then focuses on the incidence of patent backlogs, discusses possible measures of backlogs and provides an estimate of their costs. Finally, in Section 5 we discuss how backlogs are likely to change over the next five years, presenting the results of a simple model of the future growth in backlogs.

In the Annexes to the report we present a description of the data sources used in the study (Annex 1) and a brief summary of the information collected for

each of the ten patent offices, including both an overview of the grant procedure at each patent office, and recent trends in patent applications and workloads (Annexes 2-11).

2 Background to the study

2.1 Introduction

Although the world economy has become increasingly globalised over the past twenty years, the international patent system remains fragmented into national jurisdictions, each of which awards its own patents, according to national legislation. There is no such thing as an “international patent” and in order to obtain protection in multiple jurisdictions, applicants must obtain a patent for each jurisdiction through applications to each national or regional patent office.

The processes in place for examining patent applications vary considerably across jurisdictions. For instance, some offices carry out a separate search of the prior art before examination, whereas others perform search and examination together. Applicants in some jurisdictions have the opportunity to defer the decision over whether to have their application examined for several years, whereas in others (particularly the US) all applications are examined automatically. It is important to understand these differences in order to interpret and explain the data regarding patent backlogs and patent pendency correctly. In Section 2.2 we present a brief summary of the main patenting procedures at each of the 10 patent offices included in the study.

Patenting activity worldwide has grown explosively over the past ten years, with worldwide patent applications growing from 0.9 million in 1985 to 1.8 million in 2006 (WIPO, 2008b). In Section 2.3, we analyse the extent to which this trend has impacted each of the ten patent offices in the study, and identify any changes in the composition of patent applications to each office in the ten years.⁷

Although the patent system is structured around national jurisdictions, a number of proposals for increased work sharing have been put forward in recent years. Section 2.4 provides an overview of some of the major work sharing initiatives that are in place or are currently under consideration, including the Patent Co-operation Treaty (PCT).

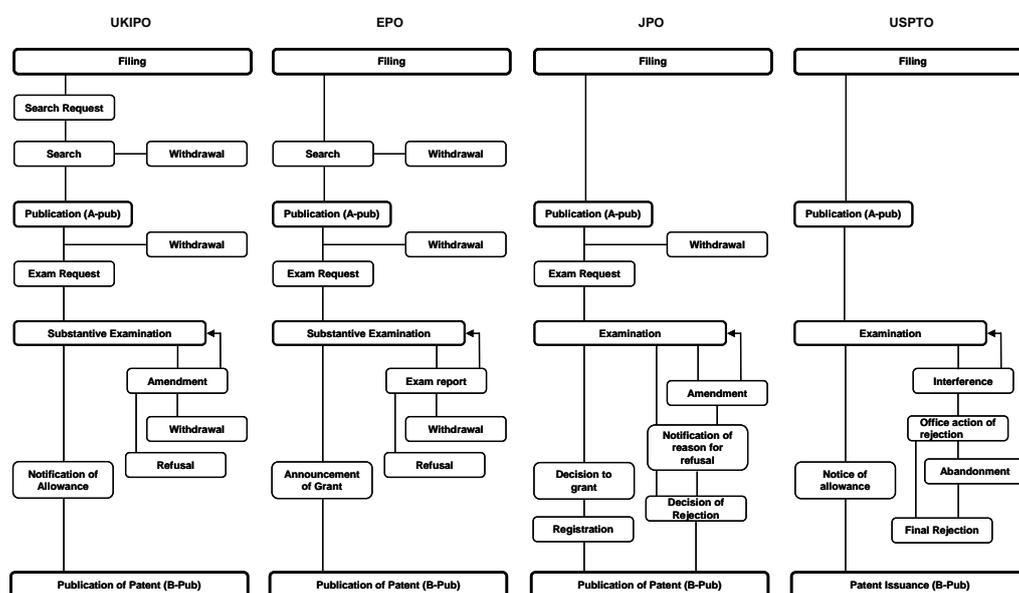
⁷ A more detailed discussion of grant procedure and recent trends at each of the patent offices is contained in the Annexes to this report.

2.2 Patenting regimes across the main international patent offices

There are a number of important differences in terms of the structure and timetable of the examination process for applicants at different patent offices, as highlighted in Figure 1 for four patent offices: the UKIPO, the EPO, the JPO and the USPTO.

The UKIPO and the EPO, for instance, generally search applications separately (i.e. prior to examination) whereas the JPO and the USPTO do not. However, whereas the UKIPO requires applicants to make a request for search, at the EPO this is implied by filing an application. Similarly, an application to the USPTO implies a request for examination (combined with search) whereas this is not the case at the JPO.

Figure 1: Comparison of patent grant procedures at four patent offices



Note: The diagram represents a simplified procedure for patent grants in each office.

Source: London Economics based on Trilateral Statistical Report 2006 and UKIPO information.

More detail on the procedures followed at each of the ten patent offices included in the study is provided in Table 1 overleaf. Notably, as mentioned above, two of the offices (the EPO and UKIPO) have a separate search procedure, as does the DPMA if requested. The other offices however combine the examination and search process, with all but the USPTO requiring a request for examination.

Types of patents

The patent offices offer a number of types of intellectual property protection, in addition to the “standard” 20-year invention patent. These include utility models (or, in Australia, innovation patents) providing protection for less complex inventions, often with a shorter commercial life, and design patents (or design rights).⁸

In this study we focus on invention patents, as these are comparable across offices, and also form the vast majority of the workload on patent offices. However, it should be noted that in some cases (in some US data for instance) the reported figures also include other patent types. Where this is the case, non-invention patents only represent a very small proportion of the total, and so do not significantly impact the results.

⁸ In some jurisdictions similar protection for designs is provided separate from the patent process.

Table 1: Outline of patent procedure in different patent offices

	CIPO	DPMA	EPO	IIPO	IP Australia	JPO	KIPO	SIPO	UKIPO	USPTO
Types of protection offered:										
Patents	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes ¹
Utility models	No	Yes	No	No	Yes ²	Yes	Yes	Yes	No	No
Length of protection (years) (patent/utility model)	20/NA	20/10	20/NA	20/NA	20/8	20 /10	20/10	20/10	20/NA	20/NA
Provisional applications	No	No	No	No	Yes	No	No	No	No	Yes
Separate search	No	On request	Yes	No	No	No	No	No	Yes	No
Request for search required	NA	NA	No	NA	NA	NA	NA	NA	12 months from filing	NA
Request for examination required	5 years from filing	7 years from filing	6 months from publication	4 years from filing	6 months from direction to request examination	3 years from filing	5 years from filing	3 years from filing	6 months from publication	No

¹ Invention patents in the US are split into utility, plant and re-issue patents.

² IP Australia offers innovation patents, which are similar to utility models.

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: London Economics based on public information and patent office interviews.

Period of requests for examination

As noted above, nine of the patent offices (the exception being the USPTO), require applicants to submit a request for examination. If this is not submitted within a certain time period, the application is considered withdrawn.

The period in which requests have to be made varies considerably between the different patent offices. At the UKIPO and the EPO, requests must be made no later than six months after publication – so that only a small proportion of applications are likely to be pending awaiting a request for examination. In other offices, however, the period is much longer. In the JPO and SIPO, the period is three years from filing (i.e. approximately 18 months from publication), in the IIPO it is four years from filing, in the CIPO and KIPO 5 years, and in the DPMA the period is up to seven years.

Notably, a large proportion of applicants tend to defer their application for several years, where the option is available. At the JPO for example, approximately 80% of requests are submitted in the final year of the three-year filing period. At the DPMA, around 55%-58% of applicants decide not to request application at the same time as filing.

It is important to consider the differences in these periods in seeking to understand patent backlogs. In many offices, a large number of applications may be waiting to be examined – but as a request for examination may not have been submitted, this may not represent a “true” patent backlog. In fact, many of these applications may never be subject to a request for examination, or, consequently, lead to a workload for the patent office.

Accelerated examination

Although obtaining a patent usually takes several years, applicants generally have the option of accelerating the process. Our research has indicated that acceleration is possible in nine of the ten patent offices examined in the study (with the exception being the IIPO).

The acceleration procedure, and the conditions applicants must meet to be eligible, vary considerably across patent offices. For instance, in some offices (the EPO, KIPO) accelerated examination and (in the case of the EPO) accelerated search is essentially open to all applicants. This is also true of some options available at the UKIPO (accelerated search, or combined search and examination).

In other cases, however, applicants may only be eligible if it is expected that prolonged pendency may damage the commercial viability of the invention, or if there is a potential infringement (e.g. JPO, USPTO, CIPO). The JPO allows accelerated examination for applications that are also filed abroad, for SMEs, or for universities.

There are notable efforts to introduce new acceleration procedures in some patent offices in order to combat the problem of growing patent backlogs. For instance, in October 2008, the JPO launched a pilot “super accelerated examination”, under which the first examination takes place within one month of filing. The first patent processed under this system was granted after 17 days.

Similarly, the KIPO launched the “Customer-tailored Patent Examination System” in September 2008, under which scope for preferential examination (starting within 2.2 months of the request date) was extended to all applications (having previously been limited to 14 fields of technology).⁹ The system also allows applicants to delay their applications, by specifying the commencement of an examination at any time in the period between one year and six months from the date of the examination request and five years from the filing date. An applicant can request a delay at the time of submitting an examination request or at any point in the following six months. This allows the applicant to estimate the time of grant with more exactitude, as the KIPO commits to begin the examination no more than three months from the specified time.

As part of the interviews with patent offices, we sought to identify the trends in the use of acceleration procedures in more detail (little information is available in public reports). This indicated that very few applicants choose to accelerate their application. At both the USPTO and IP Australia only around 1% of applications is subject to acceleration while at the EPO, the number of requests for either accelerated search or examination in 2007 was 8%. Interestingly, the trend at the UKIPO is different, with around 16% of applications undergoing combined search and examination (under which the examination is completed along with the search within four months) and a further 1% undergoing accelerated examination (where the examination is completed within 8 weeks).

Two of the patent offices were able to identify particular groups of applicants that are more likely to apply for accelerated examination. At the JPO, a higher proportion of SMEs tend to use the accelerated examination system, which may reflect a greater need to receive the patent quickly to obtain funding or to start production immediately, or may also be a result of the other assistance that they receive from the JPO. At the USPTO, a higher proportion of applications (although still only 1.3%) within the electrical technologies group are subject to requests for acceleration.

The low take-up of accelerated examination is particularly surprising given the fact that applicants do not face significant fees (often no additional fee is

⁹ To obtain preferential examination, applicants must have obtained a prior art search from one of four authorised organisations.

charged) to accelerate their application. Our discussions, did, however, highlight some possible reasons for this. In some sectors, such as medicine, acceleration is not necessary as patents will not become commercially viable before patent grant. Similarly, in some sectors firms may need to wait for the adoption of international standards.

In addition, even where acceleration is attractive, there may be difficulties beyond the fees charged by patent offices. In general, accelerating examination necessitates incurring the full costs of the patent application up-front, which may be difficult for some businesses (particularly SMEs). It is also possible that, as acceleration is unusual, accelerating a particular application would highlight the importance of that invention to competitors.

The procedure used by the patent office may also impose further costs on the applicant. Representatives from the USPTO, for instance, felt that firms may be deterred from applying for accelerated examination by the conditions that are required for an application to be eligible. In particular, applicants applying for acceleration are required to provide a substantial amount of information up-front, perform a prior art search, and limit the number of claims in the application, as well as meet tight time frames for responding to the USPTO. In particular, the volume of information that is required may be a disincentive to applicants, as under US law, this could expose applicants to litigation for inequitable conduct¹⁰ at a later date.

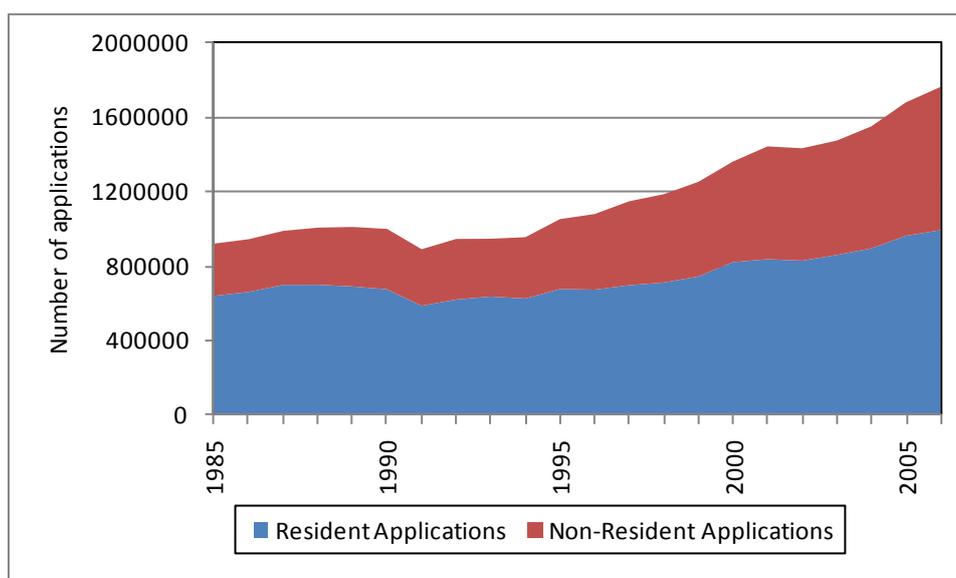
¹⁰ Under the doctrine of inequitable conduct, a patent can be rendered unenforceable in court, if the applicant knowingly fails to disclose material prior art.

2.3 Trends in patenting activity

2.3.1 Overview of patenting activity

As shown in Figure 2, since 1985 the total number of patent applications has increased substantially, with particularly rapid growth from 1994 onwards. This has been driven in particular by the growth of non-resident applications which have grown from 31% of worldwide patent applications to 43% in 2006.

Figure 2: Number of worldwide patent applications



Source: London Economics using WIPO data.

This rapid growth in the number of patent applications has fuelled concerns over the ability of patent offices to manage workloads effectively. It is however, important to note that the trend in applications varies considerably across the different patent offices – as shown in Table 2 overleaf.

Table 2: Summary of patent activity 1996-2007

	Applications			Examinations			Grants			Patent examiners		
	1996	2007	CAGR	1996	2007	CAGR	1996	2007	CAGR	2001	2007	CAGR
CIPO	27,570	40,131	3.5%	13,105	33,673	9.0%	7,145	18,550	9.1%	150	387	17.1%
DPMA	51,833	60,992	1.5%	27,074	34,297	2.2%	16,393	17,739	0.7%	na	na	na
EPO	63,895	140,725	7.4%	52,862	90,310	5.0%	40,069	54,707	2.9%	3,778	4,951	4.6%
IIPO ¹	8,562	28,940	13.0%	3,042	14,119	16.6%	907	7,539	23.6%	33	133	32.2%
IP Australia	15,018	27,343	5.6%	na	na	na	8,752	10,311	1.5%	na	na	na
JPO ²	376,615	396,291	0.5%	183,744	307,665	4.8%	215,100	164,954	-2.4%	1,096	1,567	6.1%
KIPO	90,326	172,469	6.1%	23,011	129,147	17.0%	16,516	123,705	20.1%	371	660	10.1%
SIPO	28,517	245,161	21.6%	na	100,275	na	2,976	67,948	32.9%	na	2,672	na
UKIPO	27,143	24,999	-0.7%	na	3,681	na	7,132	5,930	-1.7%	na	289	na
USPTO	206,276	468,330	7.7%	206,080	421,723	6.7%	116,875	184,376	4.2%	3,121	5,477	9.8%
Total³	895,755	1,605,381	5.4%	481,844	996,637	6.8%	431,865	655,759	3.9%	8,549	13,175	4.0%

¹ 2007 figures for India are for 2006 (year end March 2007). CAGRs are hence over 10 years, rather than 11 (five years in relation to the number of patent examiners).

² 1996 figures for examinations at the JPO refer to 1997. The CAGR is hence over 10 years, rather than 11.

³ The total for examinations excludes figures for the DPMA and SIPO, to allow comparability between 1996 and 2007. Similarly, the total for patent examiners excludes information for SIPO.

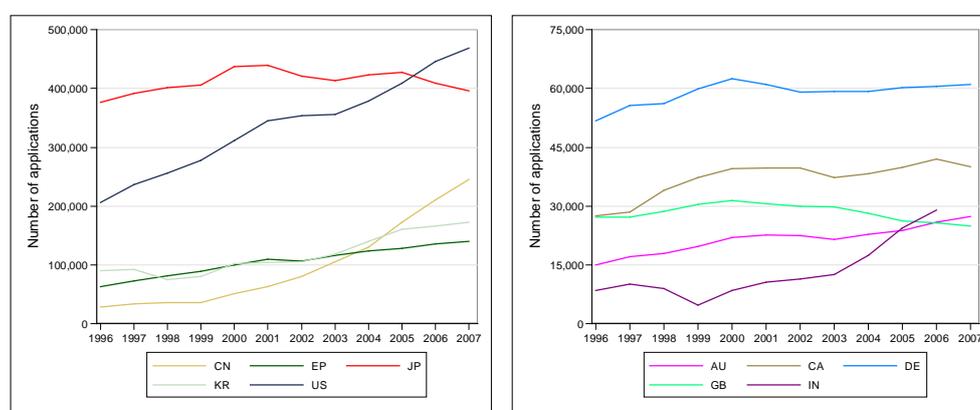
Source: London Economics using WIPO data and patent office annual reports and data.

The table indicates the extent of the growth in patent applications at different patent offices since 1996. Notably this has varied significantly between patent offices, with the emerging economies of China and India growing at compound annual growth rates of around 21% and 13% respectively, while some more established offices have experienced very low (or even negative) compound growth in applications since 1996. Each of the various aspects of patenting activity are examined in more detail below.

2.3.2 Growth in patenting activity

The total volume of global patent activity has increased significantly since 1996. Across the ten offices included in the study, the total volume of applications increased from just under 900,000 applications in 1996, to over 1.6 million applications in 2007. Further, as shown in Figure 3, application numbers have grown at nearly all (with the sole exception of the UKIPO), of the ten offices over the past ten years.

Figure 3: Number of patent applications by year, 1995-2007



Source: London Economics using WIPO data and patent office annual reports.

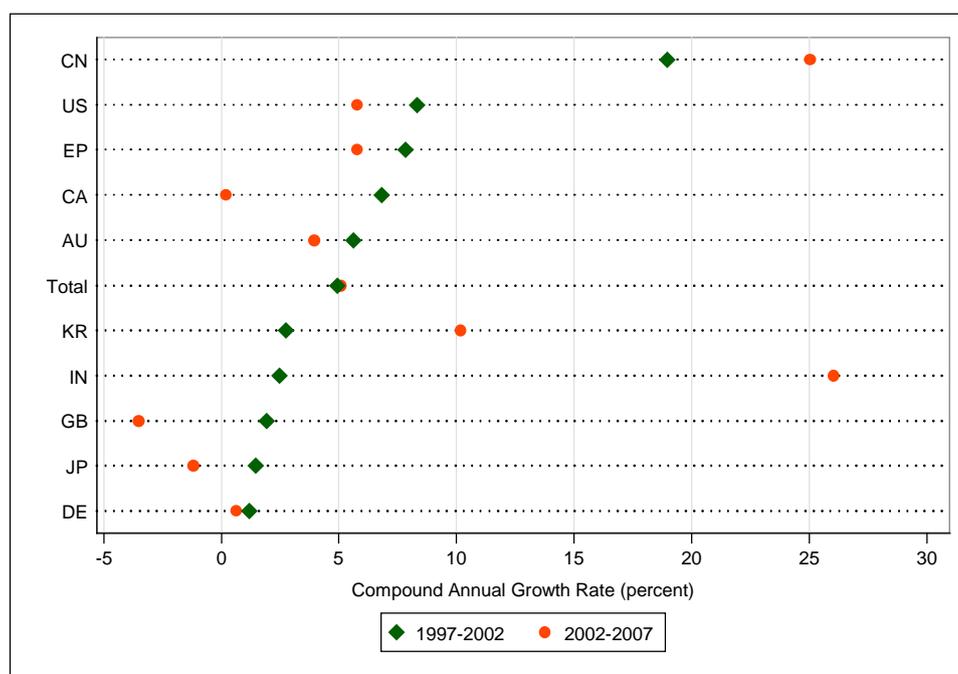
Growth in patent applications has not, however, occurred at the same rate across patent offices, with growth particularly high at patent offices in emerging markets. In 1996, applications to the IIPO, the SIPO and the KIPO accounted for 15% of all applications to the ten offices; in 2007 28%¹¹ of applications were to these three offices.

Figure 4 displays the compound growth rates in the number of applications received at each of the offices, both for the period 1997-2002 and for 2002-

¹¹ Including 2006 data for the IIPO.

2007 (or 2006 in the case of the IIPO). As this shows, the three emerging markets (China, India and South Korea) have experienced the highest rates of growth since 2002, with the number of applications growing at compound rates of 25%, 26% and 10% respectively. China also had relatively high (albeit lower) compound growth of approximately 19% between 1997 and 2002. Interestingly this was not true in either India or Korea.

Figure 4: Growth in patent applications, 1997-2007



Note: 2002-2007 CAGR for India refers to the period 2002-2006, as no 2007 data is available.

Source: London Economics using WIPO data and patent office annual reports.

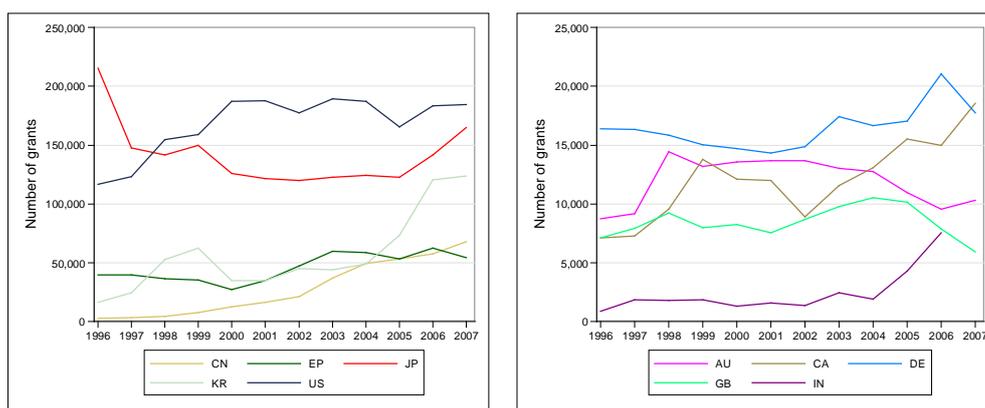
More generally, it is clear that the growth in the number of patent applications has varied considerably across the different patent offices. Outside the emerging markets growth in the number of applications has generally been slower between 2002 and 2007 than in the previous five-year period. In considering this however, it is important to note that the base (i.e. the number of applications at the beginning of the period) was higher after 2002 given the (in some cases rapid) growth between 1996 and 2002.

A further notable feature of the graph is that three of the established patent offices, in the UK, Japan and Germany, have experienced low growth (of under 2% per annum) over the past ten years. In particular, both Japan and the UK have experienced a fall in the number of applications since 2002.

Although the total number of applications has increased significantly across the ten patent offices, it does not necessarily follow that patent office

workloads have increased accordingly. It may be for instance, that many of these applications do not progress to examination, as applicants do not decide to submit a relevant request.¹² However, the rapid growth in the number of applications has also been reflected in a growing number of patent grants, suggesting that these applications relate to “real” applications (Figure 5). Again, growth has been particularly rapid in the emerging economies. However, there has also been a notable upturn in the number of grants at the JPO over the past two years. This is likely to be explained by the change in the period for examination from seven years to five years (from October 2001), which has led to a surge in the number of requests for examination.

Figure 5: Number of patent grants by year, 1996-2007



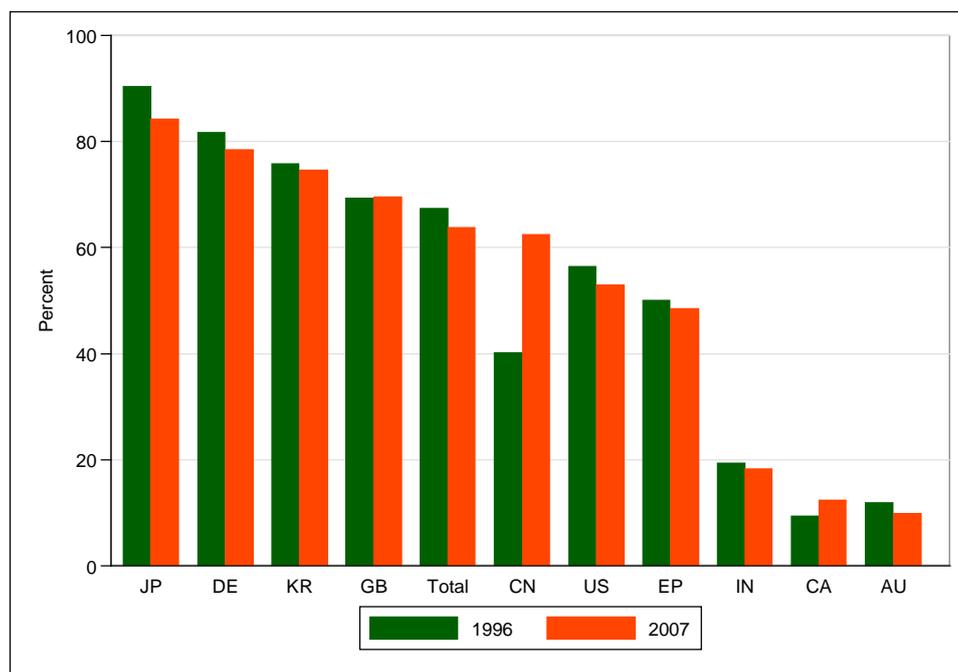
Source: London Economics using WIPO data and patent office annual reports and data.

2.3.3 Origin of applications

The proportion of applications made by domestic applicants varies considerably across the patent offices, as shown in Figure 6. Some offices, such as the JPO and the DPMA, are dominated by domestic applications. In others, however, such as the CIPO and IP Australia, domestic applicants account for a very small proportion (under 20%) of total applications.

¹² The US is an exception to this, as at the USPTO an application implies a request for examination.

Figure 6: Proportion of applications made by domestic applicants, 1996 and 2007



Note: 2007 figures for India are for 2006 (year end March 2007).

Source: London Economics using WIPO data and patent office annual reports.

The most notable feature of the figure is the relative growth of domestic applications at SIPO, which accounted for approximately 62% of applications in 2007, rising from around 40% in 1996. At most patent offices however, the proportion of applications accounted for by domestic applicants has fallen. A possible explanation for this trend is that patent applications have become increasingly global, with applicants increasingly seeking protection in several different jurisdictions.

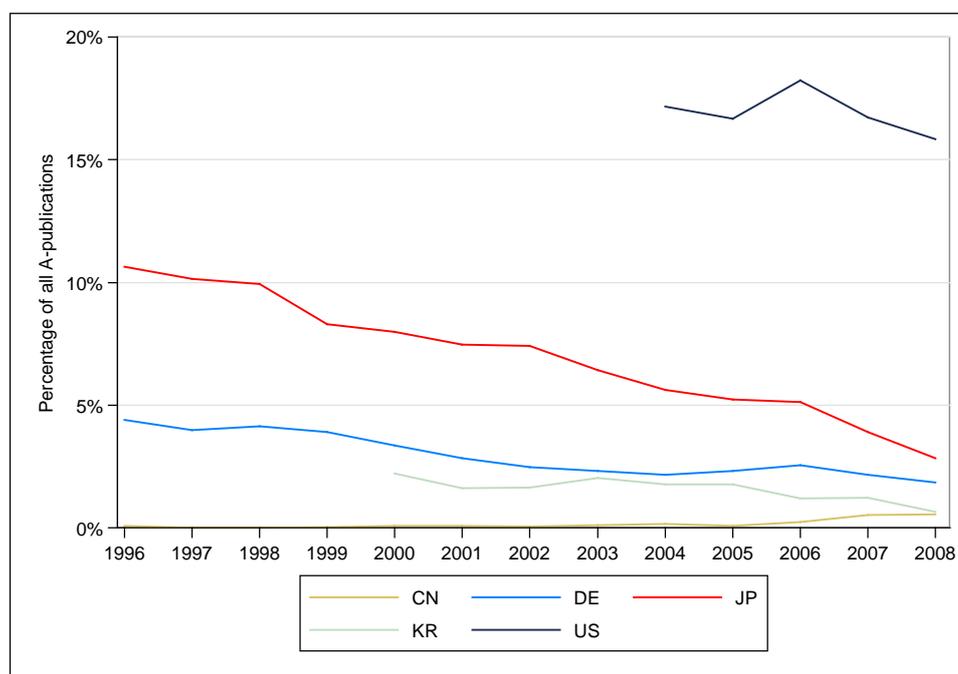
2.3.4 Globalisation of patent applications

One possible explanation for the growth in the number of applications worldwide is that patents are increasingly filed in multiple jurisdictions, as companies have become increasingly global in scope.

One way of looking at this is to consider the extent to which applications at each patent office are accounted for by second filings – that is filings that have been published previously in other patent offices. This information can be obtained through PATSTAT – and is presented for the case of the UKIPO in Figure 7 below.

As shown in the figure, there has been a clear declining trend in the number of second filings to the UKIPO over the past ten years. Between 2004 and 2007, the number of applications filed previously in any of the other ten patent offices fell from 3,550 to 2,979 or from 27% to 25% of all A-publications.

Figure 7: Second filings to the UKIPO 1996-2007



Note: Includes applications in all technology groups. US data prior to 2004 is incomparable, as a result of the fact that publication at the USPTO was not mandatory until grant prior to 2001. A-publication data for Korea is unavailable prior to 1999. Other offices are not displayed due to low share of total publications.
 Source: London Economics' analysis of PATSTAT data.

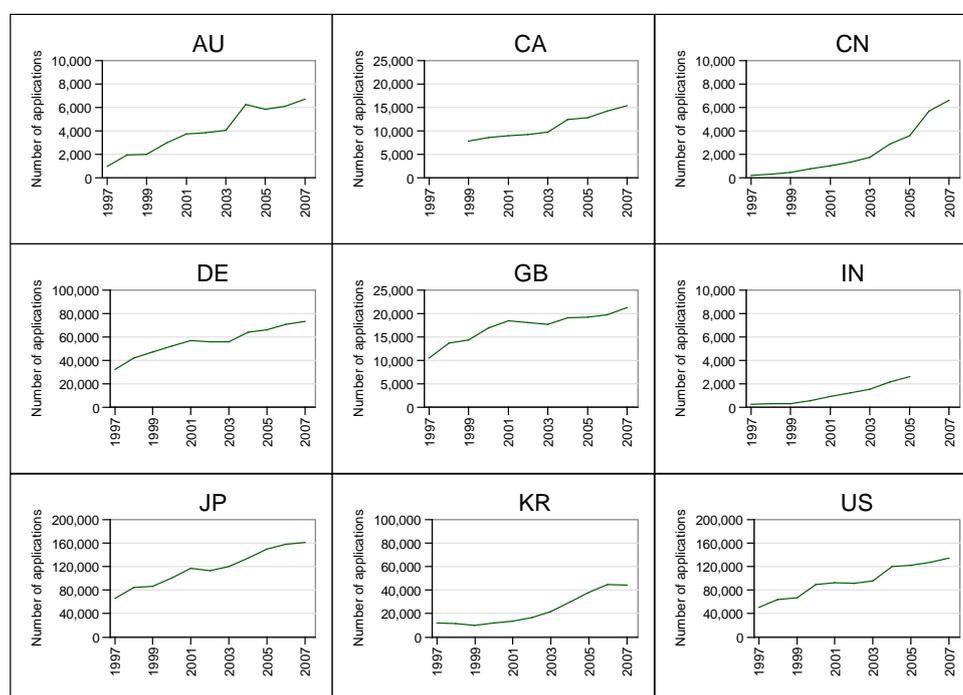
This decline appears to contradict the hypothesis that globalisation is a key driver of the increasing number of patent applications. However, this trend seems likely to be explained by the growth of applications to the EPO. In fact, as firms begin to seek protection in multiple European countries, the EPO will become relatively more attractive – and hence the number of applications directly to the UKIPO would be expected to fall.

More generally, some information on the globalisation of patent applications can be obtained by comparing the growth in the number of applications at worldwide patent offices to the growth in the number of patent families. Over the period 2000 to 2005 the number of applications worldwide originating from applicants within the nine countries covered in the study increased at a

compound growth rate of 5.2% per annum, whereas the number of patent families grew at a rate of only 1.9% per annum.¹³ This suggests that a large proportion of the growth in applications is due to applications for the same (or similar) inventions being filed multiple times at different patent offices.

Figure 8 displays the growth of applications to the other nine offices, based on the country of origin of the applicant. As we can see, there has been growth in the number of applications filed by applicants from all countries. As such, it does not appear that any one country is driving the increase in applications worldwide and, while the emerging economies have experienced faster growth rates in patent numbers, they still account for a relatively small share of overseas patent applications (note particularly in this respect the different axis scales for the USPTO and JPO charts).

Figure 8: Applications to other offices by applicant's country of origin, 1997-2007



Note: Y-axis scale differs between graphs. Year plotted refers to year of application.

Source: London Economics using WIPO data.

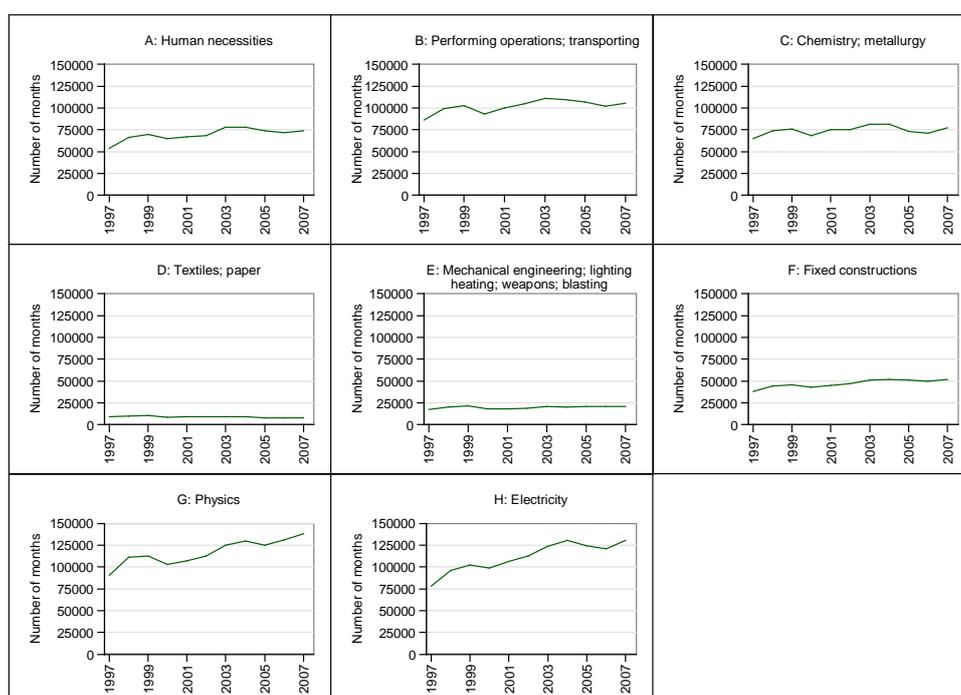
¹³ Growth rates calculated using WIPO statistics.

2.3.5 Technology field of applications

Using the PATSTAT data, we can examine the trends in grants at each office, based on technology classification. Each patent application is classified using the International Patent Classification, which contains eight major sections.¹⁴

As shown in Figure 9, there has been considerable variation across different technology groups over the past ten years. While the number of grants has increased in all but one (“Textiles; paper”) of the technology groups, growth has been particularly marked in “Physics”, “Electricity” and “Human necessities”.¹⁵

Figure 9: Patent grants by technology field, 1997-2007 – all patent offices



Note: Graphs do not include grants at the KIPO (for any year) or at the IIPO post-2004, as data was unavailable. Year plotted relates to year of grant.

Source: London Economics using PATSTAT data.

¹⁴ Applications can be classified under multiple sections, so it is not appropriate to aggregate these numbers.

¹⁵ The chart analyses technology group of granted patents, as the information relating to A-publications is less consistent over time (e.g. information for the US is only available from 2001 onward), and may include other types of patents (particularly in the case of IP Australia).

2.4 Existing schemes for mutual recognition and work sharing

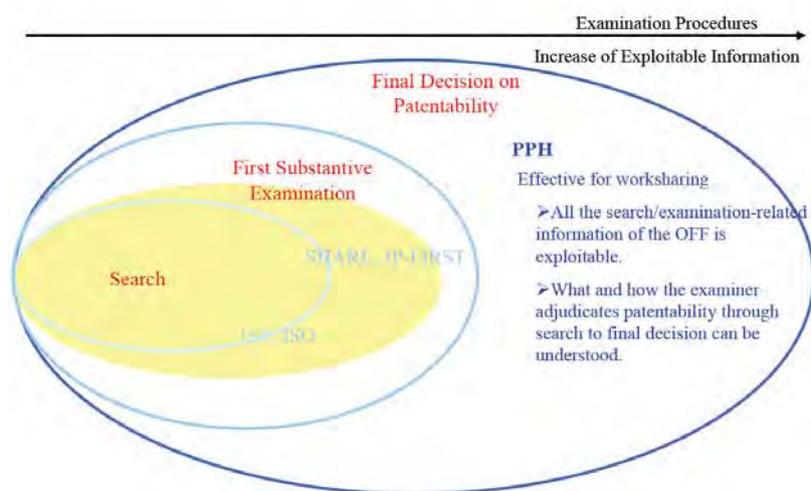
2.4.1 Overview of work sharing initiatives

Although there is no such thing as an international patent, a number of schemes for international co-operation between patent offices are in place. The most significant scheme - the Patent Co-operation Treaty (PCT) - is built around a multilateral framework, involving more than 140 patent offices worldwide. In recent years however, in response to the growing number of patent applications - and in particular an increasing number of applications filed at multiple offices - as well as a number of perceived problems with the PCT, several patent offices have investigated the potential for other work-sharing arrangements. In contrast to the PCT approach, these have generally involved much smaller numbers of countries, and are often based on bilateral agreements between patent offices.

The fundamental principle underlying mutual recognition or work-sharing schemes is that it is essentially wasteful for the same patent application to undergo substantive examination in multiple patent offices. Even where differences in patent law may mean that a patent granted elsewhere may not necessarily be acceptable in a second patent office, the search and examination results in the office of first filing may still allow an examiner in the office of second filing to complete their examination much more rapidly. In addition, utilising information collected in other patent offices may improve the quality of the examination procedure through, for instance, uncovering prior art (as different offices have access to different information databases).

The amount of information that is useable by the office of second filing grows throughout the patent examination procedure, as illustrated in Figure 10. At the most basic, offices can share a common search report which identifies the prior art that is relevant to a patent application. This is the approach taken under the PCT, with the provision of an International Search Report. As the process continues, however, more information becomes available until, once the final decision is made, the examiner (in the office of second filing), is able to directly assess the decision on patentability made in the office of first filing against their own patent law.

Figure 10: Overview of work-sharing schemes



Source: JPO (2009).

Our interviews with patent offices revealed that, wherever possible, examiners are encouraged to use the work done previously by other patent offices. It was felt that this has the potential to lead to considerable time savings, with one office noting that a good prior art search may be particularly useful. However, there are a number of factors that may limit the extent of the savings that can be achieved. The extent or nature of the claims submitted may differ in applications to different patent offices – so that search work carried out previously is either no longer relevant or insufficient. Further, some patent offices reported that it would generally be inappropriate to “cut and paste” examination reports from other patent offices, as the results would need to be translated into the terms of national law.

Given these issues, a number of more formal schemes for work-sharing have been proposed in recent years, beginning with the PCT, and moving onto a number of newer schemes (which are largely at pilot stage at present). We summarise some of the most important below.

2.4.2 Patent Co-operation Treaty (PCT)

Overview of the PCT

The Patent Co-operation Treaty (PCT) provides a route through which applicants are able to seek patent protection simultaneously in a number of jurisdictions through filing a single initial application. As well as making it easier for applicants to apply to diverse patent offices (and allowing the applicant to delay the final designation of countries in which protection is

sought), the PCT is also intended to reduce the burden on patent offices, through requiring applicants to obtain a search report (the International Search Report or ISR) before submitting their application to individual patent offices.

PCT applications pass initially through an “international phase”, after which they pass onto a “national phase”, at the end of which a patent is granted. The international phase consists of four separate stages (three mandatory and one optional). First, an international application is made to a designated Receiving Office such as several national patent offices, the World Intellectual Property Organisation (WIPO) or to regional patent offices. Generally, at least one applicant must be a national or resident of the state of the receiving office at which the international application is filed (or, in the case of regional offices, a resident of a state which is party to the relevant conventions).

In the second stage, the application is subjected to an international search, carried out by a designated International Searching Authority¹⁶. The applicant is then sent (within 4 or 5 months of filing) an International Search Report, alongside a written opinion regarding the patentability of the application. The patent application and the international search report are published by WIPO within 18 months of the application priority date (unless the application is withdrawn).

Following publication, applicants may opt for an international preliminary examination, under which they receive “a preliminary and non-binding opinion” regarding the patentability of the invention. Applicants are sent the results of the study in an international preliminary examining report (IPER), which helps them to decide whether (and in which countries) they wish to continue to the application.

Finally, the (published) international application and the international search report, as well as the international preliminary report on patentability, are communicated to the national or regional offices for the jurisdictions in which the applicant wishes to receive patent protection. Following this, the application enters the “national phase”. The decision of when (or whether) to enter the national phase is left to the applicant.

In deciding when to proceed to the application to the national phase, applicants face different time limits before different patent offices, and as such an international application may simultaneously be in the international phase for some States and the national phase for others. In general however, applicants must fulfil the requirements to move into the national phase (such

¹⁶ These include national Offices of Australia, Austria, Brazil, Canada, China, Finland, Japan, the Republic of Korea, the Russian Federation, Spain, Sweden and the United States of America, the Nordic Patent Institute, and the European Patent Office. The availability of a particular ISA to the nationals or residents of a country is determined by the receiving Office where the international application is filed.

as paying relevant fees, submitting a translation) within 30 months of the priority date of the application.¹⁷

Once they have entered the national phase, applications undergo the relevant grant procedure of each jurisdiction (as described above). In comparison to a direct examination therefore, a PCT application provides applicants with the potential to delay the point at which their application enters the national (or regional) grant procedure.

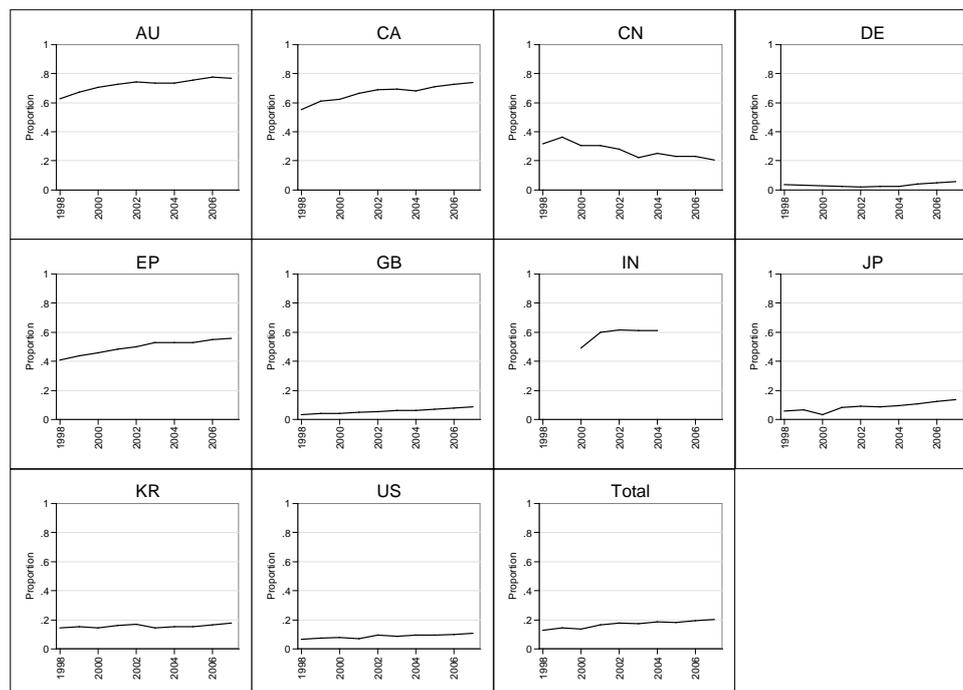
Impact of the PCT

PCT filings have become an increasingly important component of applications in recent years. In the ten offices in the study, PCT applications entering the national / regional phase increased from around 130,000 to over 320,000 between 1997 and 2007 – an increase of almost 150%. Notably, Figure 11 also indicates that the PCT has been growing as a proportion of total applications in recent years at most patent offices (with the exception of China, where domestic applications have become increasingly important as discussed above). Across all the patent offices (excluding India), PCT applications increased from 12% of applications in 1998 to over 20% in 2007.

It is also notable that the importance of the PCT (in terms of the proportion of applications it accounts for) varies considerably across patent offices. PCT applications are a relatively small proportion (under 20%) of the total number of applications at most offices. However, the PCT is much more prominent in some offices – accounting for around 75% of applications at both the CIPO and IP Australia, and more than 55% of applications to the EPO.

¹⁷ The time limit for the EPO is 31 months.

Figure 11: Proportion of applications from the PCT, 1998-2007



Note: Year plotted refers to year of filing.

Source: *London Economics using WIPO data and patent office information.*

The growth of the number of applications going through the PCT could be seen as a measure of success, in that it signals that it is attractive to applicants. However, this has also been seen as contributing to the growing number of pending patent applications, by making it extremely easy for applicants to file in additional countries (McGinley, 2007). Interestingly, however, the estimated costs of applying through the PCT are in fact no lower than applying via the national route.¹⁸

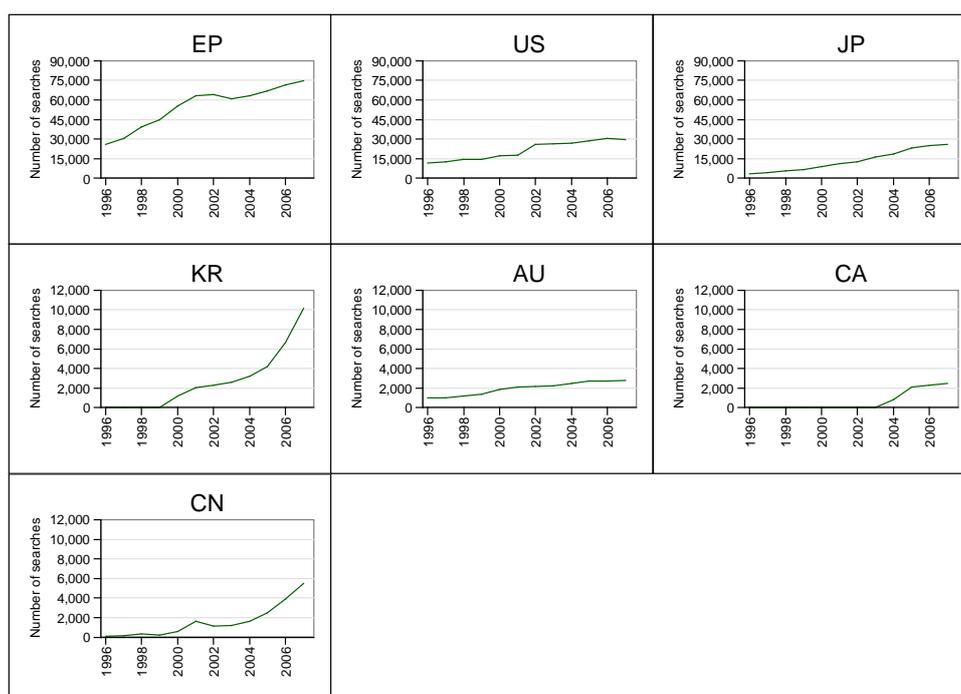
Once entering the national phase, we might expect PCT applications to encounter fewer difficulties, as they have had the benefit of receiving the international search report, written opinion, and (if requested) the IPER, and hence will be able to amend the application prior to entering the national phase. Further, many jurisdictions will use the ISR and IPER in their examination procedure, hence expediting the process. In addition, PCT

¹⁸ Based on WIPO (2008b) an application to two countries through the PCT is estimated to cost \$19,406 compared to \$16,971 through the national route. The comparable figures for an application to seven countries are \$60,481 and \$59,397 respectively, while for an application to fifteen countries, the figures are \$118,339 and \$119,381. Costs include official fees, legal costs and translation costs.

applications may be processed earlier than a direct application which reaches the national office at the same point, as they are likely to have an earlier priority date.

In practice however, the PCT does not tend to be used to provide its full potential as a work sharing mechanism. Although the number of International Searches carried out has grown rapidly, as shown in Figure 12, these are often seen as unreliable and are accordingly ignored once the patent application passes into the national phase.

Figure 12: International searches, 1996-2007



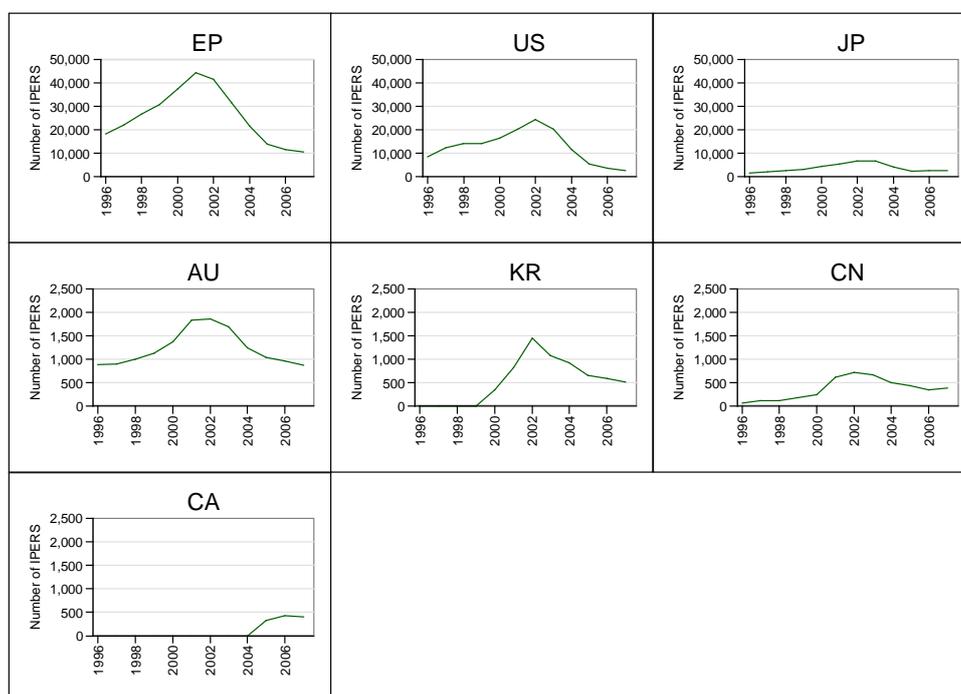
Note: The y-axis scale differs between graphs.

Source: London Economics using WIPO data.

Further, although international search is a mandatory part of the PCT, there is no requirement for applicants to obtain an International Preliminary Examination Report. In fact, as shown in Figure 13, the number of reports has decreased steadily since 2002 at all patent offices. The likely explanation for this is that prior to April 2002, a request for an IPER extended an applicant's deadline for entering the national phase (from 20 months to 30 months). Since April 2002 however, the time limit for entering the national phase has been 30 months, regardless of whether a request for preliminary examination has been submitted.

Again, as noted elsewhere in the report, this appears to indicate that many applicants wish to prolong the application process as much as possible. It should be noted however, that this may not be an appropriate explanation for all applicants. A recent focus group of UK-based PCT users held by the UKIPO, as part of a consultation process regarding ways in which the PCT could be made more effective, found that users would request IPERs more often if they could get timely responses from the examining authority. Users reported that IPEAs were too slow in responding to amendments and that, as a result, it was impossible to get an application in order during the international phase. This suggests that some users may have stopped using the service because it is ineffective, rather than as a result of the change in the deadline to enter the national phase.

Figure 13: International Preliminary Examination Reports, 1996-2007



Note: The y-axis scale differs between graphs.

Source: London Economics using WIPO data.

Even where an IPER is requested, firms face little incentive to amend their claims to meet any objections raised. (This also applies to any issues highlighted by an ISR). By not amending their claims before entering the

national phase, applicants may obtain a “second bite of the cherry”, while also postponing the associated costs (in terms of legal fees for instance).¹⁹

2.4.3 Patent Prosecution Highway (PPH)

A number of patent offices have entered into bilateral arrangements for mutual recognition with other offices through the Patent Prosecution Highway (PPH) initiative. Under the PPH, applicants are able to significantly accelerate examination where examination work has already been conducted at another intellectual property office with whom a PPH agreement in is in place. In particular, if the claims of a patent application have been found to be acceptable by a first intellectual property office, the applicant may request accelerated examination of a corresponding application at a second intellectual property office.

At the time of requesting accelerated examination at the second patent office, the applicant provides the search and examination reports from the original patent office. This information then allows the second office to benefit from the work done previously, reducing the examination workload and potentially improving patent quality. For instance, as available databases vary between different offices, this may allow the second office to identify prior art that they would otherwise have been unaware of.

Nearly all the PPH arrangements involve either the JPO or the USPTO, and have been implemented following an initial trial period. In general, the results of these pilots seem to have been positive, but, as shown in Table 3 below, have received only limited take-up amongst applicants, suggesting that the potential impact may be limited. In fact the only office that has received even a slightly significant number of requests is the CIPO, where requests amounted to 1.5% of first actions.

¹⁹ This point was raised by the representatives of the CIPO during an interview with London Economics..

Table 3: PPH requests at different patent offices	
PPH Pilot Program	PPH Requests Received
CIPO - USPTO	413 - 6
JPO - USPTO	454 - 828
KIPO - USPTO	74 - 133
UKIPO - USPTO	15 - 52
UKIPO - JPO	9 - 9

Source: CIPO (2009), UKIPO information.

CIPO have also undertaken more detailed analysis of the impact of the PPH (CIPO, 2009). This shows that the scheme was successful in incentivising applicants to amend their claims, with this occurring in 84% of PPH requests. As a result, over 40% of PPH applications were allowed at first examination, which is “significantly higher” than the usual allowance rate, while only 30% of applications that were not allowed contained prior art objections. This seems to suggest that the PPH could lead to significant time savings both for applicants and patent offices (although at present there is insufficient data to estimate the likely effect on pendency times).

2.4.4 Utilisation Pilot Project (UPP)

The European Patent Network launched the Utilisation Pilot Project in 2007 as one of its initiatives to encourage co-operation between the EPO and national IP offices. As the name of the Pilot suggests, EPO examiners utilised work carried out by national patent offices on national filings to process subsequent European patent applications. The intended benefits of this information exchange are to improve the quality of the patent grant procedure and reduce patent backlogs. The EPO is currently in the process of implementing the UPP.

When the utilisation scheme is scaled-up, it should reduce aggregate backlogs at the EPO through two channels. Firstly, by shortening the pre-classification process that determines the routing of an application at the EPO (by using national patent office classifications). Secondly, by reducing the amount of duplicate work carried out by EPO examiners at each stage of the grant procedure (for example, search activities and examinations). Moreover, it is envisaged that full, two-way co-operation of this kind will eventually lead to a dramatic reduction of backlogs throughout all offices of second filing within the Network.

The results of an impact assessment of the Pilot show some evidence of improvements in both the quality and speed with which the patent grant procedure is conducted. The majority of examiners, 54%, reported that having access to information from national patent offices improved the quality of their work. In addition, examiners perceived a time saving as a result of having access to national patent office documents; with survey evidence showing that the reported time saving was systematically higher the greater number of national patent office documents reused. That being said, on average, the perceived time saving was only 2.7%. The Pilot can therefore be viewed as largely neutral in its effects on patent backlogs.

In addition to these findings a number of interesting observations were made about strategic behaviour when applicants were relied upon to facilitate information exchange between national patent offices and the EPO. Only 35% of applicants submitted national search reports to the EPO. This level of participation may indicate strategic behaviour insofar as applicants wish examiners to face a more difficult task in uncovering prior art. Indeed, survey responses from applicants confirm a desire to have independent searches conducted for filings at each office. The impact of applicants slowing down the search process in the hope for better outcomes through their second filing may moot any effect the utilisation scheme has on backlogs. In a similar way, these applicants also treat first filings as serving a filter function, whereby applicants modify their filings based on outcomes at a national-level to have a better chance of success at the office of second filing (only 63% of filings to the EPO had the same claims as their first filing to a national patent office). While the utilisation scheme could be structured such that national patent offices exchange information directly with the EPO, the findings about strategic applicant behaviour demonstrate the importance of the incentive structure in determining the impact of any work-sharing system on backlogs.

2.4.5 JP-FIRST

The JPO Fast Information Release Strategy (JP-FIRST) attempts to encourage information sharing on examination results among patent offices. It involves giving examination priority to applications that have been filed with the JPO and subsequently submitted via the Paris route with other offices. This gives the office of second filing examination results in a timely manner that it can use to complement its own work on the corresponding application, thereby hastening the patent grant procedure.

Having begun in April 2008, the first half-year of results from JP-First have been positive. On average the JPO examined 88% of eligible applications before a first action was passed on these applications in another office (the USPTO, EPO or the KIPO). This implies that information was at the very least made available to offices of second filing, potentially facilitating shorter grant procedures.

2.4.6 Triway

The Triway initiative seeks to encourage sharing of search reports among the three Trilateral patent offices before substantive examination is carried out at *any* of the collaborating patent offices. The programme covers applications filed at each of the three offices, and where the application is ready for examination in each of the patent offices.

Triway goes further than JP-FIRST by not only encouraging information sharing at an earlier stage in the grant procedure but also in coordinating its timing. As a result, any relevant prior art is more likely to be identified at an earlier stage in the examination process, allowing weaker applications to be withdrawn, or appropriate amendments made, before substantive examination takes place. The sharing of search results would also be expected to lead to higher quality of patents granted, and hence more certainty for patent recipients. A small pilot of the programme (involving a maximum of 100 applications) was initiated in July 2008.

2.4.7 New Route

The New Route proposal is currently under consideration by the USPTO and JPO. Under the proposal a filing in any office that is party to the agreement would be deemed a filing in *all* member offices. The office of first filing would then aim to complete first examination within a 30-month period, such that the full search and examination results are available to the office of second filing. This also can reduce the costs for applicants, by giving them sufficient time after receiving the results of the examination procedure in the office of first filing, before deciding whether to continue the application in further patent offices.

2.4.8 Other initiatives

A number of other work-sharing initiatives have also been proposed. Some examples include:

- Strategic Handling of Applications for Rapid Examination (SHARE): each office will give priority to examining applications for which it is the office of first filing.
- Priority Document Exchange: an infrastructure initiative whereby patent offices can rapidly share application information securely online.

FOCUS: a proposal that the Trilateral Offices select and identify technical areas where there is a high degree of cross filings between the Offices. The offices will then “focus” on these areas to build synergies.

3 Literature review

3.1 Introduction

As part of the study, we undertook a review of the relevant academic and policy literature relating to the impact of patent backlogs. This first sets out a brief summary of the general arguments relating to the costs and benefits of patents, including a discussion of the evidence relating to the impact of patenting on innovation. We then look at the literature pertaining to the growth of patent applications by examining the motives firms have for submitting patent applications and discussing explanations for the rapid surge in patent applications in some countries. Finally, we discuss the studies and reports pertaining to patent backlogs, including possible reasons for the growth in backlogs, and the likely costs of patent backlogs and growing patent pendency.

3.2 The benefits and costs of patents

A range of theories have been proposed examining the impact of patents, and the associated costs and benefits. These can usefully be grouped into four categories (Mazzoleoni and Nelson, 1998):

- incentivising innovation;
- incentivising development and commercialisation of inventions;
- inducing disclosure of an invention; and
- enabling orderly development of broad prospects.

We provide a brief overview of each of these arguments below.

Patents incentivize innovations

The fundamental purpose of the patent system is to promote innovation in the economy. According to the classic argument for patent protection²⁰, in the absence of patents, inventors would be unable to prevent competitors imitating their products, and so are unable to appropriate the commercial returns to their innovation.

²⁰ As formulated by Arrow (1962) and Nordhaus (1969) amongst others.

If this is the case, inventors will face the full cost of innovation, but only receive part of the benefit through profits. They will invest only so much in research and development as they expect to receive back in future profits. This may be inefficient, if the value of the invention to society is greater than the value to the inventor.

The existence of a patent system therefore incentivises innovation. However, this is at the cost of granting inventors with a short-term monopoly of a patent. This is likely to lead to high prices for the invention, and hence a sub-optimal level of the good being consumed (during the term of the patent). As such, patents must strike a balance between these two concerns.

As well as these static costs, patents may also impose dynamic restrictions on innovation, by limiting the incentive to carry out 'follow-on' innovations (Merges and Nelson, 1990; Merge, 1994; Lerner, 1995).

Patents incentivise development and commercialisation of inventions

As well as incentivising innovation, patents can also provide incentives for inventors to develop their inventions in a commercial way. Often a patent may be granted early in the life of a product – where a significant amount of development work is required to make the product commercially viable. This implies that holding a patent *at an early stage* is important – as it will convince inventors to commit to developing the product further.

This argument may be particularly important in considering innovation by entities that would have made the invention in any case (universities for example). In this case, the benefit of the patent is to provide firms with the incentive to carry out the additional work to be able to market the invention without fear of imitation by a competitor.

Patents induce disclosure of an invention

The third area of benefit from a patent system is to induce inventors to register their invention to gain the benefits of the patent. Under most patent systems the broad scope of a patent is published eighteen months after filing, with the full details published upon grant of the patent.

In the absence of such a system, firms may attempt to appropriate some returns from the invention by producing it while keeping the details of the invention secret for as long as possible. Further, if as mentioned above, some inventors are unable to commercialise their invention, patents play a role of "advertising" the patent to larger firms, who may then license and develop the product.

This dissemination of information also helps inventors avoid duplication of existing inventions, and may also allow the development of innovations building on current technology (Langinier and Moschini, 2002).

Patents enable orderly development of broad prospects

As well as being linked to specific commercially valuable inventions, innovation can also be broader, opening up the opportunity for a new set of inventions, or a new field of research. According to the prospect theory of patents, put forward by Kitch (1977), patents allow these opportunities to be developed in an orderly fashion. Without patents on such discoveries, which allow the patent holder to control future innovation, inventors would engage in wasteful duplication of effort to commercialise the inventions. Patents, on the other hand, allow future innovation to develop.

However, the efficiency of the patent in this scenario relies on the opportunity for the initial invention to be built on and developed, either by the patent-holder or other firms (via licensing). To be efficient this in turn implies that either the patent-holder must be best-placed to carry out the future research (in all possible applications), or there must be a functioning license market (i.e. with low transactions costs) (Langinier and Moschini, 2002; Mazzoleoni and Nelson, 1998).

3.3 The impact of patents on innovation

The literature has sought to examine the impact of patent protection on R&D in two main ways. First, surveys of patent holders have looked to identify the impact of receiving patents on innovation. These have generally found that patents have a relatively small impact on the rate of innovation in the industries examined. Mansfield (1981), for instance, examines 31 innovations in the chemicals, pharmaceuticals, electronics, and machinery industries, finding that one-half of the innovations would have occurred without patent protection – and three-quarters if drug innovations are excluded. Generally, this was explained by the fact that patent protection had only a limited effect on limiting the entry of imitation products into the market.

Similarly, Cohen et al. (2001), using a survey of 1,478 manufacturing R&D managers, found that patents were seen as relatively ineffective compared to other appropriation strategies²¹ in protecting both process and product innovation. Interestingly also, companies tend to use multiple protection

²¹ The strategies examined included other legal techniques, secrecy, lead time, complementary sales/service, and complementary manufacturing. Secrecy was reported as the most effective mechanism on average.

mechanisms. The survey showed that the main reasons for *not* patenting were the necessity of disclosure and the ease of inventing around patents.

Arora et al. (2003) use US data to estimate the value that a firm gains from patenting an invention (the "patent premium"). Notably, the average benefit from patent protection across all inventions (i.e. including both those patented and those that were not) is only anticipated to be positive in a few industries (particularly "Biotech", "Medical instruments" and "Drugs and medicines"). This suggests that patenting a "typical" invention in most industry sectors would not be profitable for inventors, due to the costs of patent protection (such as filing costs, information disclosure and the potential for "inventing around").

However, although patent protection was not found to be beneficial for inventions on average, it was found to be valuable for inventions where the firm sought patent protection. In particular, the value of these inventions was estimated to be between 75% and 125% higher with than without patent protection, depending on the model specification used.

The model estimated by Arora et al. (2003) can also be used to estimate how the level of R&D spending is affected by a change in the patent premium (i.e. the benefits associated with patent protection). Estimating this effect is complicated because both R&D and the decision to patent are influenced by the same factors (for instance, the level of patent protection). Controlling for this, Arora et al. (2003) estimate that on average R&D spending would fall by 35% if patent protection were removed. Alternatively the results can be interpreted as showing that a 10% increase in the patent premium would stimulate R&D by a patent holder by about 6%.

Interestingly, the estimates suggested that this effect varies across industries, with the elasticity varying from about 10% in health care related industries, to 4-5% in electronics and semiconductors. It should be noted however, that the study does not account for the impact of patent use on industry entry, which might be expected to be associated with innovation (EC, 2005).

3.4 Motives for patenting

In order to understand the ways in which patent backlogs may affect patent holders, it is important to understand the motivations that companies have in applying for patents. The literature discussed above has suggested that companies may not feel that patents are a (relatively) useful way to protect innovations; which calls into question why they apply for patents at all.

Broadly, the motives to patent an innovation can be split into two groups: traditional protection of the innovation, and strategic motives (Blind et al., 2006).

Strategic motives for patenting have come into increasing focus in recent times, and are often seen as a key cause of the recent surge in patent applications (see further discussion below). A wide range of motives can be considered “strategic”, defined by the fact that the decision to patent is (at least in part) made on the basis beyond the need to appropriate the returns resulting from R&D investments in an invention.

Strategic motives are extremely diverse, but in general the two most reported in the literature relate to the need to block competitors either “offensively” or “defensively” (Blind et al., 2006). Offensive blocking refers to firms seeking to establish very broad protection around their patents, even though there is no direct desire to use the patent themselves, in order to prevent competitors using the technology in adjoining technical fields. Defensive blocking exists where firms register patents to provide themselves more scope for future inventions, including avoiding patent litigation suits from other firms (Blind et al., 2006; Cohen et al., 2002).

Blind et al. (2006) also identify a number of different strategic motives, including reputational factors, licensing revenues, the fact that patents may be used as an indicator of staff performance, pressure relating from activities of other companies, to enforce standards, providing access to capital markets and to act as a means of exchange or negotiation with other firms in the industry.

Several studies have sought to examine, through surveys of patent holders, the relative importance of different motives for patenting. The results are displayed in Table 4. All of the studies indicated that the traditional protection motive is the most important in determining patent applications. Of the strategic motives, the defensive and offensive blocking were generally found to be of high importance.

Interestingly, several of the studies indicate that the use of patents for exchange potential or for negotiations was the most important strategic motive. Similarly, a study carried out for the OECD found that patent holders felt that they were required to increase their patent holdings in response to other firms.

The studies also provide some evidence of firms using patents to enter foreign markets, although the ranking of this in comparison to other motives is low.

Table 4: Ranking of the significance of motives to patent in recent empirical studies

	Arundel et al (1995)	Duguet and Kabla (1998)	Cohen et al. (2002)	Pitkethly (2001)	Schalk et al. (1999)	OECD (2003)	Blind et al. (2006)
Traditional motive							
Protection from imitation	1	1	1	1	1	-	1
Strategic motives							
Defensive blockade	3	2	3	-	2	3	2
Offensive blockade	-	-	2	2	3	-	4
Reputation/ technical image	-	-	5	-	6	-	3
International market extension	5	5	-	-	-	4	5
Internal performance indicator/motivation	6	6	7	-	5	-	6
Exchange potential/negotiating mass	2	2	4	3	4	2	7
Licensing revenues	4	4	6	4	7	5	9
Make own invention the standard	-	-	-	5	-	-	10
Capital market	-	-	-	-	6		8
Forced to patent because of patent practice of others	-	-	-	-	-	1	-

Source: Compilation by Blind et al. (2006) Table 1 and Table 4.

3.5 Understanding the surge in patent applications

As discussed in Section 2.3, the number of patent applications has increased significantly in recent years, with some offices in particular experiencing growing backlogs of unexamined applications. At one level, this could be seen as a positive step, reflecting an increase in innovation, and a move to a more technologically intensive society (Hedlund, 2007). However, a number of other hypotheses have also been put forward, which have different implications for patent policy.

A number of studies and reports have looked to understand and explain this growth, particularly within the US context where growth has increased significantly from the early 1980s. Kortum and Lerner (1999) examine whether this was driven by changes in the legal regime facing US patent holders (in particular the establishment in 1982 of a specialised appellate court to hear patent cases). However, this hypothesis was not supported by

their analysis, which instead suggested that a “burst of innovation” was driving the increase in patent numbers.

More generally several papers have found that the growth in applications in the US has been accounted for by firms in the electrical and computing technology sectors (although patenting has increased in all technology classes) (Hall, 2005). However, while finding that there was a structural shift to a higher growth rate in patenting in the US between 1983 and 1984, Hall (2005) reports that the growth in R&D in these sectors was insufficient to explain the increase in patenting. This suggests that either the management of patenting has improved over the period, or alternatively that growth is determined instead by changes in firm patenting strategies.

These results suggest that certain technologies may be driving the growth in patent applications within the US. However, importantly, these studies do not account for growth in patent grants any later than 1997. As such, the issue of whether the same pattern has emerged in recent years remains open to question. Further, the studies are (by design) US-specific, and so are not necessarily representative of global trends.

Hu et al. (2005) have investigated the recent rapid growth in patent applications in China using data from 1995 to 2001 from the Survey of Large and Medium Companies compiled by China’s National Bureau of Statistics. They find that the link between R&D and patent applications is weak – suggesting that increasing R&D intensity within China is responsible for less than a quarter of the growth in patenting. The largest impact came from year effects in 2000 and 2001 which as 2000 saw the introduction of more pro-friendly patent legislation within China, they interpret as reflecting the impact of a more patent-friendly environment.

Apart from these empirical papers, various other reports have also sought to explain the increase in patent applications. One reason often focused on is the globalisation of patent applications, leading to companies needing to increase their patent protection internationally and hence resulting in applications being entered in several separate patent offices (“second filings”) (EPO, 2007). In particular, businesses have begun to make more use of the Patent Cooperation Treaty (PCT), which makes filing in multiple jurisdictions straightforward (McGinley, 2007; Lehman 2006). This is indicated by growth in second filings. de Rassenfosse and van Pottelsberghe (2008a) find evidence that the decrease in fees in some offices²² (because of the ability of filing in several at the same time) also affect the demand for patents strongly (they estimate an elasticity of demand for patent applications in relation to application costs and fees of -0.4).

²² The fees at the EPO have dropped sharply relative to other patent offices’ since the mid 90s although the EPO fees are still two to three times higher than the USPTO’s.

Second, the tendency of companies to file more applications has also been noted with the belief that companies now engage in “patents arms races” (Lehman, 2006). Third, in the US context, the widening of patentability (e.g. to allow business process and software patents) has also been seen as an explanation for the increase in application numbers. Fourth, the emergence of patents as a financial asset is also leading to growth in patent applications, as intangible assets becoming an increasingly important part of company value. This is likely to increase further as the International Accountancy Standards and Basel II Capital Accords both recognise patent valuation techniques (McGinley, 2007).

3.5.1 Summary – drivers of surge in applications

- increase in innovation, and a move to a more technologically intensive society, particularly growth in R&D in firms in the electrical and computing technology sectors (a driver but not, empirically, the major driver of increased patenting)
- changes in patenting legal regimes (some evidence for US of widening scope of patentability and for China of a more patent-friendly regime)
- globalisation of patent application strategies with firms needing patent protection in more than one country
- changes in firm patenting strategies (‘patents arms races’)
- the emergence of patents as assets against which firms can gain access to funding

3.6 Drivers of patent backlogs

Prima facie, the growth in patent backlogs across the world has been caused by the increase in patent applications. However, this is not the sole cause of increases in backlogs. The burden of applications on patent offices is determined not only by the number, but also the *size* and the *complexity* of patent applications.

During the same period as the increase in applications, the size of applications also increased dramatically. At the EPO, for instance, the number of claims per filing to the EPO increased at 2.5% per annum between 1988 and 2003, while the number of pages increased at 5.3% per annum (van Zeebroeck et al., 2007). The reasons for this include increased technical complexity, the growth of emerging sectors (such as biotechnology and computer science), the “export” of different drafting styles and patent strategies focusing on large, unfocused patents (EPO, 2007; van Zeebroeck et al., 2007).

Further, there is evidence that different filing strategies are associated with different pendency periods (that is the time taken to grant a patent). Van Zeebroeck (2009) shows, using EPO data, that applications with more claims or with equivalent filings at the EPO have longer periods to decision. The largest applications in terms of claims, for instance, take up to two years more to be processed. Further, the estimates indicated that divisional applications²³ took on average more than five years more to be processed than a normal application. Although this is a consequence of the nature of a divisional - i.e. a later filing receiving the same priority date, this indicates the potential that exists for applicants to use filing strategies to extend the time for their application.

Notably also, van Zeebroeck (2009) finds that higher tech industries (biotechnology, IT, telecommunications) are characterised by longer pendency, and lower grant rates. Further, generally those applications with the highest number of claims - and hence longer pendency, also had lower grant rates, suggesting that these strategies may be associated with lower quality patents.

Supporting evidence for strategic behaviour by patent applicants is provided by a study modelling delays in examination requests across four patent offices (Jensen et al., 2007). The study uses a matched dataset of 9,597 sets of non-PCT applications filed at each of the USPTO, the EPO, the JPO and IP Australia, with a common application. The results indicate that the length of the delay in making examination requests is negatively affected by a measure of private knowledge regarding the quality of the application (measured by the eventual rate of grants across the four patent offices). This implies that applicants use the knowledge of the application they have to hasten or delay the granting procedure. Applicants who know their application is of low quality will use strategies that delay examination and thus extend the period over which their patents are pending.

These results do not show conclusively that applicants do deliberately use the patent system to delay applications. However, they do indicate that that is possible. This raises the question of why an applicant would seek to extend the processing time for an application.

One reason for delaying decision may be if the applicant feels the application has a low probability of grant. In this case, the applicant can avoid the costs of examination - or of grant and subsequent legal disputes - for longer (Jensen et al., 2007; van Zeebroeck, 2009). Further, a pending patent is better than no patent - the longer the application is outstanding the more uncertainty for competitors (discussed in more detail below), and the more possibility of

²³ A divisional application is an application which contains matter from a previously-filed application.

obtaining financing, and licensing based on the invention (van Zeebroeck, 2009).

Further, delaying decision on an application may allow applicants to change the legal scope of the application (to an extent), whereas once granted this is impossible (van Zeebroeck, 2009). For instance, a firm may identify a broad set of potential inventions, one of which may be commercially valuable at a later date. A plausible strategy here would be to enter an initial, very broad patent immediately, delay decision for as long as possible, then extract the most relevant elements into a divisional filing at a later date. Building on this, pending patents could be used to exclude smaller competitors from a market.

Patent offices and the way in which they design the patent application procedures may fail to sufficiently discourage applicants from purposely delaying examination.

3.6.1 Summary – drivers of patent backlogs

- increasing number of applications
- size and the complexity of patent applications due to a combination of: growing technical complexity; patents from emerging sectors (such as biotechnology and computer science); “export” of different drafting styles
- patent strategies involving applying for large, unfocused patents (e.g. a firm identifies a broad set of potential inventions, files a very broad patent immediately, delays examination for as long as possible, then as its research progresses extracts the most relevant elements into a divisional filing at a later date)
- applicants’ preference for lengthy pendency times (evidenced by a positive correlation between pendency and a measure of applicants’ private knowledge of the quality of their applications) - a pending application is better than no patent at all and the longer the application is outstanding the more uncertainty for competitors and the more possibility of obtaining financing, and licensing based on the invention
- patent offices’ incentives structure may also contribute to backlogs if it does not sufficiently discourage strategic delay of substantive examination

3.7 Impacts of patent backlogs

This discussion leads naturally to consideration of the costs of patent backlogs. To some extent, given that patent protection is backdated to the date of first publication, the incentive for innovation encapsulated in the patent should be unaffected by the fact that grant takes longer.

However, this view overlooks the uncertainty that looms over a patent application before grant. Without this certainty, businesses may find it hard to make appropriate decisions over use of the invention, such as licensing or joint ventures or to protect their invention from infringement (Jensen et al., 2007). Long pendency may delay product roll-out and, to the extent future inventions are based on prior ones, deter future innovation (Lehman, 2006). This may particularly hurt smaller companies who may struggle to attract investment (e.g. from venture capital firms) without a confirmed patent, or those operating in industries with short product cycles (Pinkos, 2005).

Further, given the delays in patent pendency, firms may increasingly turn away from the patent system and rely on other methods of appropriation discussed above, such as trade secrets. This in turn means a loss of the dissemination of knowledge that is achieved through patenting (Pinkos, 2005).

Backlogs also incur costs from the increased period during which a non-patentable invention receives patent protection (while at “patent pending” stage). This imposes costs on the consumer, impedes competition, and may (falsely) aid firms in negotiations with other market players (van Zeebroeck, 2009).

Patent backlogs may also impose costs through lowering the *quality* of the patents granted as examiners strive to process applications more quickly in the face of rising workloads. As patent offices seek to hire more staff rapidly in response to rising numbers of applications, the proportion of senior staff decreases, and those staff spend more time training the new hires (Pinkos, 2005). In recent years plenty of anecdotal evidence has cited falls in patent quality, although to date there has been little empirical evidence of this effect (Hedlund, 2007).

A reduction of patent quality, if this does result from patent backlogs can be costly for three main reasons (Hedlund, 2007). First, if examiners are incorrectly granting applications, it may encourage firms to pursue patents for potentially infringing inventions because they know that there is a possibility of grants. The backlog problem is then exacerbated, as more applications are attracted.

Second, a low quality patent system creates an environment where infringement and litigation are more likely, as the validity of patents is

questionable. Again, this may create an incentive to file more low quality patent applications to take advantage of this.

Finally, if patents are granted incorrectly they effectively incur the costs of patent protection (the imposition of a monopoly with associated high prices), without the benefits of incentivising true innovation. This may also restrict further innovation, if “true” innovators are as a result unable to enter a particular technological field.

Barros and Stoneman (2002) argue that, for certain technologies, the direct cost to applicants of patent backlogs may not be significant. Their survey evidence indicates that patents are applied for at the very beginning of the R&D process before most of the investment is done and that applicants use the time while the patent is pending to attend to the many aspects of developing the innovation.

Palangkaraya, Jensen and Webster (2008)’s evidence also supports the view that certain applicants may be quite happy with long pendency periods. In particular, applicants for whom the expected value of the patent is higher are more likely to delay requests for examination.

Johnson and Popp (2003) further find that when patents take longer to be granted, other forms of knowledge diffusion are available and reduce the potential impact of longer pendency periods on innovation.

Another way in which long pendency of applications before examination may have a positive impact is through encouraging withdrawal of patents on which the applicant has lost interest. Lazaridis and van Pottelsberghe (2007) and Crouch (2009) reflect these views although the latter considers the benefits of delay in terms of requests for deferred examination.

3.7.1 Summary – impacts of patent backlogs

- Costs to the applicant – uncertainty about validity of the claims takes longer to be resolved complicating planning, investment decisions and access to funding
- Impact on patent quality – if the backlogs stretch patent offices’ resources and patent quality decreases: more applicants are encouraged to ‘try their luck’; infringement and litigation will increase; the balance of costs and benefits inherent to any patent system is heavily tilted towards costs
- Costs to other innovators – if the patent is ultimately not granted, the extra pending period (due to backlogs) can delay or deter innovations that use the pending claims

- Costs to competitors and consumers – may result from the lengthy pendency of an application that is finally dismissed resulting in fewer product variety and higher prices

3.8 Backlogs and other trends affecting patent quality

Large increases in the number of applications can cause strain on the resources available to POs and may result in longer pendency and render the time and resources available for search and examination inadequate.

There is also an important trend for increased complexity of the subject matter of the patent application. In fast moving technical fields it may become increasingly costly for patent offices to maintain the resources needed for thorough search and examination. The resources include both the training of the examiners and the databases of prior art information that they can draw upon.

When looking at trends affecting patent quality it may also be pertinent to look at the incentives of the different stakeholders. Applicants may have strategic objectives when submitting some patent applications. They may not particularly wish a thorough, rapid, and efficient examination process. In which case they may submit applications that are themselves of dubious quality, with obfuscated claims and accompanied by tactics designed to delay (defer) actual examination for as long as possible.

When the quality of patents granted is low and/or it is considered low by applicants and third parties, the balance between costs and benefits of a patent system is unfavourably affected. Developers of inventions worthy of protection feel uncertain about the strength that a patent will carry in the marketplace. This may deter good quality research and incentivise those who use the patent system for mainly strategic purposes. In addition, low quality patents almost inevitably lead to higher litigation costs for companies, diverting resources from more productive activities.

Ford et al (2007) make an estimate of the cost of low quality patents being granted by the USPTO. Since patent quality is very difficult to measure, the authors approximate it by the difference in grant rates at the EPO, JPO and USPTO, when applications overlap at the three offices. Their model assumes 'bad patents' impose cost because their presence reduces the value and therefore the equilibrium number of 'good patents'.

They find that the economic losses resulting from the grant of substandard patents can reach \$21 billion per year (in the US alone) by deterring valid research and have an additional deadweight loss from litigation and administrative costs of \$4.5 billion annually. Further, the authors note that

these estimates may be viewed as conservative as they do not take into account other economic costs from low quality patents, such as consumer welfare losses from monopoly rents gained by patent holders who have unwarranted patent protection.

4 Analysis of patent backlogs

4.1 Introduction

In this section we consider the impacts associated with patent backlogs. To do this, we first assess the current extent of patent backlogs at the ten offices in the study, considering the most useful measures of backlogs. We then consider the costs that might be associated with these backlogs, and provide an estimate of the level of costs that might be expected to result from an additional year of patent pendency.

4.2 Trends in patent office backlogs

4.2.1 Data on patent backlogs

The first stage in estimating the costs that backlogs impose on the patent system is to identify and construct a standardised measure of backlogs that applies across patent offices. However, our research indicated that, not only is there no commonly accepted measure of backlogs across patent offices, in practice the publicly available data regarding either patent backlogs or (for many patent offices) the number of pending applications outstanding is scarce.

The literature review, combined with the discussions held with patent offices, indicated that the concept of backlogs, although widely discussed, is in fact poorly defined. Backlogs often seem to be discussed in terms of the number of patent applications outstanding. However, this is of limited use, particularly in comparing across patent offices, as it does not account for the level of resources available within the patent office. Further, the nature of the patent system means that there are necessarily some applications outstanding at any point (unless applications are examined and then disposed of as soon as they were filed), and so having applications outstanding does not automatically indicate that a “backlog” exists.

In fact, to actually define a *backlog*, we might consider the level of applications that, due to a lack of examiner action (rather than, for instance, applicant delay) have been pending for longer than target pendency times. However, this information is not available, and so instead we consider measures of patent office workload over time. This accounts for the fact that pending applications are an inherent part of the patent process, and allows for comparison over time and across offices.

The research indicated that few of the patent offices publicly report measures of workload or backlog, and as such, we have sought to construct our own measures based on publicly available information from a number of data sources.²⁴ These included the PATSTAT database, as well as public reports by WIPO, the Trilateral Co-operation and each of the patent offices. In addition, some patent offices provided data directly as a follow-up to our interviews with them. Unfortunately however, we were not able to construct consistent measures, allowing comparisons across patent offices, using these sources.

Surprisingly, it was not straightforward to identify even the number of applications pending at many of the patent offices. It was not possible to use PATSTAT for this purpose, as the database does not distinguish between non-granted applications that are still valid (and so are part of current workload), and those that are not. Instead, information on applications pending has been gathered from patent office annual reports. However, with the exception of the Trilateral offices, publicly reported figures (some reported by WIPO) frequently do not provide data relating to the number of applications pending at each stage of the application process. This makes it difficult to construct consistent measures across patent offices.

Other information was also collected from patent office annual reports, regarding the amount of work carried out each year (i.e. in terms of searches and examinations completed, and the number of applications disposed of) and the number of patent examiners. Again, however, the data available varied across the patent offices. Some offices do not publish this information at all, while others identify the number of examinations completed, but not the complete number of patent disposals.

These issues present considerable difficulties in assessing the extent of the backlog and in particular comparing across different patent offices. However, it remains instructive to analyse the trends at particular offices, as the available data appears to be consistent over time.

4.2.2 Measures of patent office backlogs

Our research has suggested three different possible measures of patent office backlogs:

- i. **The stock of pending applications:** The most intuitive measure of backlogs is the number of applications that require processing by a patent office. However, this is of limited use in assessing whether offices are under workload pressure, as it does not take into account how examination capacity varies across patent offices (or at the same patent office over time). For instance, the same number of pending

²⁴ A full description of each of the data sources is contained in Annex 1.

applications would signify a much larger workload for the UKIPO than the USPTO, due to the difference in the size of the patent office.

- ii. **Stock of pending applications/number of examiners:** This measure is attractive as it is simple to understand, representing the average number of applications per member of the examination workforce. However, it suffers from the fact that it does not take into account differences in productivity (either across time, or between patent offices). Hence it may be less useful in comparing across patent offices.
- iii. **Stock of pending applications/work completed:** This measure estimates the number of years it would take the patent office to clear the current stock of pending applications, at the current rate of search and examination, were no more applications to be received. "Work completed" includes the number of disposals completed. This is useful, as it directly measures backlogs in terms of the current work level of the patent office.²⁵

We discuss each of these measures in more detail below.

Stock of pending applications

Discussions of backlog generally refer to the stock of pending applications. However, although at a first glance measuring of the stock is straightforward, in practice there are a number of issues that should be considered in developing an appropriate indicator.

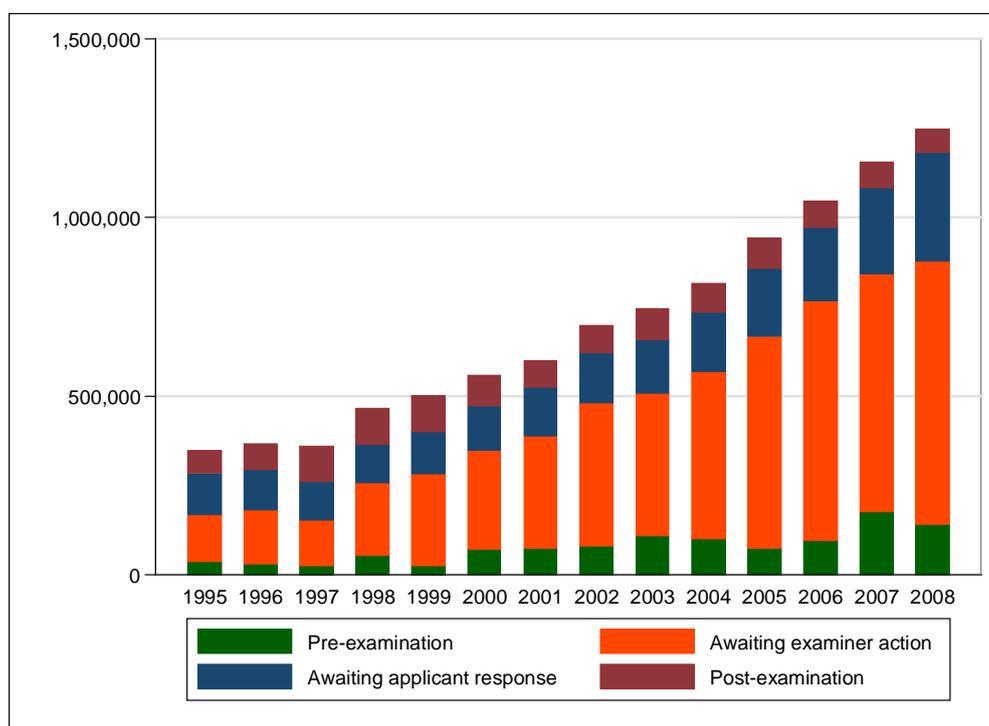
First, applications can be "pending" at several stages of the patent process including before a request for examination is submitted, after a request for examination has been made but prior to substantive examination, after substantive examination but awaiting examiner action, after substantive examination but awaiting applicant action, or awaiting grant. The numbers of pending applications will vary at each stage, and particularly across patent offices due to differences in the patent system. For instance, a large proportion of applications in Japan are awaiting a request for examination, whereas such a stage does not even exist at the USPTO (as request for examination is implied by filing).

To illustrate this point, Figure 14 displays a breakdown of the pending applications at the USPTO. This indicates that around 60% of pending

²⁵ We do not include separate searches (undertaken predominantly at the EPO and the UKIPO) in either the stock of pending applications or the work completed. This is to ensure comparability across patent offices, and enable more straightforward interpretation of this measure of backlog as the time it would take to clear the stock pending applications if no more applications were received. "Work completed" at the UKIPO includes the number of examinations and number of combined search and examinations.

applications can be seen as under examination and awaiting examiner action – i.e. a significant proportion fall outside of this category.

Figure 14: USPTO pending applications by type 1995-2008



Note: Includes utility, plant, and reissue patents. Applications “awaiting examiner action” and “awaiting applicant response” refer to applications undergoing examination.

Source: London Economics based on USPTO annual reports.

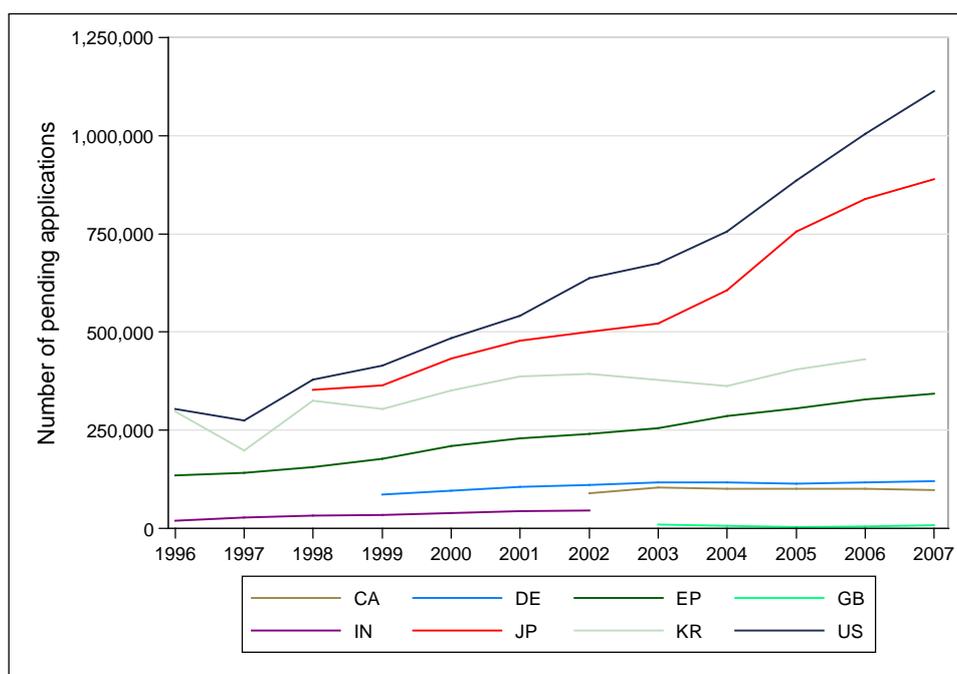
Based on our discussions with patent offices, we believe that the most appropriate measure of pending applications is “all applications for which work has been requested, but which has not yet been completed”, where work includes both search and examination, including separate searches offered. This includes applications which are currently awaiting applicant action as these will (assuming the applicant completes that action) lead to further work for the patent office at a later stage.

In considering this definition, it is important to note that the measure does not directly account for likely future increases in workload. For instance, applications may have increased rapidly, indicating that workload is likely to increase in the future – although this may not *yet* have been translated into a higher number of requests for examination. This is particularly true at offices with long deferral periods. As such, examining these numbers would provide an indicator of the potential workload facing patent offices in the near future. However, unfortunately data regarding applications awaiting request for

examination was generally not available, and so we do not consider this in the analysis below.

Similarly, it might be interesting to consider the number of applications pending between request for examination and first examination action, as during this period, applicants are less able to strategically influence the decision period for an application. Again however, data regarding the number of applications at this stage is not commonly available, and instead we use information regarding the total number of pending applications under examination. This is displayed in Figure 15.

Figure 15: Pending applications 1996-2007



Note: No information regarding pending applications available for China or Australia. Pending applications excludes applications pending awaiting search at the EPO and UKIPO.

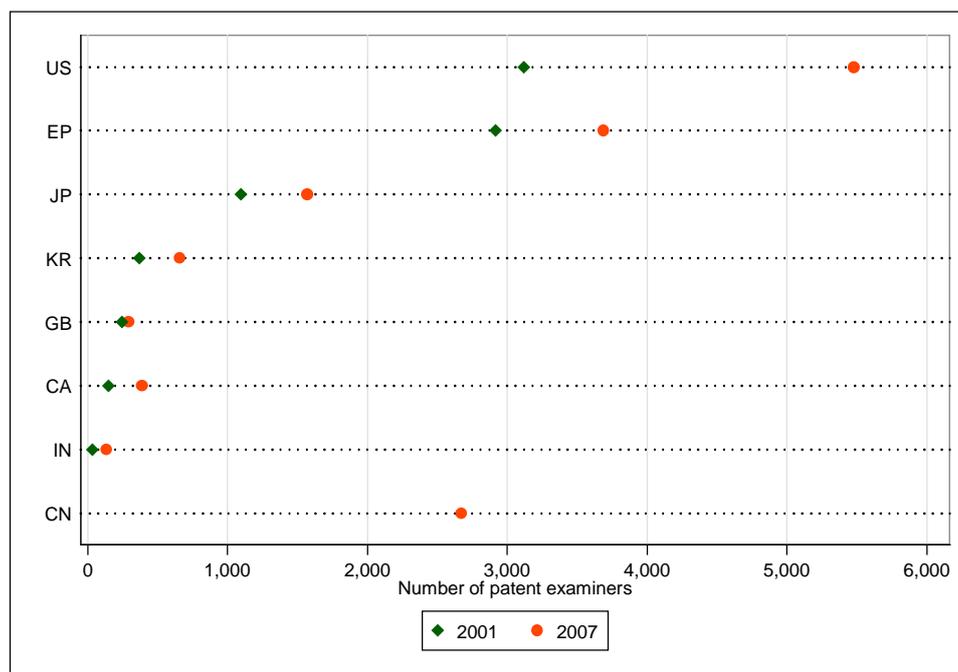
Source: London Economics using data from WIPO, TSR and patent offices.

As the graph indicates, the stock of pending applications has increased substantially at the three Trilateral offices, as well as at the KIPO, while staying reasonably constant (or decreasing) at the other patent offices. However, this does not necessarily imply that patent office backlogs have increased, as it does not take into account changes in patent offices' ability to deal with an increased number of applications - i.e. their examination capacity.

Stock of pending applications per examiner

The crudest measure of examination capacity at each patent office is the number of examination staff employed. All of the patent offices (where data is available) increased the number of examination staff between 2001 and 2007, as displayed in Figure 16.

Figure 16: Number of patent examiners, 2001 and 2007



Note: 2007 figure for India refers to year end 2006. No data available for IP Australia or DPMA.

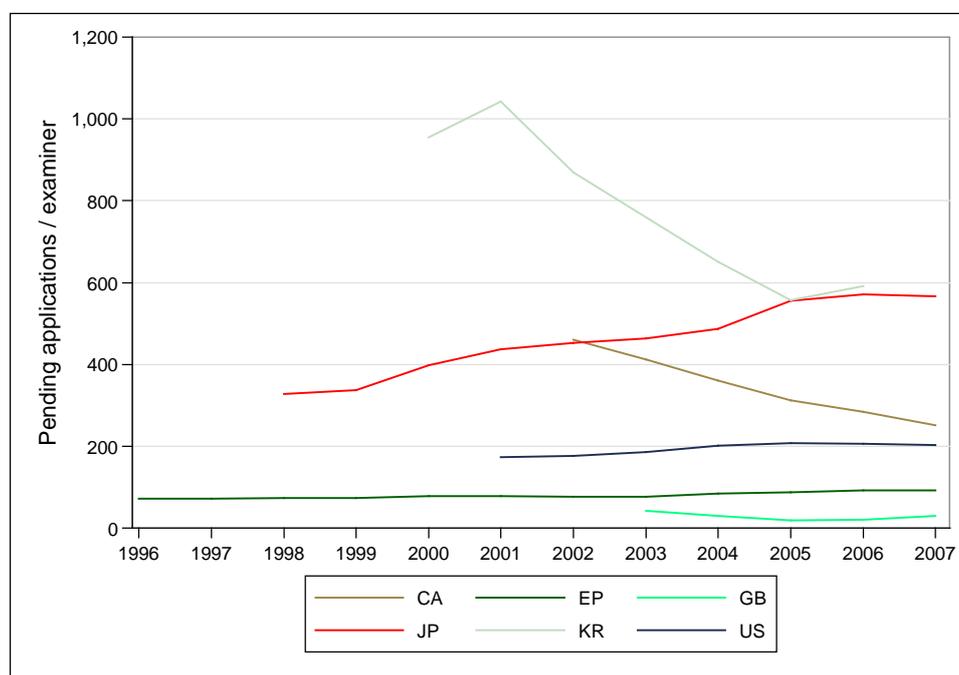
Source: London Economics using patent office information.

The most striking feature of Figure 17, which displays the number of pending applications per examiner at each office, is the wide disparity across the different patent offices. The number of pending applications ranges from around 50 per examiner (in the UKIPO) to approaching 600 (in the case of the JPO). This seems likely to result from the differences both in systems and also in data collection at the different offices. As such, it is more appropriate to compare the results over time within individual offices, rather than between the different offices.

It is notable that the only offices experiencing a significant increase in backlogs, according to this measure, are the JPO and the EPO. In fact, for the period between 2004 and 2006, workload actually declined at the CIPO, the UKIPO, and the KIPO. At the USPTO backlogs did increase between 2001 and 2006, but have fallen slightly in the last two years. Further, the increase in

workload at the JPO is likely to be temporary – and explained by the surge in applications following the change in the period for request of examination.

Figure 17: Pending applications per examiner, 1996-2007



Note: Data for IIPO is excluded, as only available for 2001 and 2002 and based on very small number of staff. Pending applications excludes applications pending awaiting search at the EPO and UKIPO.
 Source: *London Economics using WIPO data and patent office information.*

4.2.3 Ratio of stock of pending applications to work completed

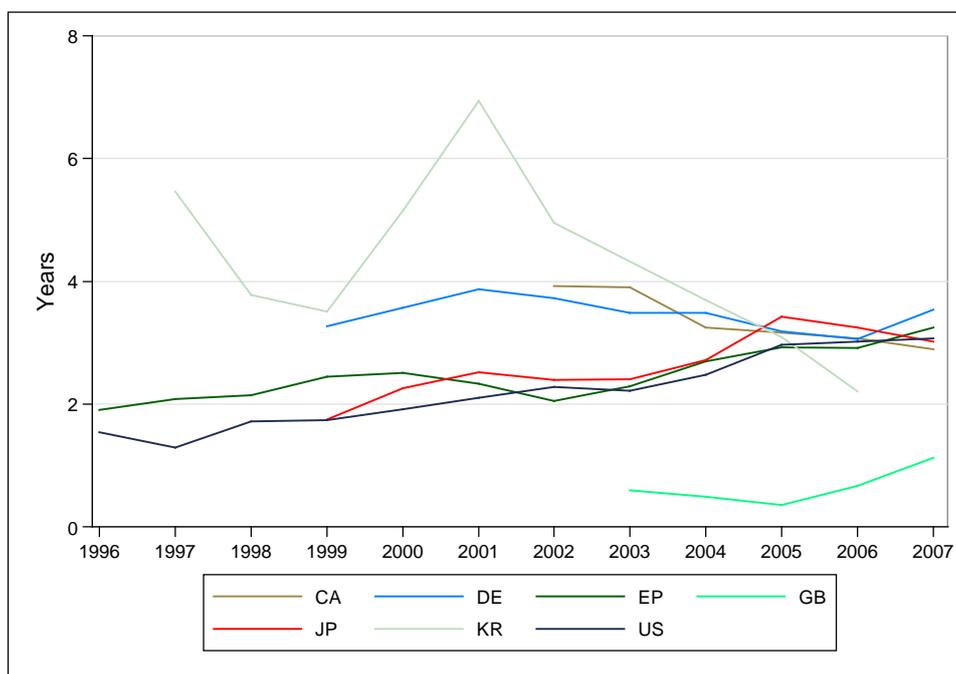
While the estimate of pending applications per examiner provides an intuitive measure of the workload facing patent offices, it is of limited use in comparing across patent offices, if there are substantial differences in productivity²⁶. A more appropriate measure, suggested by a number of the patent office experts that we have interviewed, is to compare the stock of pending applications to the actual work done by the patent office – that is the number of disposals actually carried out each year. This can be interpreted as an estimate of the length of time it would actually take to clear the stock of pending applications were no further applications to be received.

²⁶ In fact it is likely that there are large differences in productivity. For instance, a benchmarking study of the EPO, the UKIPO and the DPMA found that productivity at the EPO was significantly lower than at the other two offices (Ernst & Young, 2007).

Figure 18 displays the trend in backlogs according to this third measure. Again it is important to note that the data is not consistent across patent offices, and so inter-office comparisons are not appropriate. Further, given the lack of clarity regarding the status of the pending applications (as discussed above), it is necessary to be cautious in interpreting the actual numbers resulting from the analysis. Despite these issues however, the *trends* in the measure still provide a useful indication of the impact of the growing number of patent applications on patent office backlogs.

The results do not indicate a consistent trend in backlogs across patent offices. Over the past five years, according to this measure, workload has fallen at the KIPO and at the CIPO. Notably, backlogs have increased at the Trilateral patent offices, although the workload has fallen at the JPO since 2005.

Figure 18: Pending applications / work completed, 1996-2007



Note: Pending applications excludes applications pending awaiting search at the EPO and UKIPO. Work completed is based on the number of disposals each year, with the exception of the UKIPO which includes number of examinations (including combined searches and examinations).

Source: London Economics using WIPO data and patent office information.

4.3 Trends in patent office pendency

While the discussion above has focused directly on the backlogs facing patent offices, an alternative way of assessing the impact of the growing number of patent applications is to examine the associated effect on applicants through

the period taken to receive a patent – the “patent pendency”. Pendency can be estimated at the various stages of the application procedure – most commonly to first examiner action (first action pendency) or to grant (total pendency).

4.3.1 Data on patent office pendency

Pendency data can be obtained from two sources: published information, and from PATSTAT. The PATSTAT data allows us to compare trends across patent offices, using a single data source and comparable (and transparent) methodology. However, it is limited in some key respects.

In particular, pendency from PATSTAT is based on only those applications that reached grant (i.e. not those that were rejected or withdrawn). This may provide a biased estimate of the average pendency, if there is a difference in the time taken to process granted patents and the time taken examining other patent applications. Further, it is only possible to calculate pendency as the time between filing and grant; and so any deferral period is necessarily included in the pendency estimate. This means that pendency will be averaged over those applications for which a request for examination is submitted immediately, and those for which the applicant waits for as long as possible before submitting the request.

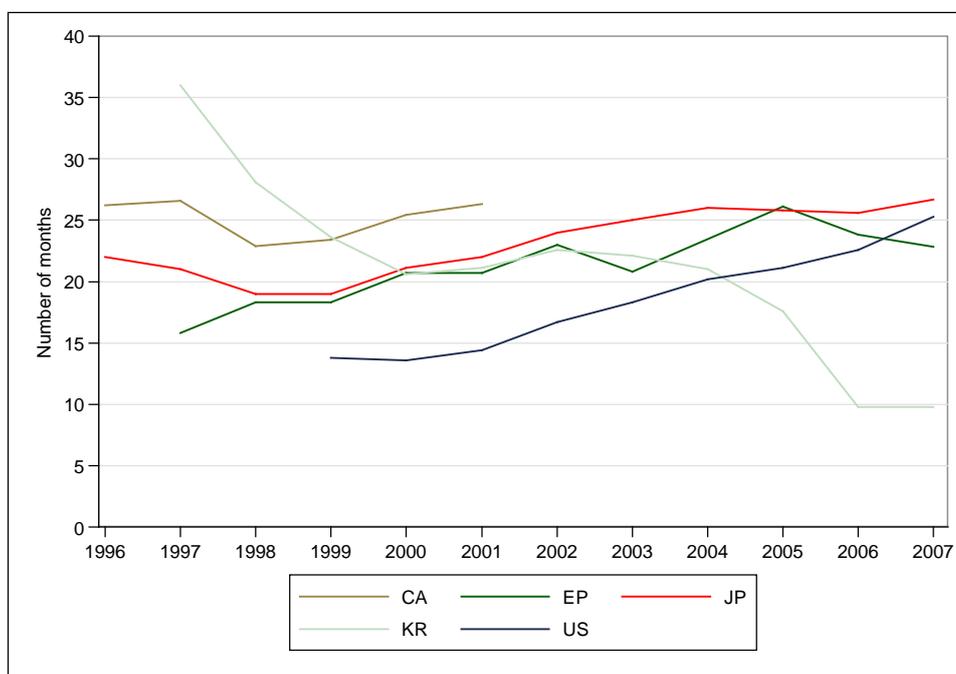
In contrast, published information generally reports pendency from request for examination and, in some cases, provides information on pendency to first action, which is in some ways preferable to total pendency in measuring the performance of the patent office. This is because it removes some potential for delay or strategic filing options on the part of the applicant. It should be noted however that the definition of first action may vary across patent offices, which precludes comparison across different patent offices (although the trends at individual patent offices are still of interest).

4.3.2 Reported patent office pendency

Figure 19 displays the first action pendency reported by five of the patent offices. The trend varies across offices, with pendency falling rapidly at the CIPO and the KIPO. Pendency has been increasing, on the other hand, at the Trilateral patent offices.²⁷

²⁷ The figures displayed for the EPO refer to average pendency (sourced from TSR data). Interestingly, as displayed in the annex, median pendency at the EPO has fallen in recent years despite the increase in average pendency times.

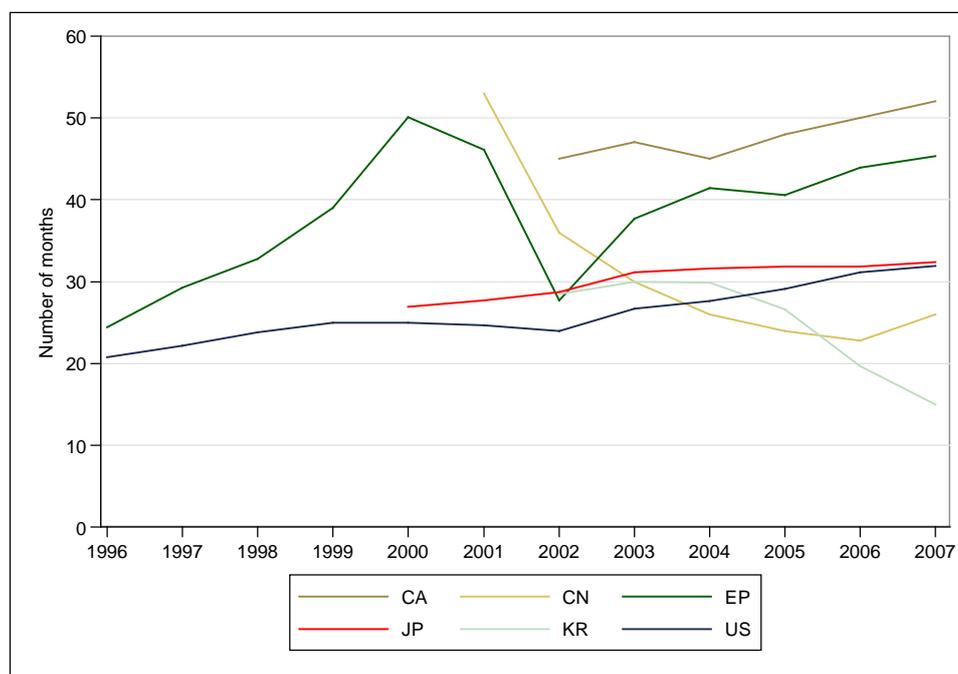
Figure 19: Reported average first action pendency



Source: London Economics using patent office information and TSR data.

A similar pattern is repeated when looking at total pendency reported across the patent offices, as shown in Figure 20. Pendency at the the KIPO and the SIPO has been falling, but has been increasing at the USPTO, the JPO and, since 2002, at the EPO.

Figure 20: Reported average total pendency



Source: London Economics using patent office information and TSR data.

4.3.3 PATSTAT patent office pendency

Using the data from PATSTAT, it is possible to examine the total filing pendency across all eight patent offices²⁸. This measures the total time between filing and grant – and as such includes any period in which an applicant may be waiting to request an examination – which may be a number of years (up to seven years in the case of the DPMA). Further, the output includes only those patents that are granted and does not incorporate either withdrawals or final decisions of rejection (as it is not possible to identify these in PATSTAT).

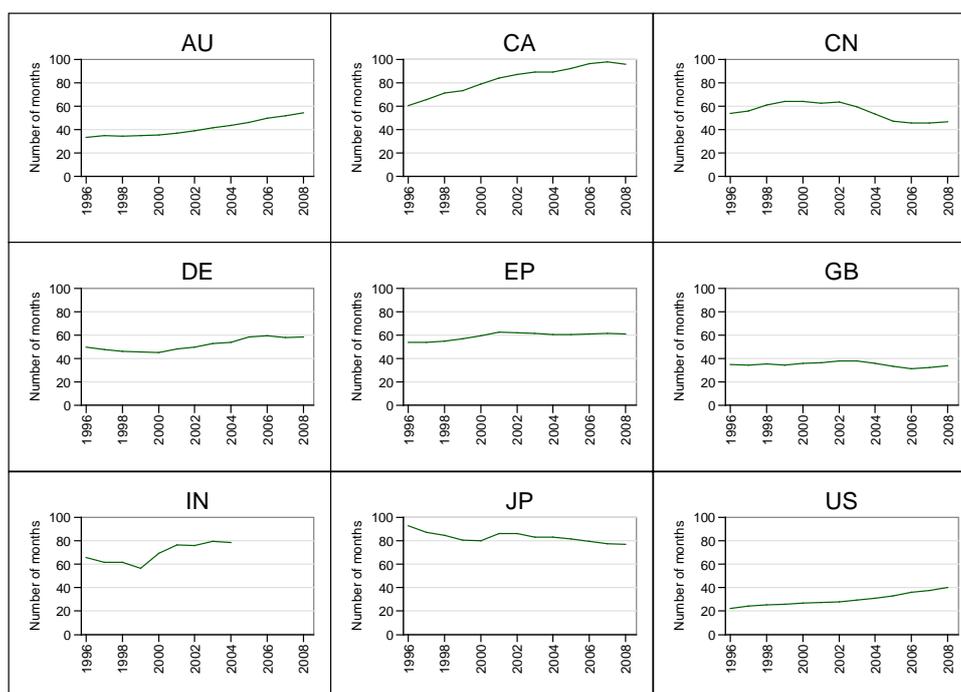
It is important to consider how these issues may affect the pendency estimates, which are displayed in Figure 21. In particular, it is not appropriate to compare the pendency across different patent offices, as both the period applicants have to request examination, and grant rates (i.e. the proportion of applications that are granted) vary considerably between jurisdictions. Similarly, when considering the trends at individual patent offices any

²⁸ Information from PATSTAT relating to the number of B-publications at the KIPO appeared inconsistent with information from KIPO annual reports, and as a result we do not display the pendency estimates relating to these patents.

procedural changes (such as the reduction in the examination request period at the JPO from 2001) must be taken into account.

In fact, as shown in Figure 21, trends in pendency have varied significantly across different offices. Pendency has increased significantly at the CIPO, the USPTO (from 20 to 40 months), at the DPMA, at IP Australia and at the IIPO (for the years for which data was available). Pendency at the EPO increased between 1996 and 2001, but has remained relatively constant over the past six years. At the UKIPO pendency has fallen from a peak in 2003, but has shown signs of increasing again since 2006. On the other hand, pendency at the SIPO and at the JPO has fallen in recent years.

Figure 21: Total pendency (granted patents)



Note: Year refers to year of B-publication. Pendency estimated as period between priority date and B-publication date.

Source: London Economics using PATSTAT data.

The PATSTAT data also provides information on the pendency by ITC technology group. Examining this data did not, however, suggest any particular trends for specific technology groups and, in general, the trend for individual technology groups seemed to follow the overall trend within particular offices.

4.4 Cost of patent backlogs

4.4.1 Overview

Growing patent backlogs may have broad costs beyond the impact on patent offices. As examiner workload grows, patent examination and issuance may be delayed leading to longer pendency periods. Alternatively, patent offices may respond to backlogs by expecting examiners to spend less time on each examination, leading to a higher probability of making errors (such as failing to identify relevant prior art).

Our research, including both discussions with patent offices and the literature review, has identified five channels through which patent backlogs may impose costs including: the reduction in value of patent protection for applicants; a reduction in the incentive to innovate and undertake research and development; granting of monopoly power to non-patentable applications (through longer pending patent rights); deterring use of the patent system; and the diversion of resources away from productive activities.

Reduction in patent value for applicants

Both reduced patent quality and increased patent pendency lead to the perceived value and strength of patent protection becoming lower and/or more difficult to assess. A reduction in patent quality increases the probability that a granted patent could be successfully challenged. Increased pendency, on the other hand, leads to a longer period of uncertainty in which the scope of granted patent rights is unknown. As a result, applicants may be unable to bring products to market before patent grant, due to difficulties licensing their invention or obtaining outside investment to further develop and market their invention, resulting in fewer years to extract benefits from patent protection. Further, where pending patent rights are not effectively enforceable (as in practice in the US), the inventor is less protected from imitators before patent grant. Hence, increased pendency may reduce the profits they are able to achieve over the lifetime of the invention; and so reduce the value of patent protection. This may disproportionately affect small start-up firms who may have more difficulty in accessing credit or meeting the legal costs of challenging patent infringement.

At some patent offices (such as the EPO and the DPMA), applicants must pay an annual fee to maintain the validity of their patent application. Increased pendency thus implies an additional cost for patents that are not eventually granted.

The evidence from the literature review and from other parts of this study suggests that patent backlogs are not (at present) a significant cost for

applicants. Applicants are often offered the possibility of speeding up the processing of their application and the evidence is that only an extremely small minority choose to do so. Rather, the evidence points to applicants making widespread use of mechanisms and strategies in order to extend or delay the examination stage of their applications for as long as possible. In jurisdictions offering the opportunity to defer examination, applicants appear keen to extend the application process. Further, although patent offices offer a variety of mechanisms for accelerating examination, take-up of these procedures is low (less than 1% at the USPTO and around 5% at the EPO). This is despite the fact that the administrative costs associated with acceleration are low. With the possible exception of the US, where applicants may be deterred by stringent application procedures and the potential for inequitable conduct litigation, this suggests that most applicants are unconcerned about current levels of pendency.²⁹

Reduced incentives to innovate

Any reduction in the strength of patent protection may also impose broader costs on society if it results in the incentives for innovation being dampened more generally. If potential inventors feel they are less able to protect and therefore benefit from any invention, then they will be less likely to invest their time and other resources in research activities. This may, in turn, have a detrimental effect on the level of innovation.

Longer pendency may also deter research and development by third parties. R&D decisions may be distorted as, while applications are pending and the scope of the eventual patent is unclear, firms may be unwilling to invest in similar areas. As a result, investment in potentially productive areas of research may be delayed, with consequent effects on consumers as the introduction of new products/technologies is delayed or even abandoned.

Deterring use of the patent system

As well as deterring innovation, it is possible that in response to growing pendency firms will choose to use other methods of intellectual property protection, rather than the patent system. In particular firms may attempt to keep the details of the invention secret for as long as possible. As a result, new inventions will not be disseminated as effectively, which may lead to duplication of existing inventions, and slow the development of improvements to existing innovations.

²⁹ Acceleration procedures at the different patent offices are discussed in more detail in Section 2.2.

Granting of monopoly power on non-patentable applications

Additional pendency on applications that are not granted imposes costs because it gives 'patent pending' protection to inventions that do not merit it, and hence provides the applicant with monopoly power they would not otherwise have had. This may lead to higher prices for the respective products if competitors are deterred from entering the market.

Diversion of resources

There may be other intermediate impacts of backlogs, as firms react strategically to longer pendency or reduced patent quality. For instance, firms with non-patentable inventions may be encouraged to apply, as they feel they will be able to benefit from a longer period of pending protection, or because they feel that their application may be incorrectly granted. Further, we might expect increased litigation activity if there is a reduction in patent quality or increased patent infringement (due to higher pendency). As a result, resources may be diverted from truly valuable inventions into processing non-patentable applications and increased litigation costs.

4.4.2 Issues in estimating the costs of patent backlogs

The discussion above indicates that, in principle, growing backlogs may impact both applicants and third parties through either increased pendency or a reduction in patent quality. In seeking to estimate the costs of patent backlogs we have focused on the costs associated with increased pendency times, as discussions with patent offices have suggested that backlogs have not (at least to date) noticeably impacted patent quality in any of the patent offices interviewed. Further, it is extremely difficult to accurately measure patent quality or the costs of declining quality, particularly as *perceptions* are more important than actual patent quality in determining applicant behaviour.

As such, our view is that at present the incidence of the costs of patent backlogs results from the impact on pendency times. In the remainder of this Section we estimate the costs associated with this in three areas: the impact on incentives to innovate, the cost of additional non-patentable applications, and the granting of monopoly power through pending patents.

It is not possible to assess how current levels of backlogs contribute to growing pendency times. In fact, as discussed in Section 4.3, there is no common trend in pendency at different patent offices, and some offices have been able to reduce pendency in recent years. However, if the number of applications worldwide continues to grow, with a consequent impact on backlogs, we might expect to see pendency grow in the near future. To provide an indication of the costs that might be associated with future growth

of backlogs, we estimate the costs associated with average pendency (to grant) increasing by one year.

In estimating the cost of increased pendency, we focus on the likely costs at the three Trilateral patent offices only, due to the degree of data availability. However, similar considerations are likely to apply in other patent offices.

4.4.3 Estimated cost of reduced incentives to innovate

Introduction

The discussion above has indicated that increased pendency could reduce the level of innovation in the economy in two ways. First, increased pendency may reduce the benefits that inventors are able to claim from patenting and hence from their invention. Second, greater uncertainty regarding the extent of patent rights may deter third parties from investment in potentially productive areas.

Our discussions with patent offices indicated that the effect of greater uncertainty is generally seen as the most important cost of patent backlogs. However, we are unable to include this in our estimation, due to the difficulties in measuring (even approximately) the extent of uncertainty or its consequences for patenting behaviour. As such in our analysis we focus on the impact on innovation of a reduction in the benefits that inventors are able to claim through applying for a patent.

We estimate the cost associated with reduced innovation in three steps. First, we estimate the number of applicants that are likely to be affected by increased pendency, based on the field of technology and the size of the company. We then approximate the potential reduction in patent value for those applicants that are affected, based on information on patent lifetimes. This information is then used to estimate the reduction in the number of patent applications resulting from the increase in pendency. Finally, we convert this into an estimated financial cost, using the information on patent values collected in the PATVAL survey.³⁰

Inventors affected by increased pendency

Our research has indicated that in reality many applicants to patent offices do not appear to be concerned with current pendency times. Even if this changes as pendency increases, patent offices generally offer the opportunity to

³⁰ The PATVAL survey involved a survey of European patents with priority date 1993-1997 granted at the EPO in eight countries including Denmark, France, Germany, Hungary, Italy, Netherlands, Spain, and UK. See Gambardella et al (2006) for further details.

accelerate applications at a low cost, suggesting that the reduction in the incentive to innovate would be low.

A further consideration is that inventions in certain technological fields will not be ready for market before patent grant, and as such an additional year of pendency is of no consequence. In pharmaceuticals, for example, product testing and approval generally takes more than 15 years. Similarly, the value of applications that are not used either for licensing or commercial uses will not be affected by increased pendency.

It seems likely that smaller applicants will be affected disproportionately by an increase in pendency, as these applicants are more likely to require access to investment to be able to develop and market their product. These applicants may also be less able to accelerate examination, due to a lack of familiarity with the patent system or an inability to incur the full costs of patenting at an early stage of product development.

To account for these factors, we assume that the effect of increased pendency will be limited to applications that are in high technology fields; are made by small companies, and that are intended to be either licensed or used for either industrial or commercial usage. We estimate each of these using the following assumptions:

- applications in high technology fields account accounted for 23% of applications at the EPO, 22% at the JPO and 39% at the USPTO (Trilateral Statistical Report 2007, p39);³¹
- small firms account for 30% of applications at each of the three offices³² (Wilder, 2001); and
- 75% of patents held by small firms are used for licensing or for commercial purposes, based on the results of the PATVAL survey.³³

Based on these assumptions, increased pendency will affect approximately 7,300 applications at the EPO, 41,000 applications to the USPTO and 20,000 applications to the JPO. This represents around 5% of total applications to the EPO and the JPO, and 9% of applications to the USPTO.

³¹ The fields defined as high technology include "Computer and automated business equipment", "Micro-organism and genetic engineering", "Aviation", "Communications technology", "Semi-conductors", and "Lasers".

³² Based on information from the USPTO in Wilder (2001), where small entities account for firms with fewer than 500 employees.

³³ See Gamdardella et al. (2006). In particular, the results showed that 75% of patents held by companies with between 100 and 250 employees were "used" as opposed to 80% for firms with fewer than 100 employees and 59% for firms with more than 250 employees.

Impact of pendency on patent value

Each additional year of pendency reduces the time period during which applicants can benefit from patent protection, with a consequent reduction in the value of the patent. We estimate the impact of increased pendency on the basis that the value is spread linearly over the lifetime of the patent.

Data from the TSR indicates that average patent lifetimes are around 11 years at the EPO, 16 years at the JPO and 15 years at the USPTO.³⁴ This implies that an additional year of pendency reduces the benefit associated with a patent by around 9% at the EPO, by 7% at the USPTO and by 6% at the JPO.

Cost of reduced patent value

This reduction in patent value represents a dampening of the incentives for innovation, and as such is expected to lead to a loss in welfare. We can approximate this cost by first estimating the reduction in the number of patent applications that will occur as a result of increased pendency, and second estimating the value of the innovations associated with those applications.

Based on results provided by Arora et al. (2003), a 10% reduction in the patent premium (i.e. the value of patents for inventors) is estimated to lead to a 12% reduction in the number of patent applications in high technology sectors.³⁵

As such, the reduction in the number of applications is calculated as follows:

$$\text{Reduction in apps} = \text{No. affected applications} * \% \text{ reduction in patent value} * 1.2$$

This implies that an additional year of pendency would lead to a reduction in the number of affected applications of between 8% and 11%. This relates to a reduction of, in total, around 5,700 applications across the three Trilateral patent offices. These applications (if granted) represent valuable innovations which will hence be lost to society, with consequent costs.

This cost is estimated as follows:

$$\text{Cost} = \text{Reduction in applications} * \text{grant rate (\%)} * \text{value of granted patent}$$

³⁴ Trilateral Statistical Report 2007. Data downloadable from <http://www.trilateral.net/statistics/tsr/2007.html>. Ideally, we would use information on the lifetime of patents granted within high technology fields only. However, we have been unable to identify any relevant data in order to analyse this.

³⁵ Based on Table 6, using the average elasticity for the "Biotech", "Computers and other office equipment", "Other electrical equipment", "Communication equipment", "Aircraft and missiles", "Semiconductors", and "Electronic components excl. Semiconductors" sectors. More detail on the results of Arora et al.'s model is contained in Section 3.

The average value of an EPO patent is assumed to be £2.7 million, based on the results of the PATVAL survey. We assume that the value of a patent issued by the USPTO is the same as the EPO, while for a patent issued by the JPO has one quarter of the value (to adjust for the smaller size of the Japanese market).

The results of this estimation are shown in Table 5. As this shows the estimated impact of the loss of innovation as a result of increased pendency is approximately **£6 billion** per annum. As emphasised above, this only includes the impact due to the reduction in the incentive to innovate; and in particular does not include any impact due to the increased uncertainty regarding the scope of patent rights as a result of increased pendency.

Table 5: Estimated cost of foregone innovation due to increased pendency				
	EPO	USPTO	JPO	Total
Affected applications ¹	7,283	41,096	19,616	67,995
Reduction in patent value ²	9%	7%	6%	7%
Responsiveness of patent applications to change in patent value ³	1.2	1.2	1.2	1.2
Change in number of applications (%)	-11%	-8%	-8%	-8%
Grant rate ²	51%	49%	49%	49%
Change in number of applications	-404	-1,646	-733	-2,783
Average patent value ⁴	£2.7m	£2.7m	£0.7m	£2.1m
Estimated cost of foregone innovation	£1,091m	£4,444m	£495m	£6,030m

1 See text above for calculation of affected applications.

2 Based on patent lifetimes reported in Trilateral Statistical Report (2007).

3 Based on estimates reported by Arora et al. (2003) Table 6.

4 Estimates from Gambardella et al. (2006), adjusted using an exchange rate of 1 EUR = 0.9 GBP.

Source: *London Economics calculations.*

4.4.4 Incentivising applications for non-patentable inventions

As well as deterring legitimate applications, increased pendency also imposes costs through providing patent pending protection and hence (quasi) monopoly power to applicants with non-patentable inventions. This may lead to higher prices for the respective products, as competitors are deterred from entering the market.

Before estimating the cost of the monopoly power associated with increased patent pendency, we first assess the impact of the increase in patent pendency on the number of non-patentable applications that are submitted. This is costly in itself, as each non-patentable application involves the diversion of resources away from productive uses.

To estimate the potential extent of this increase, we assume that the responsiveness of non-patentable applications is the same as for patentable applications, as estimated by Arora et al (2003) and discussed above. As above, we assume that only applications in high technology sectors - i.e. those with short product lifetimes - will be affected by the increase in pendency. However, unlike for valid applications, the impact will not be limited to small companies. Nor will it be limited to applications that are used commercially - but also those that are intended to be used as "blocking patents".

The total number of additional applications from an additional year of pendency is hence estimated as:

$$\text{Additional applications} = (1/\text{average pendency}) * 1.2 * \text{affected patent applications}$$

where $(1/\text{average pendency})$ represents the percentage increase of an additional year of pendency and 1.2 represents the assumed elasticity of demand of non-patentable applications.

As shown in Table 6, based on these assumptions, an additional year of pendency is expected to lead to an additional 39,400 non-patentable applications at the Trilateral patent offices.

Table 6: Additional non-patentable applications due to increased pendency				
	EPO	USPTO	JPO	Total
Number of affected patent applications ¹	13,056	77,770	36,977	127,803
Average pendency (years) ²	4	3	6	5
Responsiveness of patent applications to change in patent value ³	1.2	1.2	1.2	1.2
Additional applications	3,839	28,343	7,229	39,411
Total non-patentable applications	16,895	106,113	44,206	167,214

1 Estimated using grant rates reported in Trilateral Statistical Report 2007.

2 Estimates from PATSTAT, as discussed above.

3 Based on estimates reported by Arora et al. (2003) Table 6.

Source: London Economics calculations.

The administrative cost associated with these additional applications can be estimated using the average cost of application at each of the three patent offices. In particular, van Pottelsberghe and Francois (2006) estimate that the average application cost - including process fees, translation costs, and the costs of legal advisers and patent attorneys - is £18,513 at the EPO, £8,870 at the USPTO and £4,987 at the JPO. Using these figures, the increase in pendency would be expected to lead to an additional **£359 million** per annum in application costs at the Trilateral patent offices.

4.4.5 Granting of monopoly power on non-patentable applications

Using the information regarding the value of a patent from the PATVAL survey, we are able to estimate the increase in the value of a pending patent due to an increase in patent pendency. This increase reflects the fact that, with pending patent protection, applicants will be able to charge higher prices, as no competitor will be able to enter the market.

As an estimate of the value of a pending patent, we first adjust the value of a granted patent (of £2.7 million for the EPO) to reflect the proportion of the average patent lifetime for which the patent is pending. We then adjust the estimate to account for the fact that it is not possible to enforce pending patent protection (if the patent is never granted), and that it may be more difficult to benefit from a pending patent in terms of for instance licensing agreements. As it is not possible to measure the relative strength of a pending and a granted patent, for indicative purposes we have assumed that the value of a pending patent is 50% of that of a granted patent.

For example, at the EPO, the average patent pendency is around 4 years, and the average patent lifetime is 11 years. The value of a pending patent is then estimated as: $\text{Value} = (4/11) * £2.7 \text{ million} * 50\% = £0.5 \text{ million}$.

Growing pendency will lead to an increase in the value associated with a pending patent. If pendency is currently 4 years, an additional year of pendency would increase the value by 25%.

Importantly, this value is not directly a loss to society as, although higher prices represent a cost to consumers, they also benefit applicants. However, in addition to the transfer from consumers to firms, the imposition of monopoly prices also implies a deadweight loss. We estimate this loss as 12.5% of the patent holder's excess profits, based on standard economic assumptions regarding consumer behaviour and firm cost structure³⁶. While this is necessarily simplistic, it allows us to provide an indicative estimate of the cost to society associated with increased pendency.

The results of this estimation are displayed in Table 7. As this shows, an additional year of increased pendency is anticipated to lead to firms with applications for non-patentable inventions benefitting from an additional **£9.4 billion** in monopoly profits. The deadweight loss associated with this is estimated to be approximately **£1.2 billion** per annum.

³⁶ In particular, the deadweight loss will be 12.5% of the excess profits, if the pending patent leads to firms charging a 20% mark-up and as a result the quantity demanded falls 20% (i.e. the price elasticity of demand is -1) and where the firm faces constant unit costs.

Table 7: Estimated cost of monopoly power due to increased pendency

	EPO	USPTO	JPO	Total
Non-patentable applications	13,056	77,770	36,977	127,803
Original value of pending patent right	£0.5m	£0.3m	£0.1m	£0.3m
Value of pending patent right with increased pendency	£0.6m	£0.4m	£0.2m	£0.4m
Increase in profits due to increased pendency	£1,560m	£7,077m	£782m	£9,419m
Cost to society from additional pendency²	£195m	£885m	£98m	£1,177m

1 Adjusting the total value of a patent for the years of pendency compared to total patent lifetime, and assuming a pending patent is half as valuable as a granted patent (for an equivalent lifetime).

2 Assuming that the deadweight loss is 12.5% of the increase in profits.

Source: London Economics calculations.

In estimating the costs of additional monopoly power we have included only those applications which are already within the patent system and have not included the *additional* applications that may be submitted (as discussed above). This is because the cost (in terms of monopoly power) associated with these applications is likely to be small. If firms were able to obtain large monopoly profits as a result of obtaining a pending patent, we would expect them to have already done so at current pendency levels. The new applications will consist of firms for whom the increase in pendency leads to a pending patent (minus the application costs) becoming profitable – whereas before it was not. Given that application costs are relatively low (in general), this suggests that the monopoly profits associated with these applications is low in comparison to the average value of £0.5 million assumed above.

4.4.6 Summary of costs

This analysis suggests that the costs associated with an additional year of pendency at each of the three Trilateral offices could be significant. In total, taking into account the potential impact on future innovation, the administration costs associated with additional non-patentable applications and the cost of increased monopoly power, the costs are estimated to be **£7.6 billion** per annum. Although this estimate necessarily relies on a number of assumptions, it does provide an indication of the order of magnitude of the impact that an additional year of pendency might have.

In considering this estimate, it is important to note that no account has been taken of the possible impact on innovation of increased uncertainty over the scope of intellectual property rights resulting from longer pendency periods. As this is generally regarded to be the most significant cost of delays in patent decisions, the actual costs from an additional year of pendency might be expected to be significantly greater than our estimates.

5 Possible future trends in patent office backlogs

5.1 Introduction

The evidence presented in the previous chapters has outlined the current situation regarding patent office backlogs, and estimated the cost associated with increases in pendency. To understand how this may change in the coming years, in this section we look to understand how workload is likely to change over the next five years, based on a simple modelling exercise.

5.2 Modelling patent office backlogs

5.2.1 Overview

In modelling patent office backlogs, we use the measure “stock of current pending applications / work completed”³⁷, based on the formula:

$$\text{Applications pending at end of period} = \text{Applications under examination at beginning of period} + \text{applications entering substantive examination during period (i.e. requests for examination)} - \text{disposals.}$$

Although the inputs to the model are in theory straightforward, relevant data was in some cases not available, and the analysis was limited to the case of seven of the patent offices (CA, DE, EP, GB, JP, KR and the US).

Modelling the future growth in workloads involves two steps. First, we seek to measure the growth in the number of applications over time. Second, we then predict the actual workload (i.e. the number of examination requests) associated with the applications.

5.2.2 Growth in patent applications

The starting point of the model involves predicting the likely growth in the number of applications originating from each country – and being filed either domestically or abroad. As a basis for estimating the future growth rates at most of the offices we assume that historical growth rates will continue over the next five years. However, while this seems a reasonable assumption for applications originating from established economies it may be less

³⁷ This measure is discussed in more detail in section 4.

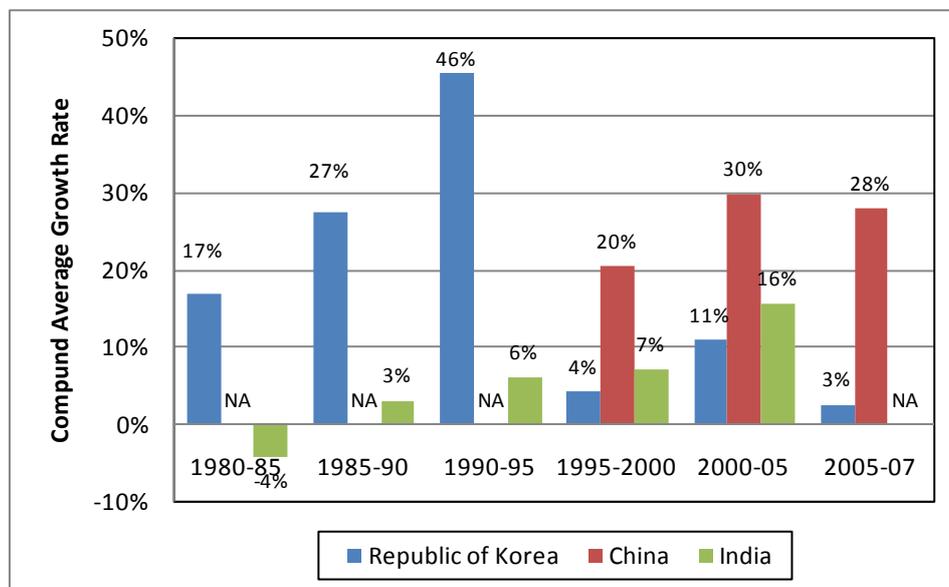
appropriate for those originating in the emerging economies (i.e. Korea, China and India), for which there is a greater level of uncertainty regarding future trends. As such, we consider the likely trends at these three offices in more detail below.

Growth in applications originating in emerging markets

The number of patent applications within China, India and Korea has increased rapidly in the past few years. However, as these offices have emerged as major components of the global patent system relatively recently (in comparison to the other offices), it is not necessarily the case that growth in the future will continue at similar levels. In considering this, it is informative to analyse the growth of applications originating from Korea over the past twenty years, comparing this to the recent growth in Chinese and Indian applications.

Figure 22 displays the historic growth in domestic applications in each of the three countries. This clearly illustrates the fact that patent applications in Korea “took off” around 1980, followed by fifteen years of extremely rapid growth in the number of patent applications. A similar level of growth has occurred in China over the past fifteen years, with some evidence of a similar trend beginning within India. Growth has not, to date, been as fast in China as in Korea in percentage terms – although this may reflect the fact that the overall number of applications originating from China is much larger.

Figure 22: Historic growth in domestic patent applications in the Republic of Korea, China and India

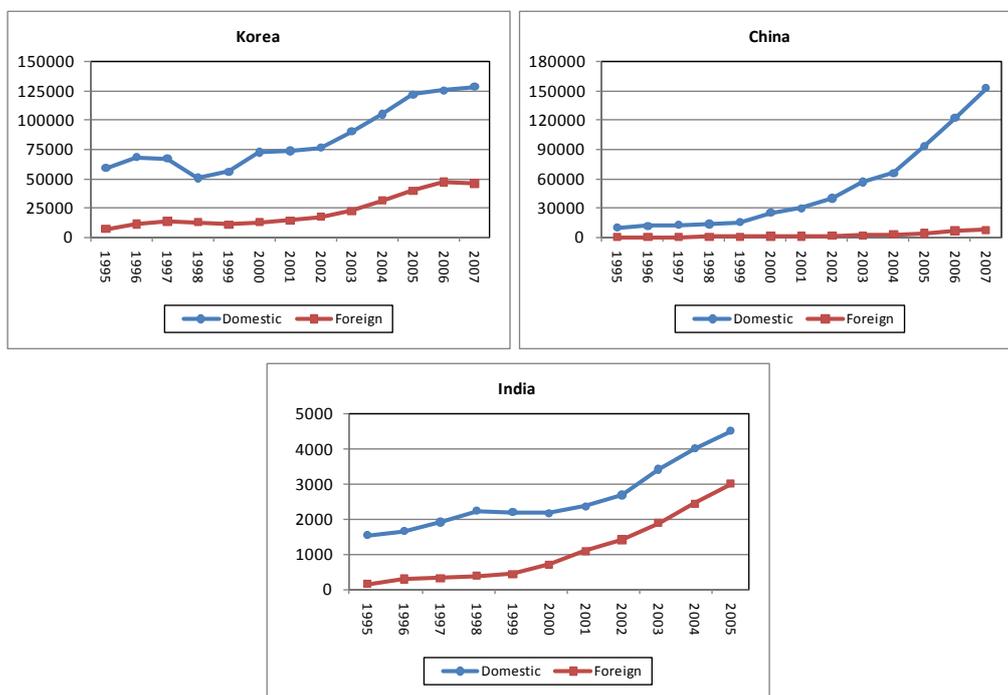


Source: London Economics using WIPO data.

Although this suggests that domestic applications by Chinese applicants might be expected to continue to grow over the next few years, when considering the impact of global patent office workloads, the major concern is the number of applications filed abroad. To examine this, in Figure 23 we display the annual number of applications made by applicants from Korea, China and India since 1995, split into domestic (i.e. in the home country) and foreign (i.e. elsewhere) applications.

As the figure shows, in both Korea and India applications made abroad comprise a significant proportion of the total number of applications made by Korean and Indian applicants (approximately 26% and 40% respectively). In China, however, this is not the case, with applications abroad representing just 5% of the total number of Chinese applications in 2007.

Figure 23: Number of patent applications originating in the Republic of Korea, China and India 1995-2007



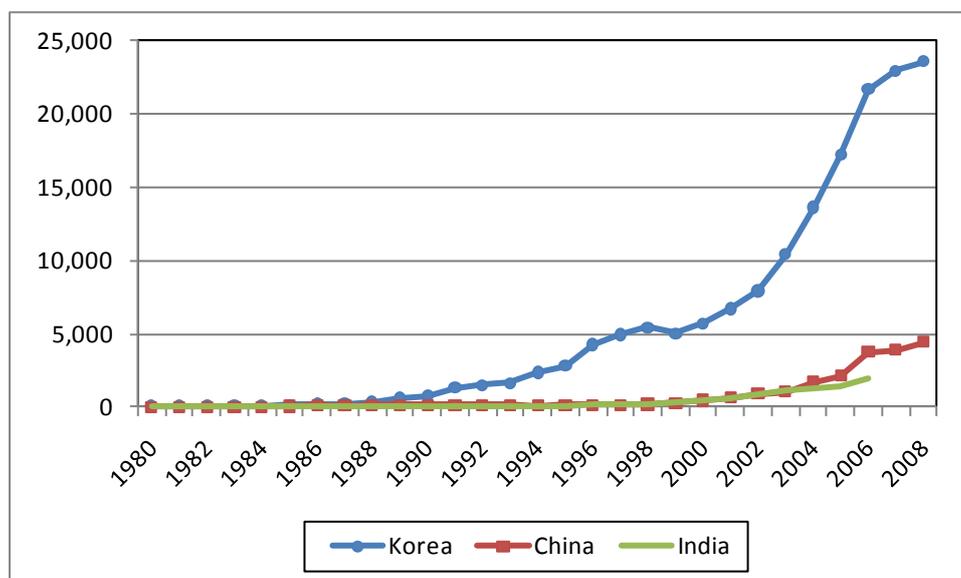
Note: No data available for India after 2005.

Source: *London Economics* using *WIPO* data.

To gain some indication of the growth in applications over a longer-term perspective, in Figure 24 we present the number of Chinese, Korean and Indian applications to the USPTO.³⁸

³⁸ Information relating to foreign applications more widely was not available for a sufficient time period.

Figure 24: Number of patent applications to the USPTO, originating from Korea, China and India



Note: Data obtained from http://www.uspto.gov/web/offices/ac/ido/oeip/taf/appl_yr.htm.
Source: London Economics using USPTO data.

This chart indicates the rapid growth that has occurred in the number of Korean applications to the USPTO in recent years, with the aggregate number increasing from just over 100 in 1985 to approaching 3,000 in 1995, and to around 23,500 in 2007. Particularly notable is the fact that the vast majority of this growth (in absolute, rather than percentage terms) occurred *after* the rapid growth in domestic applications described above. Further, the number of Korean applications is much higher than the number of Chinese applications, despite the fact that the number of domestic Chinese applications is higher than the number of domestic applications filed in Korea (153,000 compared to 129,000).

Overall, this suggests that there is significant potential for growth in foreign filings by Chinese applicants over the next five year period. If they follow a similar path as that experienced by Korea, the rapid growth in domestic applications over the past ten years will be followed a similar increase in the number of applications filed in other patent offices.

Growth scenarios

Based on this discussion, we construct two scenarios, to represent the possible growth in the number of patent applications submitted worldwide over the next five years.

In the **base case**, we assume that for applications originating in all countries – and being filed either domestically or abroad – the annual growth rate over the next five years will be the same as experienced over the previous five years. For established economies (and also Korea), this seems the best prediction that we are able to make – in the absence of other information.³⁹ For applications originating in China and India, this appears reasonable, given the experience of Korea, which experienced at least 15 years of very rapid expansion in application numbers.

In the **high growth case**, we adjust these assumptions to take into account the potential for a rapid increase in the number of applications – and particularly foreign applications – originating from China. Domestic applications are (as in the base case) assumed to grow at the rate experienced over the past five years. For China, applications abroad are assumed to grow sufficiently quickly that within five years the proportion of applications abroad is comparable to that in Korea (i.e. around 25%).⁴⁰ This involves an annual growth rate in applications abroad of 95% per annum. While in practice this level of growth seems unlikely, this scenario is useful in establishing a potential upper limit to the impact that might be expected from the growth in applications originating in China (and being filed abroad).

Table 8 displays the full list of growth assumptions used.

³⁹ Historical growth rates were based on 2002 to 2007 CAGRs, estimated using WIPO and patent office information (2004-2006 for Indian applications). Where the applications had declined in recent years, we assumed an ongoing growth rate of 0%.

⁴⁰ Given the fact that a high proportion (40%) of applications originating in India are filed abroad, a similar assumption is not appropriate for Indian applications.

Table 8: Scenarios for annual growth in patent applications

Country	Base case		High growth case	
	Domestic	Abroad	Domestic	Abroad
AU	3%	14%	3%	14%
CA	5%	11%	5%	11%
CN	31%	36%	31%	95%
DE	0%	5%	0%	5%
EP	5%	0%	5%	0%
GB	0%	4%	0%	4%
IN	19%	26%	19%	26%
JP	0%	8%	0%	8%
KR	11%	21%	11%	21%
US	5%	11%	5%	11%
Other	4%	4%	4%	4%

Source: London Economics.

Table 9 shows the projected number of applications worldwide under each of the scenarios, as well as the share of applications worldwide originating from different countries.

As this shows, both scenarios project significant growth in the total number of patent applications worldwide in the next five years. In the base case, patent applications increase by more than 37% over the next five years, while in the high growth case applications are projected to grow by more than 46%.

This growth is largely accounted for by applications from emerging markets and, in particular, China. While currently Chinese applications account for just over 9% of worldwide applications, this is anticipated to grow to around 25% in each of the two scenarios.

Table 9: Outcomes of application growth scenarios

	Current	In five years	
		Base case	High growth case
Number of applications worldwide	1.73m	2.74m	2.92m
<i>Difference from current</i>		58.3%	68.4%
% applications from:			
Japanese applicants	28.9%	21.2%	19.9%
US applicants	23.5%	21.4%	20.1%
Korean applications	10.1%	12.3%	11.5%
Chinese applicants	9.3%	22.8%	27.5%
Indian applicants	0.5%	0.9%	0.9%

Source: London Economics using WIPO data and patent office information.

5.2.3 Effect on workload

The discussion above has projected how the number of applications will grow over the next five years. However, patent applications do not actually pose a workload on patent offices until a request for examination (or search) is submitted. In fact, many applications do not *ever* enter the substantive examination phase.⁴¹ As a result, to estimate the impact on workload, it is necessary to estimate how many applications filed in a particular year will result in examination requests – and at what point this will occur (given the option to defer requesting examination in some offices).

We estimate this using the information that is available from each of the patent offices, regarding the proportion of applications that receive a request for examination, and the frequency of deferring examination. Where no other information is available, we assume that applicants will take *as long as possible* to submit a request for examination. For the purposes of the modelling exercise, this assumption is conservative, as it effectively delays the impact of the growth in application numbers on workload.

5.3 Projected future trends in patent office backlogs

Based on the assumptions above, we are able to project patent office workload and backlogs under each of the growth scenarios. To measure backlogs, we use the stock of pending applications divided by the number of patent disposals which (as discussed in Section 4) appears to be the best way of comparing workloads across different offices. We refer to this measure as “backlog months”, which can be interpreted as the amount of time it would take to clear the existing stock of pending applications, if no further applications were received.⁴²

In considering these projections, it should be noted that they are indicative only, and rest on the assumptions discussed above.

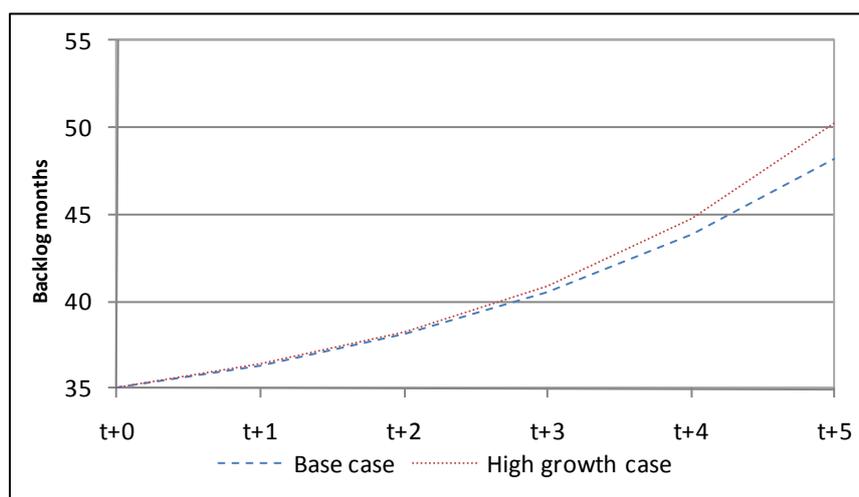
As shown in Figure 25, backlogs are anticipated to increase substantially over the next five years. In particular, in the base case, the backlog is anticipated to increase from 35 backlog months to 48 months. Interestingly, the impact is similar in the high growth case, despite the higher growth assumptions, with backlogs increasing to 50 backlog months after five years.

⁴¹ And as such, will not be included in estimates of pending applications.

⁴² In the charts below we use the number of disposals per month, as opposed to disposals per year in Section 4, to identify the changes over time more clearly.

This reflects the fact that, even with the rapid growth assumptions made in the high growth case, foreign applications made by Chinese and Indian applicants remain a very small proportion of the total backlog. For instance, in year 5, the model projects that around 210,000 applications will be made by Chinese applicants abroad. Even if all these applications were to receive an examination request, the contribution to the backlog is very small (around 5%) compared to the total backlog of 4 million pending applications. Further, as the workload of the SIPO and the IIPO is not analysed in this model, the impact from the growing number of domestic applications in those offices is not included in the estimated workload numbers.

Figure 25: Projected trends in patent office backlogs



Source: London Economics.

Although the impact of the rapid growth in patent applications from the patent offices in emerging markets is limited in the next five years, it is important to note that there may be a longer term effect. In particular, if applications from these offices remain at a high level each year, they will continue to contribute to the stock of pending applications and hence to patent office backlogs. Although, given the simplistic nature of the model, it is not appropriate to project further than five years ahead, this should be considered before concluding that further growth in the number of patent applications from these economies has only a minimal effect on backlogs.

5.4 Potential impact of a system of mutual recognition

The anticipated growth in patent office applications and examination requests raises the question of what actions patent offices could take to

mitigate the impact on workloads. In particular, it is clear that a system of mutual recognition has, at least in theory, the potential to substantially reduce the amount of work performed by patent offices globally. Under an extreme system of mutual recognition, for instance, patent offices would not conduct any further examination of any application where the same claims have previously been examined by another patent office. As many applications are filed in multiple patent offices, this could reduce the number of examinations needing to be performed significantly. Even less “pure” mutual recognition systems, such as the work sharing schemes discussed in Section 2, may be able to reduce workload through reducing the time taken to re-examine a patent that has been examined previously by another patent office. As such, we use the predicted growth scenarios to provide some indicative estimates of the size of the impact that a system of mutual recognition could have on projected patent office backlogs.

5.4.1 Alternative systems of mutual recognition

A system of mutual recognition has the potential to reduce patent offices’ workload, as they will be required to spend less time in examining applications that have been previously examined in other patent offices (assuming the claims are the same). As a result, patent offices would be able to dispose of a greater number of pending applications each year and so address their backlog more rapidly.⁴³ Under a “pure” system of mutual recognition, examiners would not need to examine second filings (i.e. those previously filed at other patent offices) at all.

As part of the study, we have discussed the potential for a system of mutual recognition with representatives from a number of patent offices. This indicated that, given differences in national legislation, a “full” system of mutual recognition is unlikely to occur. Instead, increased levels of work-sharing between offices is seen as having the most potential for cost saving in practice. However, in considering this, the discussions highlighted a number of potential obstacles to further work-sharing agreements.

First, as noted earlier, claims can differ significantly in applications to different patent offices. This precludes a system, for instance, where patent offices are happy to “rubber stamp” applications made in other patent offices. In fact, PPH agreements have sought to avoid this problem, through ensuring that only claims granted in the office of first filing are also submitted in the second office.

⁴³ At patent offices where search is carried out separately (the EPO and the UKIPO) there will also be an effect on workload through a reduction in the number of applications that require searching. For simplicity, we do not include this effect in the model and focus we focus on the implications for examination. As such, when measuring workload at these offices the number of pending applications includes only applications pending after the search stage.

Second, the patent offices noted that often differences in practice at patent offices may serve as a barrier to mutual recognition, even where legislation is similar. As an example of this, it was noted that offices vary substantially in the allocation of applications to IPC technology groups. As a result, it seems likely that offices would be required to spend significant resources in understanding each others' practices and gaining confidence in the value of each others' work as a prelude to any mutual recognition agreement – even regarding relatively minor examination issues.

Third, the extent to which a system of mutual recognition is able to achieve cost savings will depend on the extent to which examiners are able to submit search and examination reports completed elsewhere. Our interviews showed that although this was the case in some patent offices, in others examiners would be likely to have to spend significant time to identify and explain similar defects using the wording appropriate to national law. As a result, the benefits from mutual recognition, while still significant, would be reduced.

In reality, our discussions with patent offices indicated that generally patent offices would need to confirm that patent applications fall within the scope of national patent law, and as a result some examination time would be required even for these applications.

Given this uncertainty, we model three different scenarios regarding the extent to which mutual recognition would reduce the work required to examine duplicate applications.

Scenario 1

First, we model a scenario in which a system of mutual recognition allows examiners to spend no time on any duplicate applications. Although it is unlikely that such a “pure” system could be implemented in practice, this provides an indication of the upper bound of the workload savings that could be achieved through introducing mutual patent recognition.

Implicitly, this scenario assumes that all the duplicated patent applications (as identified below) have the same claims when submitted at different offices. At present this does not appear to be the case, as addressed in Scenario 2. However, the imposition of a system of mutual recognition may be able to incentivise applicants to standardise their claims to different patent offices. There is some evidence, for instance, that this has occurred under the Patent Prosecution Highways (CIPO, 2009 – see Section 2 for further details).

Scenario 2

In Scenario 2, we consider a scenario where the impact of the mutual recognition system is limited by the fact that applicants continue to vary the claims included in applications to different patent offices. In particular, based on the findings of the Utilisation Pilot Project (discussed in Section 2), we

assume that around 60% of the duplicate applications will have the same claims. As such, 40% of duplicate applications would still require examination, even under a system of mutual recognition.

Scenario 3

Both these scenarios assume that there are a large proportion (either 100% or 60%) of duplicate applications that would require minimal examination. In reality, however, it is likely that even these applications will require some examination work. To account for this, we include a third scenario, where mutual recognition leads to a 25% reduction in the examination time spent on duplicate applications.

5.4.2 Duplicate applications

The potential impact of a system of mutual recognition on patent office workload depends on the extent to which duplicate applications are entered at international offices. To estimate this, we assume that all *applications filed outside of an applicant's country of origin are duplicates*. In other words, this implies that any applicant filing an application abroad will file a domestic application as well.

This is a strong simplifying assumption which we were forced to make due to unavailability of data separating first from second filings. The effect of this assumption may be particularly pronounced in offices such as the UKIPO or the USPTO which, according to our discussions with patent offices, receive a relatively large proportion of first filings from non-domestic applicants.

Mutual recognition will also have a further impact through reducing the need to examine duplicate applications made by applicants resident outside the mutual recognition area. An application from a non-mutual recognition country would no longer need to, for instance, undergo substantive examination in both the UK and the US. This is accounted for as following:

- i) All applications by applicants within EPC member states are assumed to be duplicates, as it seems likely that the majority of applicants in these states that seek protection abroad will seek protection at the EPO – and hence any other applications will be duplicated.
- ii) All applications by applicants from other (non-EPC) states are assumed not to be duplicated (i.e. the numbers of applications are unaffected by the system of mutual recognition). This is a conservative assumption, and in any case is unlikely to have a major impact, given the small proportion of applications accounted for by such applicants.

As shown in Table 10, under these assumptions, we estimate that around 0.6 million of the 1.6 million applications (34%) to the ten patent offices are duplicate applications.⁴⁴ This estimate seems reasonable when compared to the other figures regarding the extent of duplication. For instance, it has been estimated that 25% of applications at the three Trilateral offices are duplicated (Koezuka, 2007; section 1.1) and, given the dominance of these offices, we would expect a higher proportion of applications to be duplicated across a wider group of patent offices. Further, data from the 2008 WIPO statistical report regarding the distribution of patent families according to the number of offices filed at, implies that more than 35% of applications are filed at more than one office, even if applications filed in more than five countries are excluded.⁴⁵

⁴⁴ Note that worldwide, around 44% of applications are filed by overseas residents, suggesting that a worldwide system of mutual recognition would have an even greater impact (WIPO, 2008b).

⁴⁵ Source Figure A.2.1b in WIPO World Patent Report. Calculation based on data for eight patent offices (EPO and IIPO not included), for the period 2001 to 2005.

Table 10: Estimated number of duplicate patent applications				
	Current number of applications			% duplicate applications¹
	Total (1)	Domestic (2)	Non-EPC (3)	
AU	27,343	2,717	1,649	84%
CA	40,219	5,086	889	85%
CN	245,161	153,060	2,174	37%
DE	60,992	47,853	1,218	20%
EP	141,377	66,866	6,480	48%
GB	24,999	17,375	1,475	25%
IN	28,940	5,314	6,753	58%
JP	396,291	333,498	3,967	15%
KR	172,469	128,701	1,643	24%
US	461,779	241,347	35,578	40%
Total	1,599,570	1,001,817	61,826	34%

1 % Duplicate calculations=(Total applications-domestic applications-non-EPC applications)/total applications.

Note: Shaded offices are those with sufficient information to be included in the model. Total applications based on 2007 data, with the exception of the IIPO for which 2006 data are used. Numbers of domestic applications and non-EPC applications are extrapolated from 2004 data for the IIPO.

Source: London Economics using WIPO data and patent office annual reports.

5.4.3 Other activities undertaken by patent offices

In modelling the impact of mutual recognition, we assume that the patent offices do not react in other ways to growing workloads. As such, the number of patent examiners and the proportion of applications receiving examination requests at each patent office are assumed to remain constant over time. This implies that, in the absence of a system of mutual recognition, the number of disposals carried out annually would remain constant. This allows us to focus on the impact of mutual recognition, *if* other factors remain constant – it should not be treated as a prediction. In reality, offices seem likely to undertake other measures, such as recruitment and improving examination efficiency, in response to growing workloads.

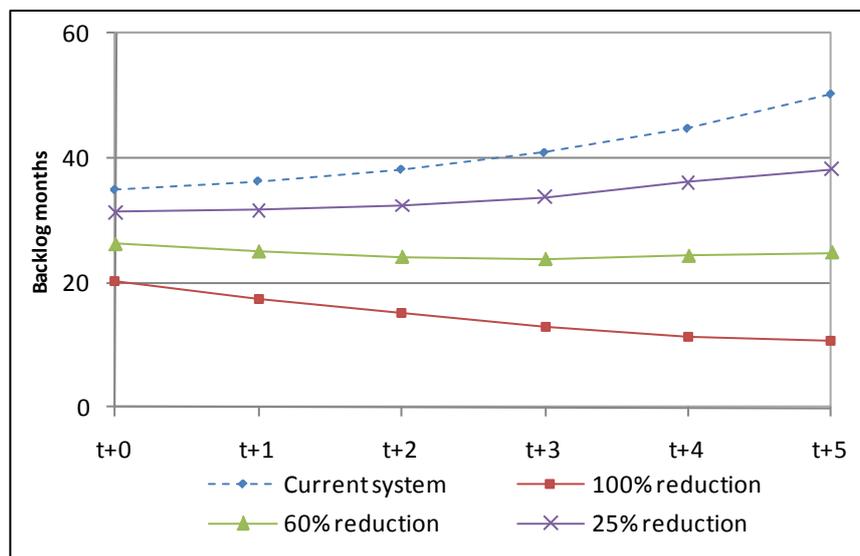
In addition, the modelling exercise abstracts from differences across different patent offices. Different patent offices receive varying proportions of both second filings and filings from abroad, and so may be affected differently by the implementation of a system of mutual recognition. In particular, offices with a very high proportion of second filings are likely to see their backlog reduced more substantially than those (such as the JPO) whose workload is dominated by domestic applications.

It is not clear how patent offices would react to this change in the balance of workload across different offices. One possibility is that some offices would adjust their examination resources (i.e. those with more work enlarge and others reduce their staff numbers). Alternatively, patent offices may begin to outsource work to each other, in order to take advantage of any spare examination resource. Given these complexities, for the purposes of this report, we focus on the overall impact of mutual recognition on patent office backlogs globally (i.e. at the seven patent offices), and do not focus on the impact on individual patent offices.

5.4.4 Impact of a system of mutual recognition

The projected backlogs under a system of mutual recognition are presented in Figure 26, using the base case growth assumptions. As mentioned above, we model the impact of mutual recognition under three different cases. First, where 100% of examination work on duplicate applications is avoided as a result of mutual recognition. Second, where 60% of the work is avoided and, third, where 25% of the work is avoided.

Figure 26: Impact of mutual recognition on projected patent office backlogs



Source: London Economics.

As the figure indicates, the model suggests that a system of mutual recognition could have a major impact on patent office backlogs, even under the most conservative case. Whereas under the current system backlogs are anticipated to reach 48 months after five years, under a mutual recognition system which reduces the amount of time spent on duplicate applications by 25%, workload is 38 backlog months. Where 60% of the work is saved, the workload in t+5 is 25 backlog months and, if all work on duplicate

applications is rendered unnecessary, the estimated backlog is just 11 backlog months.

This impact consists of two separate effects. First, there is projected to be an initial one-off reduction in backlogs as a result of the fact that many historic patent applications (i.e. those pending) will be duplicated across patent offices – and hence will no longer require substantive examination once the system of mutual recognition is in place.⁴⁶ Beyond this, however, the level of workload grows more slowly over time, as duplicate applications no longer require substantive examination. In fact, in the case that 100% of the work performed on duplicate applications is rendered unnecessary, mutual recognition allows patent offices to reduce their stock of pending applications year-on-year (based on the assumption of a fixed level of examination resources).

The analysis above considers patent office workload trends in aggregate, not at the level of the individual patent offices. In reality, the impact of the identified trends is likely to differ significantly across patent offices. One possibility is that applicants would apply first to their domestic patent office and that as a result there would be no need for patent offices to carry out substantive examination work on any foreign applications. Patent offices such as the JPO, which currently receive predominantly domestic applications, would experience little impact. On the other hand, patent offices such as the CIPO which receive a large proportion of second filings would see their workload reduced substantially. However, applicant behaviour is in fact likely to be more strategic than this – and as such is liable to depend on the details of the system put in place. Further, patent offices themselves could also determine which patent office carried out the substantive work, either through adjusting the incentives faced by the applicants (e.g. application fees) or by negotiating outsourcing agreements with other patent offices.

5.5 Discussion

This modelling exercise is necessarily simplistic, with the ability to model backlogs more robustly limited by the availability of data. However, it does draw out some important factors that should be considered when analysing the likely benefits and costs of a system of mutual recognition.

The first, and perhaps most important comment, is that mutual recognition (at its fullest extent) could substantially reduce the workload facing patent offices worldwide. If patent offices were not required to fully examine duplicate applications (i.e. those previously submitted in other patent offices),

⁴⁶ The reduction in the stock number of pending applications is assumed to be proportional to the reduction in the number of patent applications at each office.

they would face smaller backlogs, and be able to reduce the remaining backlog year-on-year.

Notably, the model suggests that, under the current system, patent office workloads will increase significantly over the next five years, with backlogs (as measured by the time to clear existing stocks of pending applications) increasing by more than a third over the next five years, even under a relatively conservative growth scenario (the base case). Interestingly, these results are not very sensitive to the level of growth anticipated within China – which might be thought to be the most important driver of changes in patent office workloads in the near future. A scenario where the number of foreign applications originating from China grows at 95% per annum (rather than 36% under the base case) is only anticipated to increase global backlogs by around two backlog months after five years relative to the base scenario.

Under a system of full mutual recognition, workload is predicted to fall initially by more than a third, with further gains as patent offices are able to reduce their stock of pending applications annually. By year five, the introduction of a system of mutual recognition is predicted to reduce backlogs by around three quarters at the seven patent offices included in the model.

Further, although the analysis above has focused on the impact on patent office backlogs from mutual recognition, it is important to note that this is likely to lead in turn to impacts on applicants, through reduced average pendency times. It is reasonable to assume that any reduction in backlog – measured as the time to clear the stock of pending applications – would be passed on as a reduction in pendency, as reduced workload implies less time spent waiting for an examiner to respond to an application (or an amendment). For instance, if the backlog is reduced by 12 months, we might expect average pendency times to fall by roughly the same amount.

In the base case growth scenario above, it is estimated that the time taken to clear the backlog under a mutual recognition system would be reduced by between 9 and 37 months compared to the current system, depending on the proportion of the examination work that could be saved on duplicate applications. This is likely to lead to similar declines in pendency.

Based on our estimates in the previous chapter, an increase of one year in pendency at the three Trilateral patent offices could impose costs of £7.6 billion per annum on the global economy. This cost estimate includes the detrimental impact on incentives for innovation, the wasted resources associated with additional non-patentable applications and the cost of increased monopoly power. Importantly however, due to measurement difficulties, it excludes any cost associated with the fact that growing pendency leads to a longer period of uncertainty relating to the scope of patent rights, which may deter investment in productive areas by third parties.

Accordingly the savings associated with a system of mutual recognition could be between **£6 billion and £23 billion** per annum.⁴⁷ Although this should be treated as an indicative estimate only, given the model used is necessarily simplistic and as the effects of mutual recognition refer to workload levels worldwide rather than actual pendency amounts, it provides some indication of the scale of the potential benefits that could be achieved if a system of mutual recognition were possible.

⁴⁷ This is calculated as:
(9 months/12 months) x £7.6 million = £6 billion; and
(37 months/12 months) x £7.6 million = £23 billion.

References

- Arundel, A., (2001) "The relative effectiveness of patents and secrecy for appropriation", *Research Policy* 30 (4), 611-624.
- Arora, A., Ceccagnoli, M., and Cohen, W.M., (2003) "R&D and the Patent Premium", NBER Working Papers, n.9431.
- Arrow, K.J., (1962) "Economic Welfare and the Allocation of Resources for Inventions", in *The Rate and Direction of Inventive Activity: Economic and Social Factors*, R.R. Nelson (ed.) Princeton, NJ: Princeton University Press.
- van Beuzekom, B. and Arundel, A. (2009), OECD Biotechnology Statistics 2009, OECD, Paris.
- Blind, K., Edler, J., Frietsch, R., and Schmoch, U., (2006) "Motives to patent: Empirical evidence from Germany", *Research Policy* 35(5), 655-672.
- Blind, K., and Thumm, N., (2004) "Interrelation between patenting and standardisation strategies: empirical evidence and policy implications", *Research Policy* 33 (10), 1583-1598.
- CIPO (2009) "Summary on the Patent Prosecution Highway Pilot Program between the Canadian Intellectual Property Office and the United States Patent and Trademark Office for the trial period of January 28, 2008, to January 28, 2009", Report prepared by J. Jorge.
- Cohen, W., Nelson, R.R., and Walsh, J., (2000) "Protecting their intellectual assets: appropriability conditions and why U.S. manufacturing firms patent (or not)", Working Paper 7552, National Bureau of Economic Research, Cambridge, MA.
- Cohen, W.M., Goto, A., Nagata, A., Nelson, R.R., and Walsh, J.P., (2002) "R&D spillovers, patents and the incentives to innovate in Japan and the United States", *Research Policy* 31, 1349-1367.
- De Rassenfosse, G. and van Pottelsberghe, B., (2008a) "On the price elasticity of demand for patents", Working Papers CEB 08-031.RS, Université Libre de Bruxelles, Solvay Brussels School of Economics and Management, Centre Emile Bernheim (CEB).
- Duguet, E., and Kabla, I., (1998) "Appropriation strategy and the motivations to use the patent system: an econometric analysis at the firm level in French manufacturing", *Annales d'Economie et de Statistique* 49/50, 289-327.

Encaoua D., Guellec, D. and Martinez, C., (2003) "The economics of patents: from natural rights to policy instruments", EPIP Conference, European Patent Office, Munich.

Ernst & Young (2007) "Benchmarking Project - Productivity of the EPO, UKIPO and DPMA", Report prepared for the EPO, March.

EPO (2007) "Future workload", A study prepared for the European Patent Organisation by The Board 28 (Board of the Administrative Council set up under Article 28 EPC), November.

European Commission (2005), Study on Evaluating the Knowledge Economy - What are Patents Actually Worth?, Brussels.

Ford, G. S., Thomas M. Koutsky, and Lawrence J. Spiwak, Esq (2007), "Quantifying the Cost of Substandard Patents: Some Preliminary Evidence" Phoenix Center Policy Paper Number 30, at <http://www.phoenix-center.org/pcpp/PCPP30Final.pdf>

Gambardella A., Giuri P. and Mariani M. (2006) "Study on evaluating the knowledge economy: what are patents actually worth? The value of patents for today's economy and society", Final Report to European Commission, Directorate-General for Internal Market, Tender n° MARKT/2004/09/E, Lot 2.

Hall B.H., (2004) "Exploring the Patent Explosion", NBER Working Paper 10605".

Hall, B.H., Ziedonis, R.H., (2001) "The patent paradox revisited, an empirical study of patenting in the US semiconductor industry, 1979-1995", *RAND Journal of Economics* 32, 101-128.

Hedlund, J.A., (2007) "Patents Pending: Patent Reform for the Innovation Economy," Information Technology and Innovation Foundation (May): 3.

Hu, A., G., and Jefferson G., H., (2006) "A Great Wall of Patents: What is behind China's Recent Patent Explosion?"

Hussinger, K., (2006) "Is silence golden? Patents versus secrecy at the firm level", *Economics of Innovation and New Technology* 15 (6).

Japanese Patent Office (2009) "Development of global work work-sharing", PO 2009 Liaison Council Reports, Reports from the Meeting of the U.S. Patent Bar/JPO Liaison Council, January 24, 2009. Available at <http://www.nyipla.org/Articles/JPOLiaisonCouncil09.htm>.

-
- Jensen P. H., Palangkaraya A., and Webster E., (2008) "Application Pendency Times and Outcomes across Four Patent Offices", Intellectual Property Research Institute of Australia, Working Paper No 01/08.
- Kitch, E.,W., (1977) "The Nature and Function of the Patent System" *Journal of Law and Economics* 20, 265-90.
- Koezuka (2007) "Patent Office Insights on the Trilateral Process: Past Successes and Future Challenges", Presentation to the Trilateral Users Meeting, November 8, 2007. Available at <http://www.trilateral.net/events/meetings/2007/koezuka.pdf>.
- Kortum, S., and Lerner J., (1999) "What is Behind the Recent Surge in Patenting", *Research Policy* 28, 1-22.
- Langinier, C., and Moschini G., (2002) "The Economics of Patents: An Overview", Working Paper 02-WP, Center for Agricultural and Rural Development, Department of Economics, Iowa State University.
- Ledwell K. and Sprigings M. (2007) "Canada and the U.S.: Differences in Patent Prosecution", Gowling Lafleur Henderson LLP.
- Lehman B. (2006) "Tackling the shadow over the international patent system", *Intellectual Asset Management*, August/September, 8-10.
- Lerner, J. (1994) "The Importance of Patent Scope: An Empirical Analysis", *RAND Journal of Economics*, 25(2), 319-333.
- Mansfield E., Schwartz M., and Wagner S., (1981) "Imitation Costs and Patents: An Empirical Study", *Economic Journal* 91, December.
- Mazzoleni, R., and Nelson R.R., (1998) "The Benefits and Costs of Strong Patent Protection: A Contribution to the Current Debate" *Research Policy* 27, 273-84.
- McGinley (2006) "A European perspective on global patent workload", *Intellectual Asset Management* April/May 2007, 9-14.
- Merges, R.P., and Nelson R.R., (1990) "On the Complex Economics of Patent Scope" *Columbia Law Review* 90, 839-916.
- Nordhaus, W.D. (1969) *Inventions, Growth and Welfare: A Theoretical Treatment of Technological Change*, Cambridge, MA: MIT Press.
- OECD, Committee for Scientific and Technological Policy (Ed.), (2003) "Preliminary Results of OECD/BIAC Survey on the Use and Perception of Patents in the Business Community. Working Party on Innovation and Policy", 19-20 June.

Pinkos (2005) Statement to Antitrust Modernization Commission, Hearing on the New Economy and Patent Reform, November 8.

Pitkethly, R.H., (2001) "Intellectual property in Japanese and UK companies: patent licensing decisions and learning opportunities", *Research Policy* 30 (3), 425-442.

van Pottelsberghe B. and François D., (2006) "The Cost Factor in Patent Systems", Working Papers CEB 06-002.RS, Université Libre de Bruxelles, Solvay Brussels School of Economics and Management, Centre Emile Bernheim (CEB).

Schalk, H.J., Tager, U.C., Brander, S., (Eds.), (1999) "Wissensverbreitung und Diffusionsdynamik im Spannungsfeld zwischen innovierenden und imitierenden Unternehmen", Ifo-Institut für Wirtschaftsforschung, München.

Scherer, F. M., and Harhoff D., (2000) "Policy Implications for a World with Skew-Distributed Returns to Innovation", *Research Policy* 29, 559-566.

Wilder R. (2001) "Fostering the Innovation Potential of SMEs in the Globalization Era: The Role Of Patents", WIPO Milan Forum on Intellectual Property and Small and Medium-sized Enterprises, Milan, Italy, February 9 and 10, 2001.

WIPO (2008a) "Understanding Industrial Property", World Intellectual Property Organization. Available to download at http://www.wipo.int/freepublications/en/intproperty/895/wipo_pub_895.pdf

WIPO (2008b) "World Patent Report: A Statistical Review", World Intellectual Property Organization. Available to download at: http://www.wipo.int/export/sites/www/ipstats/en/statistics/patents/pdf/wipo_pub_931.pdf

van Zeebroeck N., (2007) "Patents only live twice: a patent survival analysis in Europe", Working Papers CEB 07-028.RS, Université Libre de Bruxelles.

van Zeebroeck (2009) "Filing strategies and the increasing duration of patent applications", CEB Working Paper N° 09/005, January.

Annex 1 Data sources

PATSTAT

The PATSTAT database is produced by the EPO for use by other patent offices and governmental organisations. The database includes data on patent applications from 73 patent offices worldwide, including post-grant data for more than 40 offices.⁴⁸ Updates to the database are released biannually; in this report we utilise data from the September 2008 release.

PATSTAT includes information on published applications, including both A-publications and B-publications. As discussed above, A-publication generally occurs eighteen months after an application's priority date. As such, there is a *lag* between an application filing at any patent office and entry into PATSTAT.⁴⁹ As a result of this lag, many applications submitted from the beginning of 2007 onwards will not be included in the PATSTAT data, as they have not yet been published.

In the case of international applications (through the PCT route), the lag on entry into PATSTAT may be longer, as the application will not be published until it has been published in the national or regional stage – i.e. up to 31 months after priority. The application will be published earlier at the receiving office (eighteen months after priority); however in most cases this will be a different office (or the International Bureau of WIPO).

A further issue with the PATSTAT data is that once applications are entered into the database, they are not removed, even if the patent is never granted. After an application reaches A-publication, it may be withdrawn, the application may lapse, or it may be rejected following examination. In this case the application clearly should not be included as a patent backlog; but it will remain in PATSTAT. As a result, it would be incorrect to assess patent backlogs using the total number of applications that have been A-published, but not B-published.

⁴⁸ The quality of data available varies by patent office. For instance, information on patents registered at some offices does not contain detailed information on the inventors listed on applications (Abramovsky et al., 2008).

⁴⁹ The lag between the application priority date and entry into PATSTAT will generally be eighteen months for direct applications to a patent office. This is also the maximum lag between the application filing date and entry into PATSTAT (the lag may be less if an application has a priority date before the filing date).

Patent office information

Patent office data was collected through searching websites, and downloading annual reports where available. This provides information on the number of applications and grants each year, generally disaggregated by origin. In addition, many patent offices also provide additional information relating to other elements of the application process such as backlogs, patent pendency, and number of requests for examination.

This information is useful in supplementing the information provided through PATSTAT, and also provides insight into the effects of the different patent grant procedures. However, there are likely to be significant issues with the way in which data is reported by different patent offices, and so caution is important when comparing numbers across offices.

WIPO online statistical data

WIPO provide historical data relating to the number of patent applications and grants to each patent office over a long period, broken down by country of origin. In addition, WIPO provide information on patent families, derived from PATSTAT. Data can be downloaded from <http://www.wipo.int/ipstats/en/statistics/patents/>.

This information was used to supplement the information provided by patent offices, where necessary. Wherever possible, however, patent office data was used for two reasons. First, in many cases more recent information was available, and second, the patent office data provided information on a wider range of measures. In any case, comparisons generally showed only small differences (if any) between the WIPO figures and those obtained from the patent office information.

Trilateral Statistical Reports

The final source of information was the *Trilateral Statistical Reports* published by the Trilateral Co-operation. This includes information on patent applications to each of the three constituent patent offices (the USPTO, the EPO and the JPO), including patent applications, grants, backlogs and pendency. In some cases, this provided additional information than the patent offices directly; however the same concerns regarding comparability between offices apply to this data source.

Annex 2 Procedure and trends at the EPO

A2.1 Grant procedure

A2.1.1 Overview

Table 11: Outline of patent procedure at the EPO	
Types of protection offered:	
Patents	Yes
Utility models	No
Length of protection (years) (patent/utility model)	20/NA
Provisional applications	No
Separate search	Yes
Request for search required	No
Request for examination required	6 months from publication
Acceleration possible	Yes

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: *London Economics* based on information from patent office annual reports, websites, and WIPO.

A2.1.2 Standard procedure

Applicants can apply to the European Patent Office (EPO) in order to receive a European patent. European patents provide protection in up to 38 states⁵⁰, with the applicant able to designate as many countries as they wish.

Applications to the EPO must be made in English, French or German (or at least a translation in one of these languages must be provided within two months of application). Applications can be filed either direct with the EPO, or via the patent office of any of the contracting states.

At the first stage, the EPO identify the date of filing, carry out a brief examination to ensure that the application meets the formalities of the regulations, and then produce a European search report.

The European search report is drawn up on the basis of the claims contained in the application, with consideration of the other elements (e.g. the

⁵⁰ This includes the 35 members of the European Patent Organisation, as well as Albania, Bosnia and Herzegovina, and Serbia.

description and any drawings). It is also accompanied by a (non-binding) opinion on whether the invention is likely to be eligible to receive a patent. The European search report is provided to the applicant, who is then able to withdraw the application, or amend it to reflect the search findings.

The application is published (in electronic form) once eighteen months have elapsed since the date of filing or the earliest priority date. Applicants have up to six months after the publication of the search report to file a request for examination. Following this, the EPO carries out the examination of the patent, and determines the patentability of the invention.

In the case of the examiner having objections to the application, an Examination Report will be sent to the applicant with the opportunity to submit amendments. If the applicant's actions are "clearly indicative of an interest in speedy substantive examination", the examiner will make every effort to issue the first communication within three months of the examining division's receipt of the application. If the applicant is unable to make sufficient amendments to the application, an Intention to Refuse is sent to the applicant.

If the application is accepted, the applicant will be sent an Announcement of Grant, following which a mention of the grant is published in the European Patent Bulletin once the appropriate fees have been paid. Following this, any person can oppose the grant within nine months of the final publication.

European patents are maintained through the payment of an annual renewal fee from the third year onwards (fees are paid in advance, so the first fee becomes available before the second anniversary of filing).

A2.1.3 Alternative award procedures

The EPO offers applicants the opportunity for accelerated prosecution of the patent applications (the "PACE" programme). Under this the applicant has several options to speed up the application procedure.

- **Search:** All applications that do not request priority automatically receive accelerated search, under which the EPO aims to complete search within six months of filing. Applications that do request priority can also request accelerated search – in which case the EPO aims to complete search as soon as possible.⁵¹
- **Examination:** Accelerated examination can be requested in writing when filing the European patent application, provided examination is bindingly requested at the same time, in response to the search

⁵¹ In both cases the ability of the EPO to carry out the accelerated search is dependent on the filing meeting certain criteria.

report, or subsequently. In this case the EPO aims to issue the first examination communication within 3 months of receipt of the application (or of the request for accelerated examination, if later). The EPO also aims to produce all subsequent examination communications within three months, provided that the applicant responds within the granted time limits, and responds to all necessary points.

- **Other methods:** The procedure can also be accelerated through applicants waiving their right to consider the results of the search before proceeding to the examination. In this case, under Rule 62 EPC the European search report is issued together with a first examining communication instead of the opinion on patentability. A prompt and full response from the applicant then ensures that the proceedings can continue quickly.

Alternatively, applicants can file a substantive response to the search report, without waiting for the first examination communication.⁵²

In September 2008, the EPO also implemented a Patent Prosecution Highway (PPH) pilot agreement with the USPTO, with an initial duration of one year.

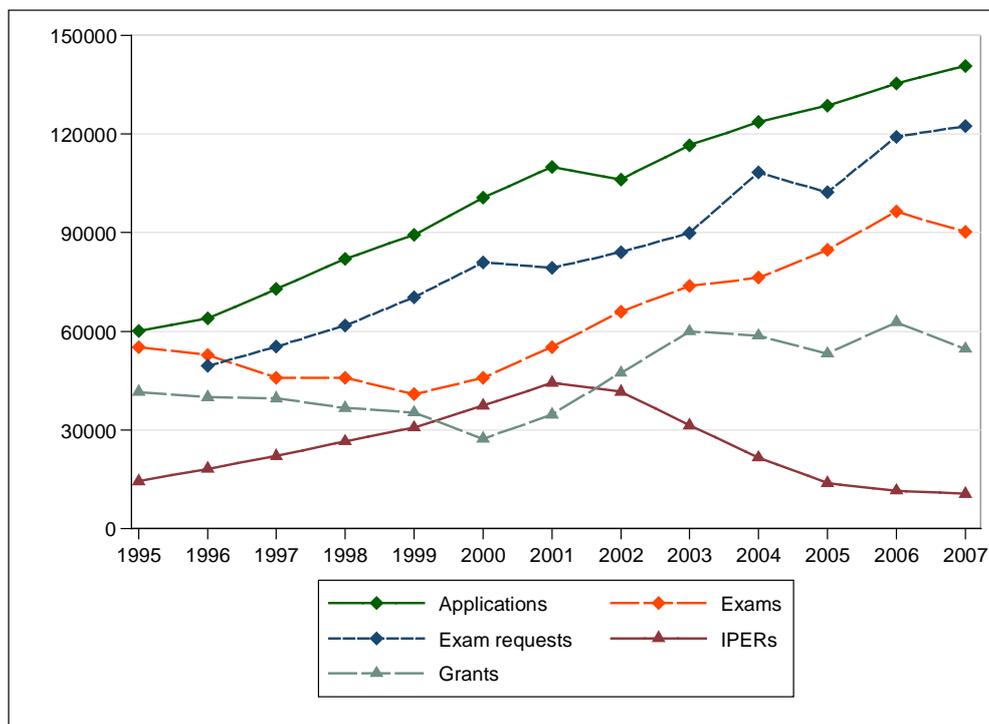
A2.2 Trends in patent activity

A2.2.1 Applications, examinations and grants

As shown in Figure 27, patent applications to the EPO have grown almost every year from 1995 to 2007. Over this period the total number of applications increased from 60,063 in 1995 to 140,725 in 2007. Growth was relatively constant (at a compound rate of around 7% over the entire period), with the exception in 2002 when the number of applications fell.

⁵² A "substantive" response means reasoned observations or appropriate amendments to the application.

Figure 27: Trends in patent activity at the EPO 1995-2007



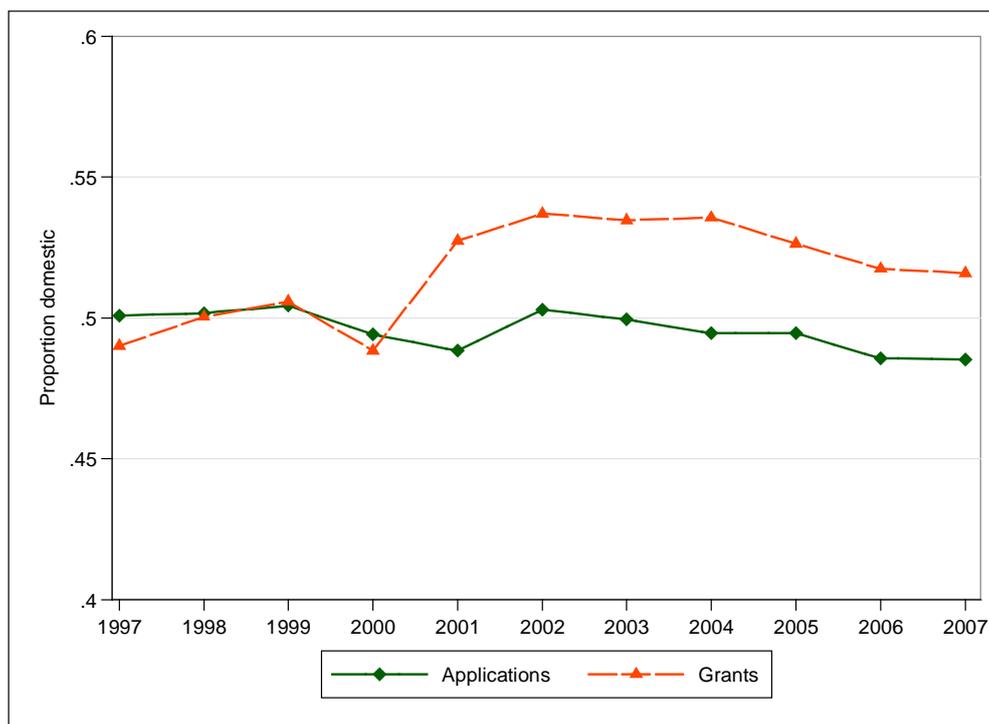
Source: London Economics using patent office information.

A2.2.2 Origin of applications

Both applications and grants to the EPO are split evenly between foreign and domestic⁵³ applicants, as shown in Figure 28. This has been fairly constant over the period, although there was a slight increase in the proportion of grants provided to domestic applicants between 1997 and 2002 (from around 49% to 54%).

⁵³ Domestic in this instance refers to applications from the EPC contracting states.

Figure 28: Origin of patent applications and grants 1997-2007



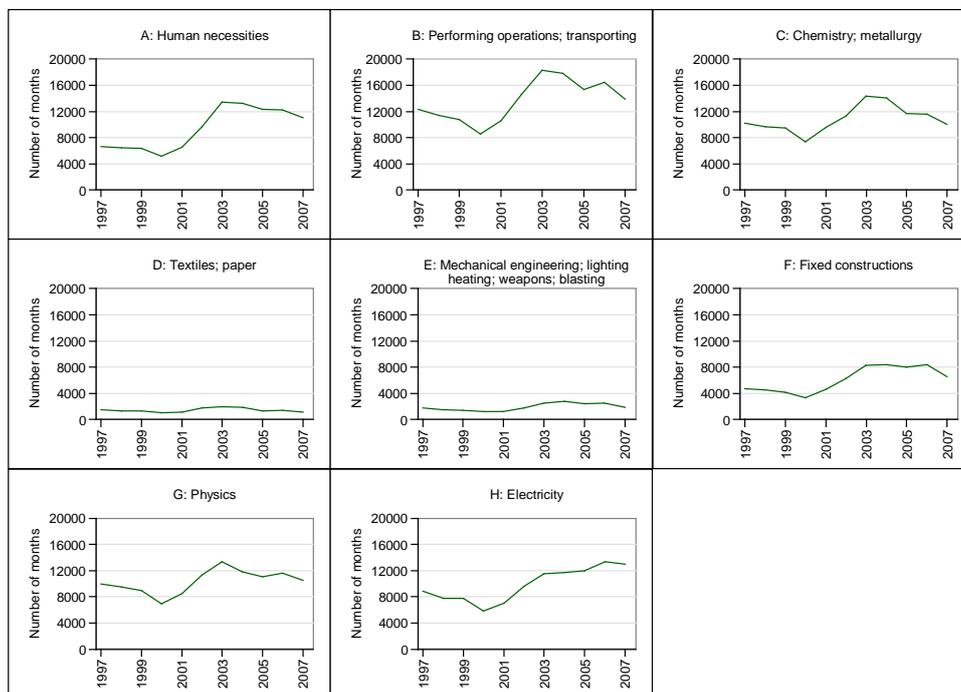
Source: London Economics using patent office information.

A2.2.3 Trends in different technology groups

As shown in Figure 29, the most important source of patent grants at the EPO is the Performing operations and transporting technology group (group B). Generally, the trend in patent grants is similar across the different technology groups, with the number of grants rapidly increasing between 2000 and 2003, followed by a period where the number of grants has fallen. The Electricity group (class H) was an exception to this trend, with grants continuing to increase before a small decline in 2007.

These findings reflect the comments of the EPO representative, who noted that the growth in the number of applications has been similar across different technologies. However it was noted that there has been particularly rapid growth in the number of applications relating to new technologies, such as telecoms or biotechnology.

Figure 29: Patent grants by technology field 1997-2007



Note: Year plotted refers to year of grant.

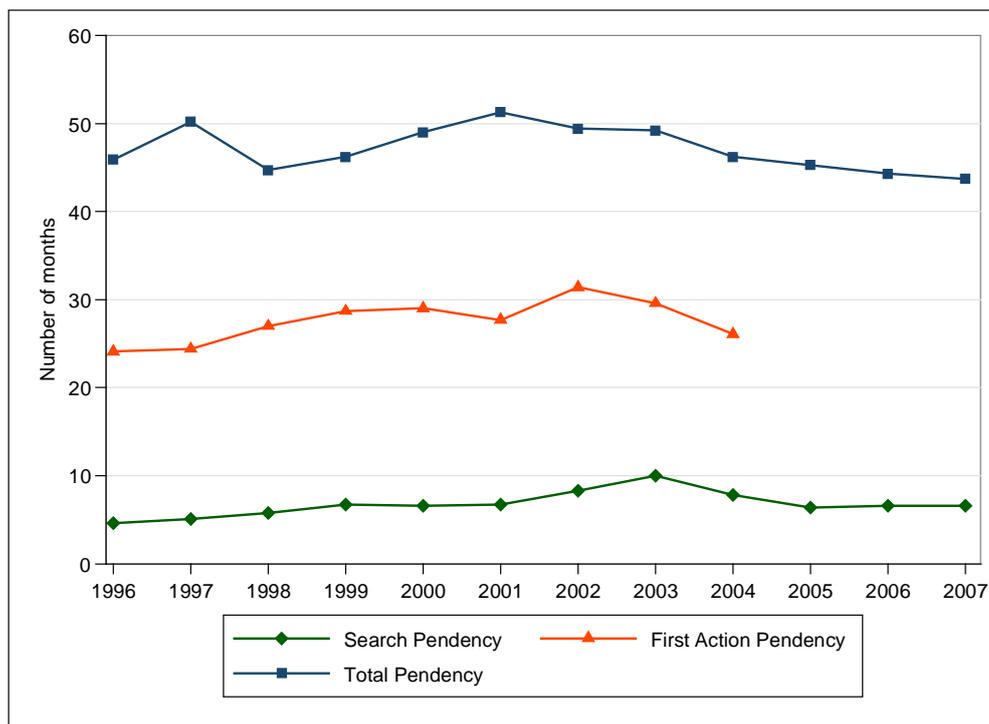
Source: London Economics using PATSTAT data.

A2.2.4 Patent pendency

Figures reported by the EPO suggest that pendency has fallen in recent years, as shown in Figure 30. Median total pendency (referring to the time to publication of a granted patent) fell from over 50 months in 2001 to under 44 months in 2007.

However, while the median pendency appears to have fallen, figures from the TSR and from the WIPO Statistical report suggest that average (i.e. mean) pendency has actually increased since 2003. In particular, the reported pendency figures indicate that, after falling from 50 months to 28 months from 2000 to 2002, pendency had risen to 45.3 months in 2007.

Figure 30: EPO reported patent pendency 1996-2007



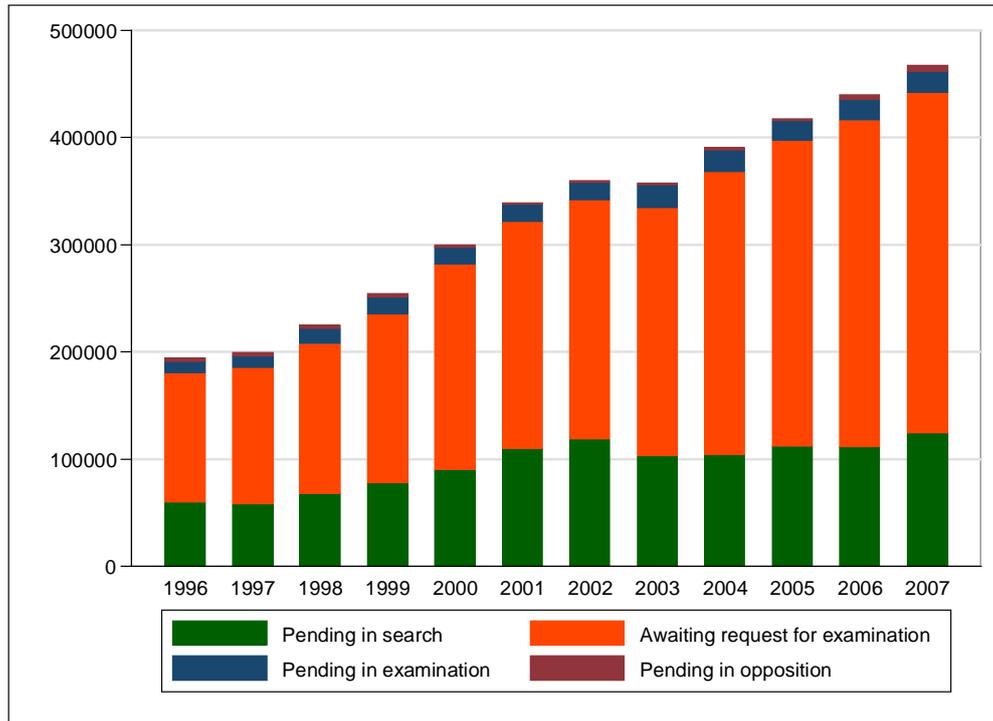
Note: Averages refer to medians.

Source: London Economics using patent office information.

A2.2.5 Patent backlogs and workloads

Although the available information indicates that pendency at the EPO has fallen in recent years, at the same time the number of pending applications has risen, as shown in Figure 31. The vast majority of these (over 95% in 2007) are pending at either the search or examination stage - implying that these are "true" backlogs for the EPO. Our discussion with the EPO indicated that this is largely a result of the increasing number of filings.

Figure 31: EPO pending applications by type 1996-2007

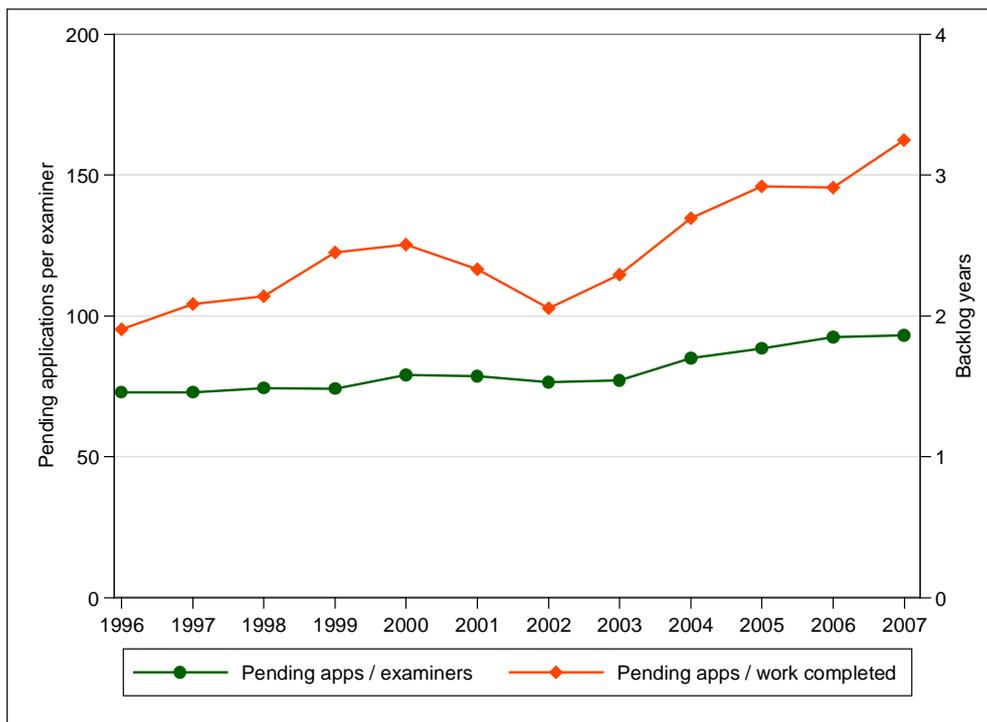


Source: London Economics using TSR data.

Figure 32 below displays the other measures of patent workload for the EPO. Interestingly, the EPO has recently begun to use a measure of “output-months” which corresponds to our measure of backlog years in reflecting the length of time that would be needed to clear outstanding cases.

Our measures show that the EPO’s workload has increased over the past ten years. The number of pending applications per examiner has increased from 73 in 1997 to 93 in 2007 while, over the same period, the number of years that would be required to clear the backlog has risen from 1.9 to 3.2.

Figure 32: EPO workload 1996-2007



Source: London Economics using patent office information and TSR data.

It is difficult to reconcile the increasing numbers of pending applications with the reduction in pendency noted above. One possibility is that few of the applications reported as pending have yet been granted, in which case we would expect a rapid increase in pendency in the near future.

A2.2.6 Number of patent examiners

The number of patent examiners at the EPO has grown consistently over the past eleven years, from approximately 1,800 in 1996 to over 3,500 in 2007.⁵⁴

⁵⁴ These figures are based on information from the Trilateral Statistical Report.

Annex 3 Procedure and trends at the JPO

A3.1 Grant procedure

A3.1.1 Overview

Table 12: Outline of patent procedure at JPO	
Types of protection offered:	
Patents	Yes
Utility models	Yes
Length of protection (years) (patent/utility model)	20 /10
Provisional applications	No
Separate search	No
Request for search required	NA
Request for examination required	3 years from filing
Acceleration possible	Yes

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: *London Economics based on information from patent office annual reports, websites, and WIPO.*

A3.1.2 Standard procedure

Applicants to the JPO are required to submit a request for examination, which can be made at any point up to three years after filing.⁵⁵ In general, applicants choose to defer application, with approximately 80% of requests submitted in the final year of the three-year filing period. Once the request for examination is received substantive search and examination are then undertaken together. A decision to grant a patent in the JPO is communicated to the applicant via an Announcement of Grant, whereas rejections are communicated via a Notification of reason for refusal. Examiners can also issue a Decision of Refusal (ending the examination stage), after which applicants can only continue their application through the appeals procedure.

As of April 1, 2009, the filing period for an appeal against an examiner's Decision of Refusal has been extended from 30 days to 3 months for Japanese applicants and from 3 months to 4 months for overseas applicants. Any

⁵⁵ Prior to October 2001 the period in which applicants to the JPO were required to submit a request for application (after filing) was seven years.

amendments made (either to the specification or the drawings) must now be submitted concurrently with the demand for appeal. In the case of any amendments being made (either to the specification or drawings) within 30 days from the filing date of the demand for the appeal, the application is reviewed again by the examiner. Following the decision to grant the patent (and the payment of the patent fee), the Patent Gazette is published.

Since 2004, any person is able to demand a trial for invalidation of a granted patent at any time following grant.

A3.1.3 Alternative award procedures

The JPO has had accelerated examination and accelerated appeal examination systems in place since 1986. Under these procedures, certain groups of applications are able to obtain patents under an accelerated timetable, whereby first actions are completed within a maximum of nine months (and on average within 2.2 months) of request for examination. On average, the final decision on the application is made within around 6 months.

To qualify for accelerated examination, applicants must meet one of the following criteria.

- i) Working invention-related applications: applications where the invention has already been commercialised, or it is planned that it will be commercialized within two years from the filing date of a request for accelerated examination.
- ii) Internationally-filed applications: applications for inventions that were filed with at least one foreign IP Office as well as the JPO or filed as international applications under the PCT.
- iii) Academic institutes-related applications: Applications filed by a university, junior college, public research institute, approved TLO, or an authorized TLO.
- iv) SME-related applications: Applications filed by an SME or an individual.

To be able to accelerate the examination, applicants must provide a copy of at least one search or examination report, and an explanation of the differences between the application and the prior art and the advantages of the invention over the prior art. Applications must be carried out in the Japanese language, and any international applicant (i.e. who has neither an address nor domicile in Japan) is required to follow the procedure through a Japan-based representative (e.g. Japanese patent attorney).

In October 2008, the JPO launched a pilot “super accelerated examination”, under which the first examination takes place within one month of filing. The first patent processed under this system was granted after 17 days.

The JPO also has Patent Prosecution Highway (PPH) agreements in place with the USPTO, the KIPO, the UKIPO, the DPMA (on trial) the DKPTO, and the National Board of Patents and Registration of Finland (NBPR).

As well as allowing accelerated appeal, the JPO also allows for accelerated appeal examination, whereby the appeal examination is carried out more quickly. Applications are eligible if they meet any of the four criteria for accelerated examination (as above), or if they refer to an application in which a person who is not an appellant (i.e. a third party) has exploited the invention during the period after the laying open of the application and before the appeal decision.

Our discussion with the representative of the JPO indicated that, in general, SMEs are more likely to use the accelerated examination system, which may reflect the fact that SMEs have more urgent need to receive patents quickly. In addition, SMEs receive further support from the JPO (e.g. free searches of the prior art prior to a request for examination) to encourage them to use the patent system.

A3.2 Trends in patent activity

A3.2.1 Applications, examinations and grants

The JPO receives around 400,000 patent applications each year. As shown in Figure 33, the total number of applications received by the JPO has fallen in recent years, with compound average annual growth of around -2% between 2001 and 2007.

The JPO has identified two important factors driving this decline in patent applications in their annual report. First, many Japanese firms have changed focus to acquiring a few high-quality patents relevant to their core business, rather than seeking a high quantity of patents more concerned with keeping pace with rivals’ technology. Second, an increasing number of Japanese applicants have taken a global-filing strategy, under which domestic applications are selected more carefully.⁵⁶

As discussed above, since October 2001 the period in which applicants to the JPO are required to submit a request for application (after filing) has been reduced from seven years to three years. Corresponding to this change,

⁵⁶ Japanese Patent Office 2008 Annual Report, p.8.

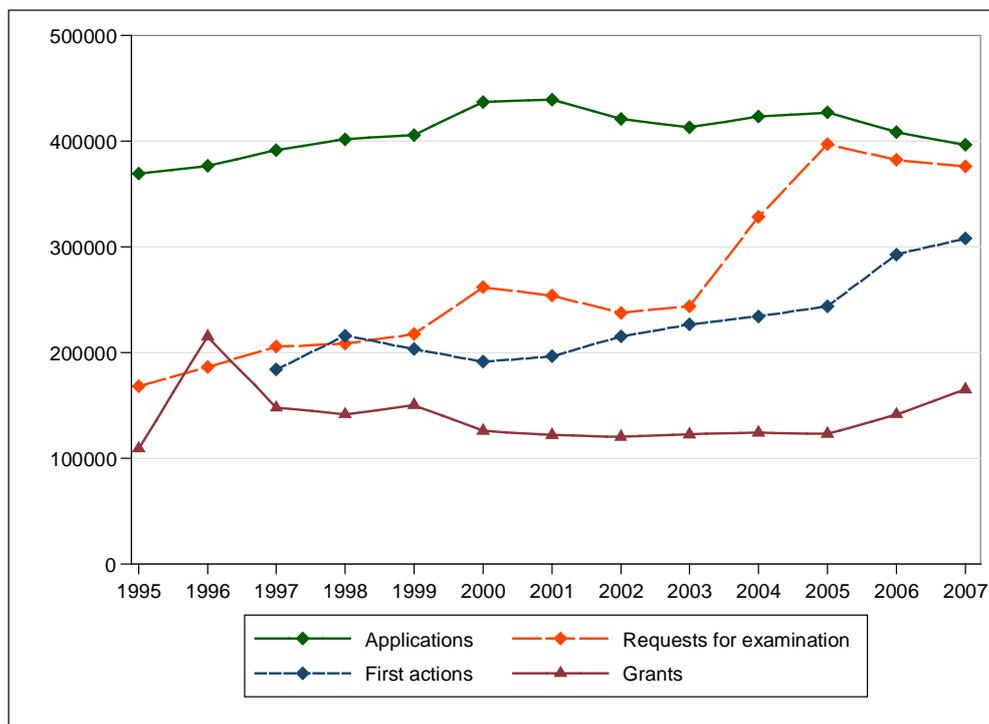
October 2004 saw a sudden increase in the number of requests for examination, as requests became increasingly concentrated in the final year of the request period. At the same time, the JPO has reported an increase in the rate at which examinations are requested; around 55% of applications filed between 1995 and 1999 were subject to requests for examination; compared to more than 65% of applications filed between 2001 and 2004.

In each of the last two years however, the number of requests for examination has decreased, suggesting that the impact of the change in request period may have passed its peak. Further, as of 2008, all applications filed while the seven-year request period was in place will have passed the time limit for making a request for examination. As such, it is expected that the number of requests for examination will continue to fall in the near future. In addition, data for FY2008 shows that the number of first actions completed by the JPO exceeded the number of requests for examination, implying that patent backlogs are being reduced – a trend that is expected to continue over the next few years.⁵⁷

In response to this increase in the number of patent applications, the JPO has sought to expedite the patent application process. This has resulted in a rapid increase in the number of first actions since 2005. However, this increase has not matched the growth in examination requests, at least until 2007.

⁵⁷ The information regarding FY2008 was obtained via the consultation with the representative of the JPO.

Figure 33: Trends in patent activity at the JPO 1995-2007



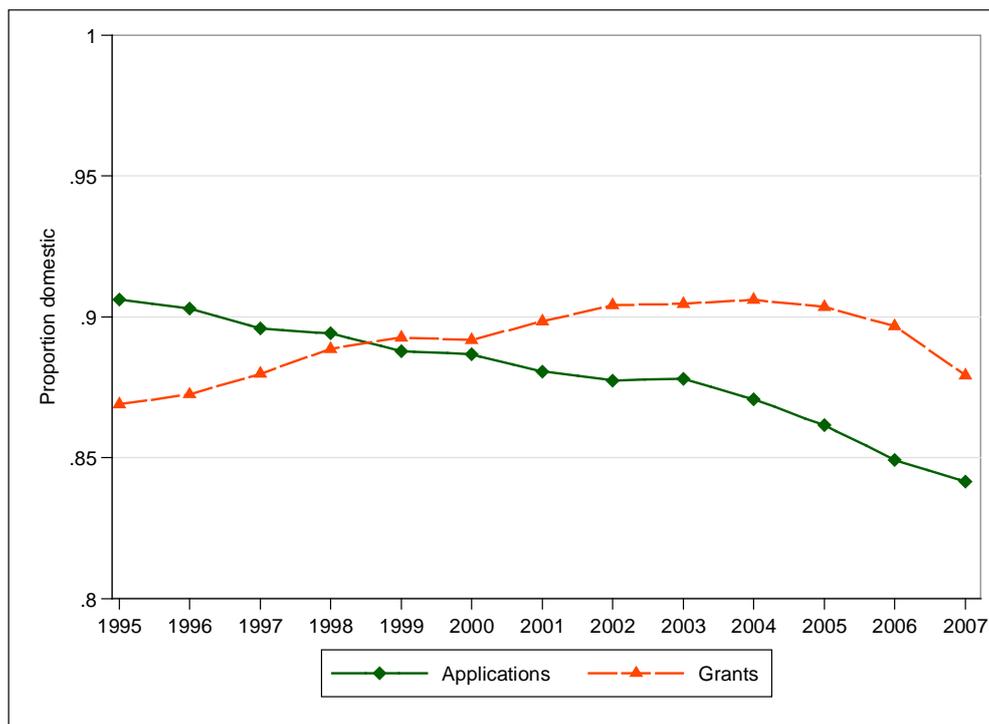
Source: London Economics using patent office information.

In the last two years there has been a notable increase in the number of patents being registered at the JPO, reflecting in turn the increased incidence of first actions noted above. This follows a period between 2000 and 2005 where the number of patents registered each year remained approximately constant (at around 125,000 registrations per annum), having fallen from a peak of 215,000 registrations in 1996.

A3.2.2 Origin of applications

A very high proportion (around 85%) of both applications by and grants at the JPO are related to domestic applicants, as shown in Figure 34. This proportion has fallen slightly in recent years, as the number of domestic applications has fallen, while foreign applications have grown at a compound annual rate of over 3% since 1995.

Figure 34: Origin of patent applications and grants 1995-2007



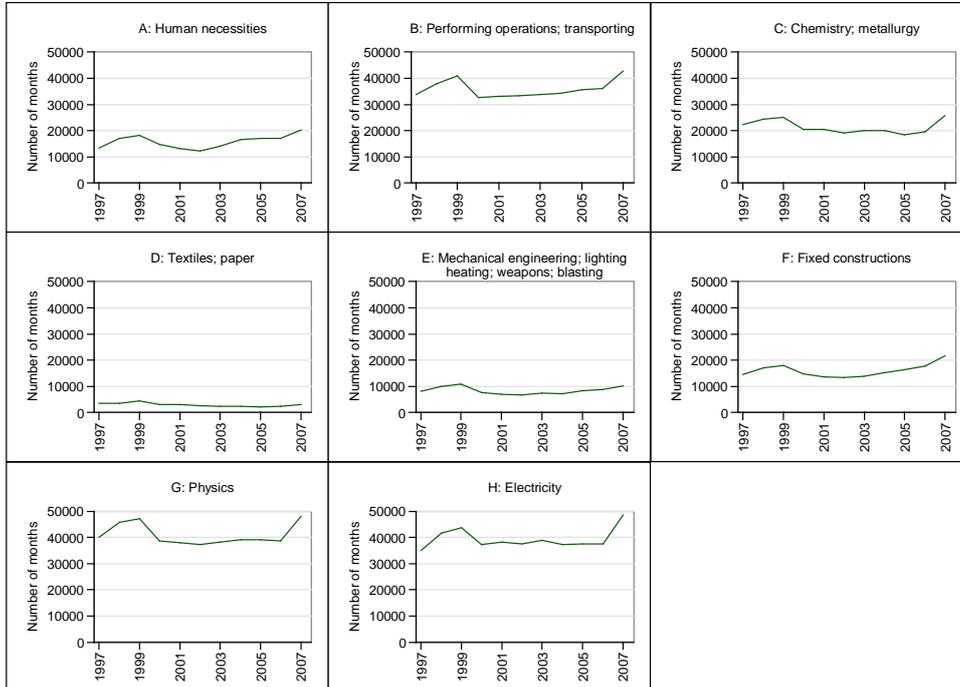
Source: London Economics using patent office information.

A3.2.3 Trends in different technology groups

As shown in Figure 35, the most important source of patent grants at the JPO are the Electricity, Physics and the Performance operations and transporting technology groups (groups H, G and B). This reflects the fact that the JPO receives a high level of applications relating to electronics and automobiles.

Generally, the trend in patent grants is similar across the different technology groups, with the number of grants staying relatively constant between 1997 and 2006, before increasing in 2007. However, the number of business method patent applications is decreasing sharply.

Figure 35: Patent grants by technology field 1997-2007



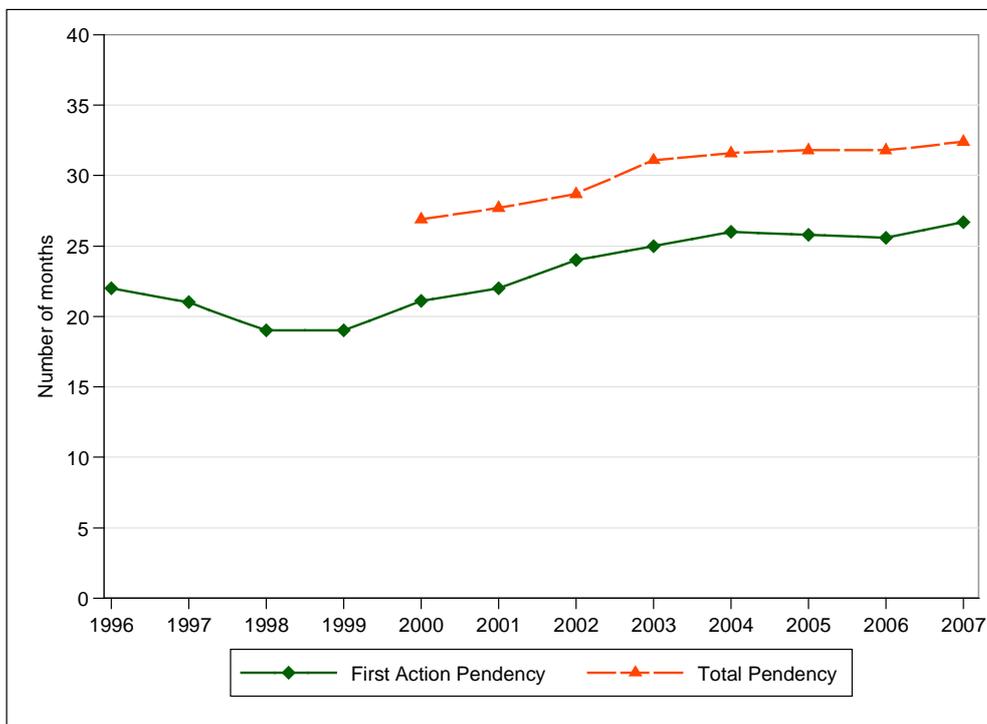
Note: Year plotted refers to year of grant.

Source: London Economics using PATSTAT data.

A3.2.4 Patent pendency

Information collected from the Trilateral Statistical Report suggests that pendency at the JPO has been increasing in recent years. As shown in Figure 36, pendency from request from examination to both first action and to disposal has increased over the past ten years.

Figure 36: JPO patent pendency 1996-2007



Source: London Economics using TSR data.

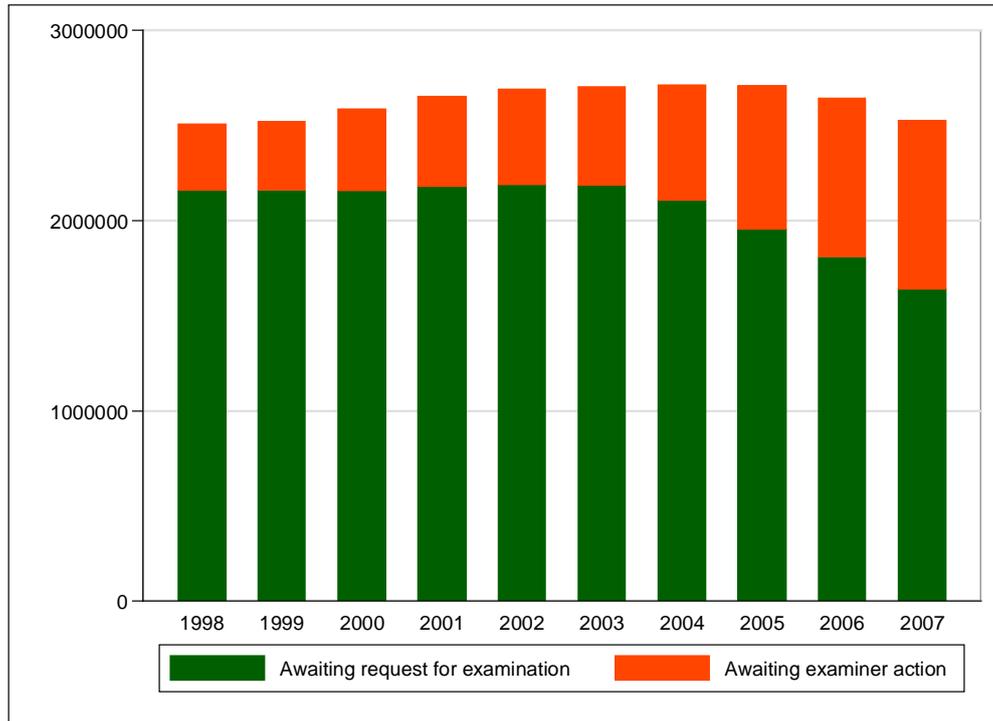
A3.2.5 Patent backlogs and workloads

The workload at the JPO has increased in recent years, due to the bump in requests for examination caused by the revision to the filing period for examination requests.

The total number of applications pending at the JPO has fallen since 2002. However, this is not a true representation of patent backlogs, as it includes a large proportion of applications which are awaiting request for examination, as shown in Figure 37.

In fact, the decline in pending applications has been driven by the reduction in the period for request for examination. Considering only applications awaiting examiner action, the backlog has increased considerably over the past few years, from 521,435 applications in 2003 to 888,198 applications in 2007. As noted above, however, the JPO was able to reduce its backlog in FY 2008, and expects to continue to do so in the next few years.

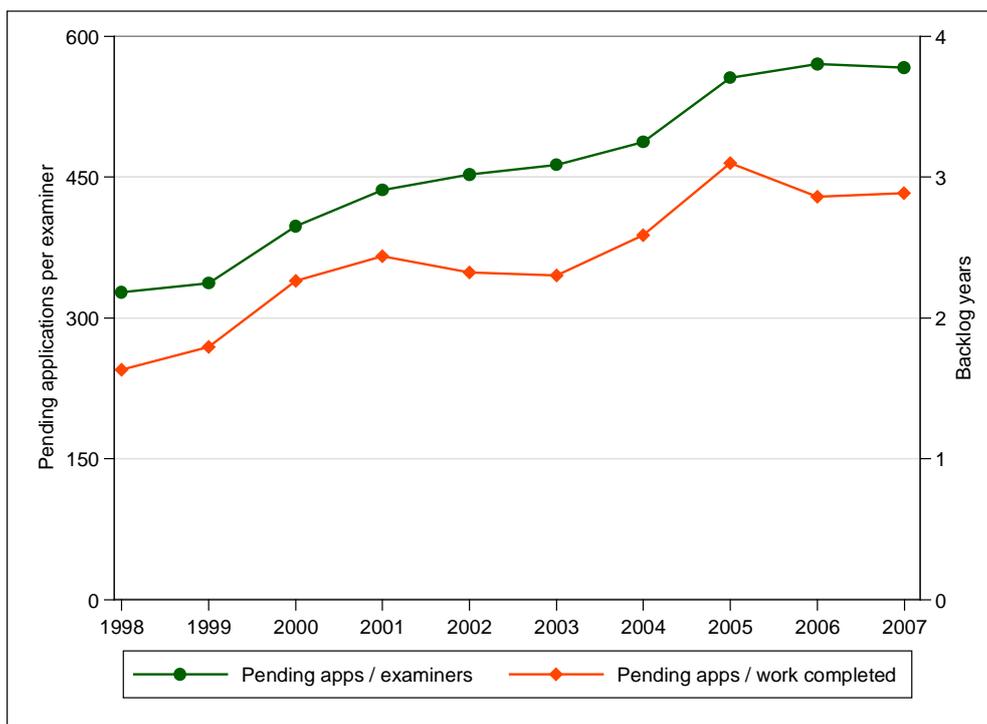
Figure 37: JPO pending applications by type 1998-2007



Source: London Economics using patent office information and TSR data.

Figure 38 below displays the other measures of patent workload for the JPO. These show that the JPO's workload has increased over the past ten years. The number of pending applications per examiner has increased from around 325 in 1998 to over 560 in 2007 while, over the same period, the number of years that would be required to clear the backlog has risen from 1.6 to 2.9.

Figure 38: JPO workload 1998-2007



Source: London Economics using patent office information and TSR data.

A3.2.6 Number of patent examiners

The JPO employed 2,901 staff in 2008, including 2,268 examiners and appeal examiners. Of these, 1,680 were designated patent and utility model examiners (representing 58% of the total staff).

The JPO has recruited a number of new patent examiners in recent years in order to combat patent office backlogs. The number of patent/utility model examiners increased from 1,126 in 2003 to 1,680 in 2008 – a compound annual growth rate of 8%. This is notably higher than the previous five years – in which growth occurred at a compound rate of less than 1% per annum.

Alongside these measures, the JPO has also outsourced some searching of prior art to external organisations. Two forms of outsourcing are used: report by paper, and report by dialogue.

Annex 4 Procedure and trends at the USPTO

A4.1 Grant procedure

A4.1.1 Overview

Table 13: Outline of patent procedure at USPTO	
Types of protection offered:	
Patents	Yes (Utility, Plant and Reissue)
Utility models	No
Length of protection (years) (patent/utility model/design)	20/NA
Provisional applications	Yes
Separate search	No
Request for search required	NA
Request for examination required	No
Acceleration possible	Yes

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: London Economics based on information from patent office annual reports, websites, and WIPO.

A4.1.2 Standard procedure

Inventors may apply for one of two types of patent applications at the USPTO: (1) A non-provisional application, which begins the examination process and may lead to a patent and (2) a provisional application, which establishes a filing date but does not begin the examination process.

Unlike most other patent jurisdictions, applicants are able to request that their patent application is not published (until grant), unless the application is (or will be) also the subject of an application filed in another jurisdiction. If this is the case, or no request is made, then the patent is published after 18 months after the filing or priority date. Until 2001, no patent applications were automatically published.

Filing of an application with the USPTO is taken to imply a request for examination (with search carried out simultaneously). Applications, other than provisional applications, are assigned for examination to the relevant examining technology centres (TC) and are queued according to the order in which they have been filed or in accordance with examining procedures.

Applicants are informed of the outcome of the examination via an office action, which (if the application is rejected) includes information and references helping the applicant decide whether to continue the application. The applicant then has the right to reply. This must be within a period of between 30 days and six months, and is normally set at three months.

On the second or later consideration of the application, the rejection may be made final. The applicant's reply is then limited to appeal in the case of rejection of any claim and further amendment is restricted. Where the patent is found to be allowable, the applicant is sent a Notice of Allowance and Fee(s) Due. The patent is then issued and published.

In some cases (around 500 each year), separate patent applications are made for essentially the same patentable invention. The USPTO then institutes an "interference" proceeding to determine who is the first inventor and entitled to the patent.⁵⁸ In general, the inventor who proves to be the first to conceive the invention and the first to reduce it to practice will be held to be the prior inventor.

The grant of US patents is generally for 20 years from the application priority date, and is subject to the ongoing payment of the relevant maintenance fees. Maintenance fees are due at 3 ½, 7 ½ and 11 ½ years following the grant of the patent.

Following grant, the patent holder is able to apply for a re-issue patent, which necessitates a further examination. Following this, a re-issue can be provided only for the balance of the unexpired term.

Alternatively, anyone can file a request for re-examination of a patent at any point during the lifetime of the patent, based only on prior art.

A4.1.3 Alternative award procedures

In a number of special cases, applications to the USPTO can be effectively accelerated through advancing a prosecution for examination "out of turn". Many of the special cases are procedural in nature (e.g. applications that are almost ready for allowance), or refer to the type of application (e.g. reissue applications). However it is also possible for applicants to petition for an application to be "made special" assuming certain criteria are met.

An application can be made special by petition based on the applicant's age (if they are aged over 65) or health. Alternatively, under the revised accelerated examination program coming into effect in August 2006, any

⁵⁸ Interference proceedings may also be instituted between an application and an issued patent, provided that the patent has not been issued, nor the application been published, for more than one year prior to the filing of the conflicting application.

applicant can apply for accelerated examination, assuming the application meets certain conditions. In particular, to be eligible for accelerated examination applicants must limit the number of claims, carry out a pre-examination search, agree to an interview with an examiner and meet information disclosure requirements.

The representatives of the USPTO felt that accelerated examination might be attractive as a means of preventing infringement. In particular, it was mentioned that, in the US, pending patent rights are not an effective deterrent against infringement, as retroactive protection only applies where the granted claims are the same as the published claims – which only happens rarely.

The accelerated examination program aims to complete the examination of an application within twelve months from filing date. Up to May 2009, on average first actions under the accelerated examination program occur around 6 months after filing, with allowance or abandonment occurring after 8 months. This compares to around 26 months and 40 months for a standard application.

Applications for accelerated examination at the USPTO are rare, with around 1,500 (i.e. less than 1% of all applications) each year. Applications for accelerated examination have been concentrated in electrical technologies, with more than half the applications for accelerated examination in this category. It is felt that firms may be deterred from applying for accelerated examination by the conditions that are required for an application to be eligible. In particular, applicants are required to submit a substantial amount of information up-front, as well as perform a prior art search, which may expose applicants to litigation for inequitable conduct at a later date. In addition, applicants may be deterred by the greater up-front costs in terms of attorney fees (there is no additional application cost), the limit on the number of claims, and the tight time frames for responding to the USPTO.

The USPTO has also initiated a number of Patent Prosecution Highway (PPH) agreements, including with the JPO, the UKIPO, the CIPO, the KIPO and (currently under trial) with IP Australia, the EPO, the DKPTO and the IPOS.

Applicants to the USPTO are able to defer application for up to three years, but this occurs extremely rarely, and has been used in less than 200 cases since the procedure was implemented in November 2000.

A4.2 Trends in patent activity

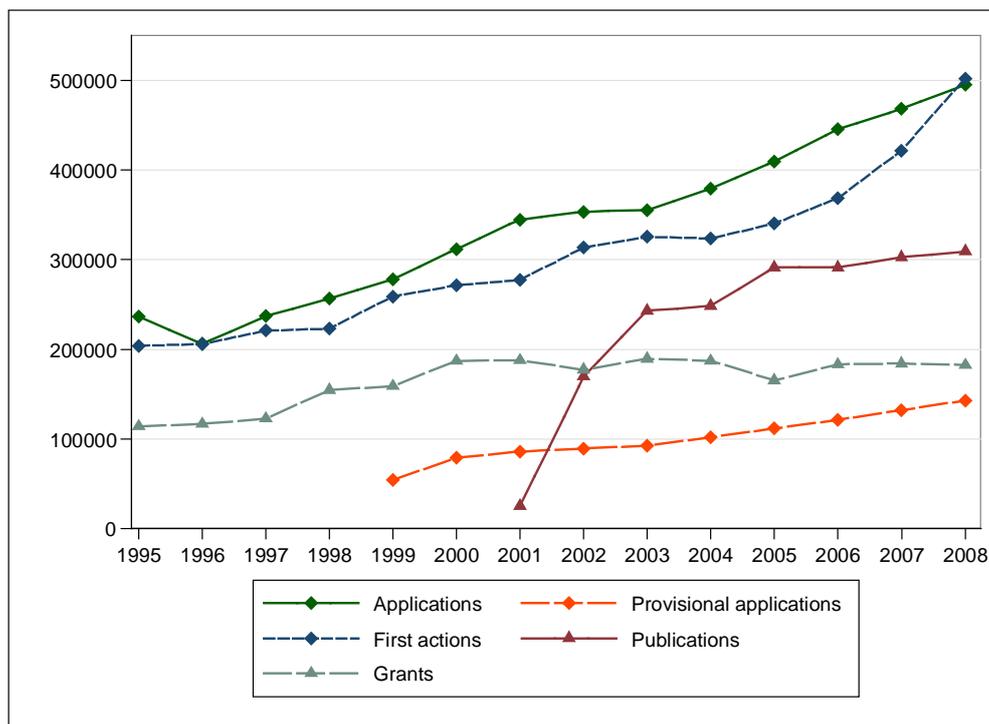
A4.2.1 Applications, examinations and grants

As shown in Figure 39 patent applications to the USPTO have increased from around 228,000 in 1995 to over 450,000 in 2007, representing growth of almost 100%.

The number of first actions taken by the USPTO has also increased at a similar rate during this period, with total growth of almost 150% between 1995 and 2008. Notably, while the number of applications was significantly higher than the number of first actions for nearly all the period, in 2008 this was not the case.

The graph also indicates the number of patent applications published by the USPTO over the past fifteen years. After 2001, when publications first became automatic, the number increased rapidly, before steadying over the past two years. Notably, as the USPTO allows applicants to re-file patent applications as continuations or continuations in part, the number of “original” applications each year is less than the total number of applications. As a result, the number of applications published is substantially smaller than the number of applications.

Figure 39: Trends in patent activity at the USPTO 1995-2008



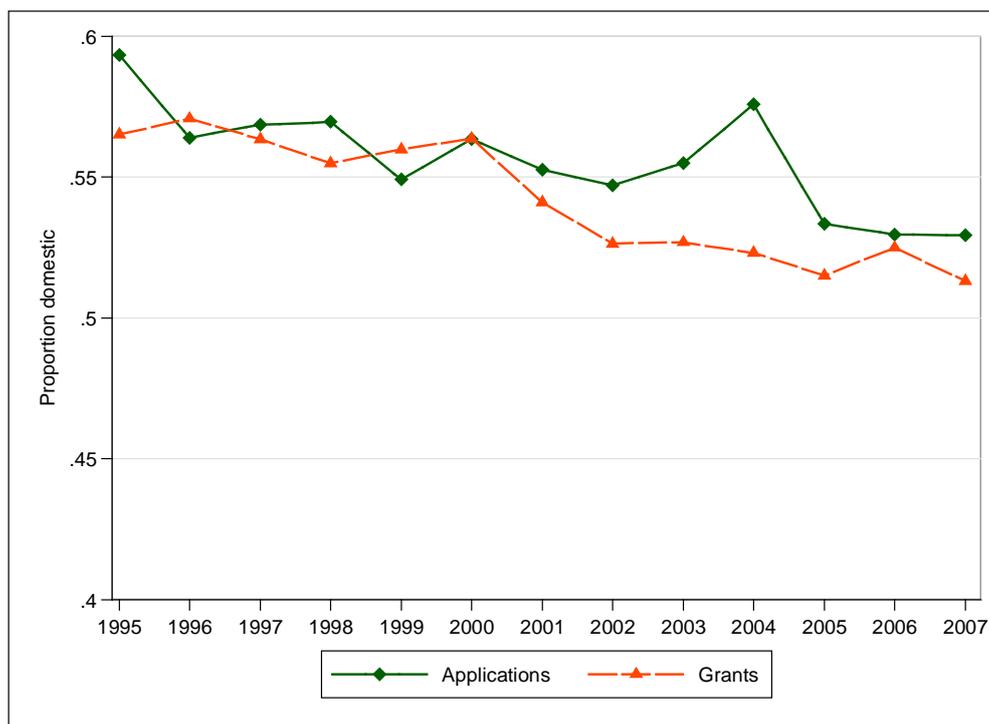
Source: London Economics using patent office information.

Patent grants by the USPTO have also increased significantly over the period, from 114,000 in 1995 to 183,000 in 2008. However, this increase - of 60% over the period - is notably less than the corresponding increase either in applications or in first actions documented above.

A4.2.2 Origin of applications

As Figure 40 indicates, there has been a slight decline in the proportion of applications and grants accounted for by domestic applicants during the period. In 1995 59% of applications and 57% of grants were made by (or to) domestic applicants; by 2007 the corresponding figures were 53% and 51% respectively. Over the last few years, the largest filing countries to the USPTO have consistently been Japan, Korea and Germany. Applications from abroad to the USPTO are nearly always second filings, with the exception of applications originating in Canada.

Figure 40: Origin of patent applications and grants 1995-2007



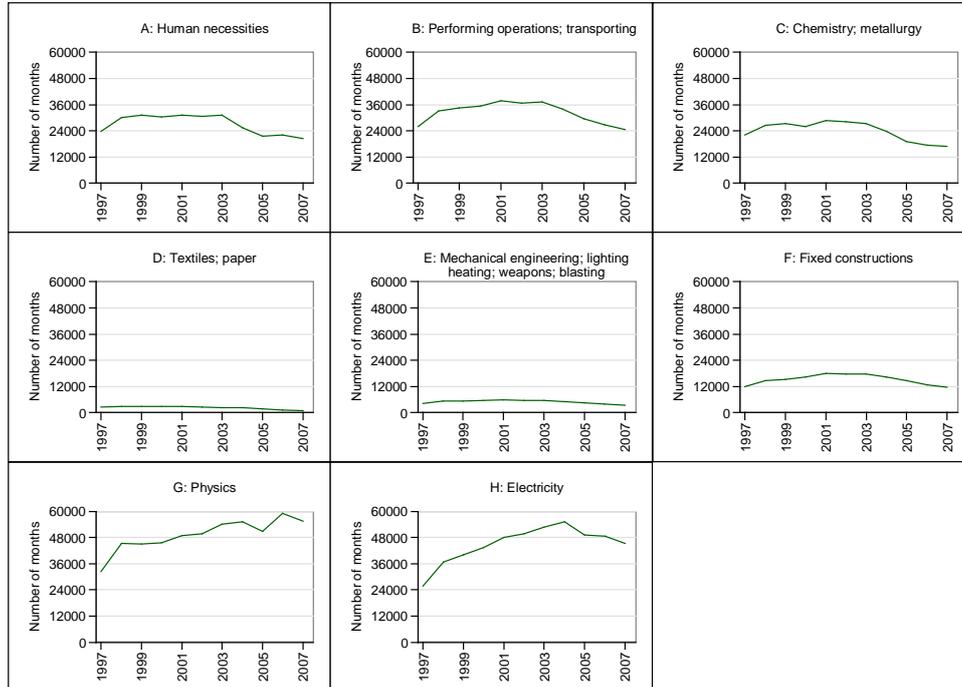
Source: London Economics using patent office information.

A4.2.3 Trends in different technology groups

The most important source of patent grants at the USPTO are the Physics and Electricity groups (groups G and H). These sectors have also seen particularly rapid increases in the number of grants over the past ten years. Interestingly, the number of grants in the other sectors has declined since 2003. The PATSTAT figures also suggest that the total number of grants declined in 2007; however this differs from the figures reported in the USPTO annual report (as presented above).

The USPTO reported that there are no technologies that place a particular workload burden on the office. However, there are differences in the level of complexity of applications in different technologies, which are then built in to examiner production goals.

Figure 41: Patent grants by technology field 1997-2007



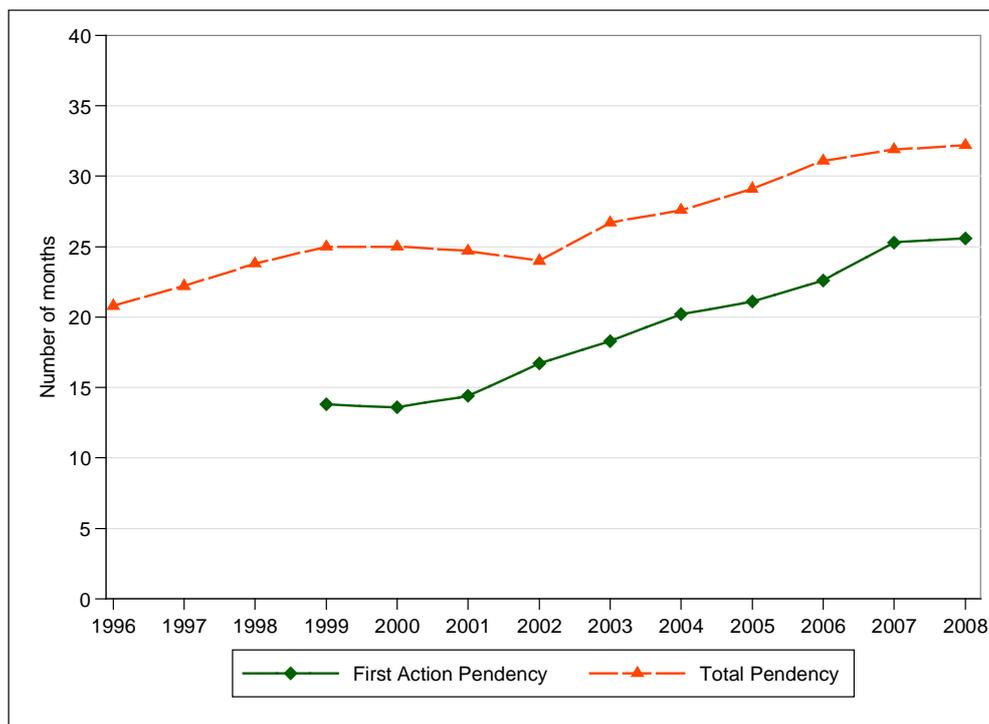
Note: Year plotted refers to year of grant.

Source: London Economics using PATSTAT data.

A4.2.4 Patent pendency

The USPTO provides information on patent pendency both to first action and also for the whole patent process, as shown in Figure 42. As this indicates, pendency has risen steadily over the past ten years, with first action pendency, for instance, increasing from 14 months in 1999 to approaching 26 months in 2008.

Figure 42: USPTO reported patent pendency 1996-2008



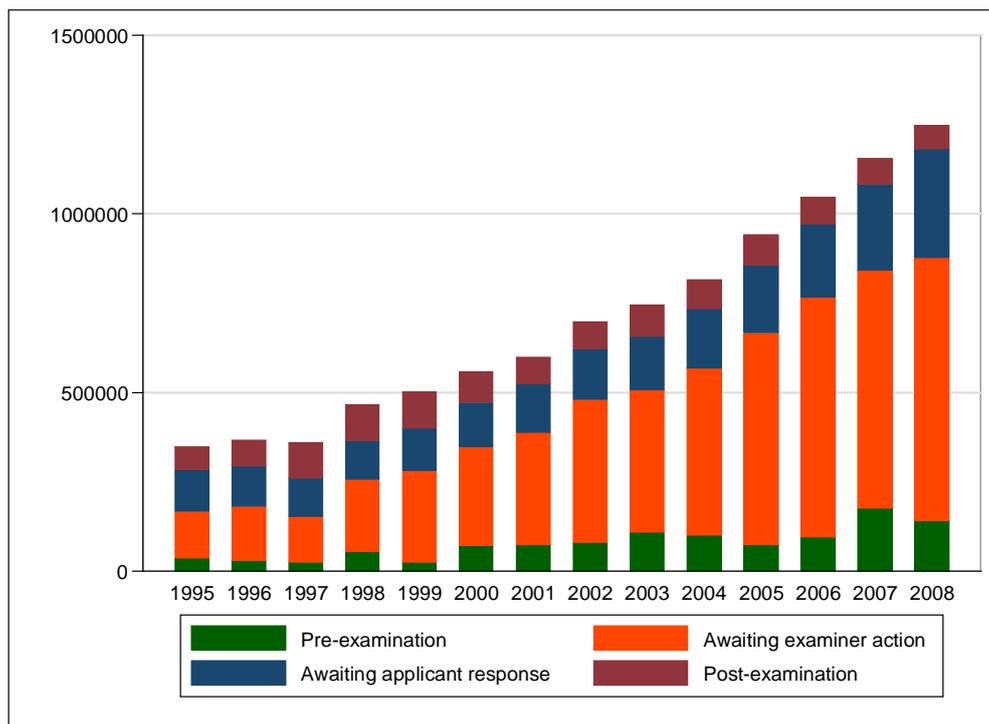
Source: London Economics using patent office information.

A4.2.5 Patent backlogs and workloads

The USPTO felt that the most appropriate indicators of workload are the number of unexamined applications and pendency (both to first action and to disposal). As noted above, pendency has grown substantially in recent years, and as shown in Figure 43, the same is true of the number of pending applications. This has been driven largely by an increase in the number of applications that are under examination and awaiting examiner action. In 1995 131,780 applications fell into this category, while the second largest category (applications awaiting applicant response) contained 116,650 applications. By 2008, in contrast, 735,299 applications were awaiting examiner action (an increase of over 450%) while 303,655 were awaiting a response from the applicant (an increase of 161%).

In contrast to these recent increases, the USPTO expects the number of pending applications to fall in FY 2009.

Figure 43: USPTO pending applications by type 1995-2008

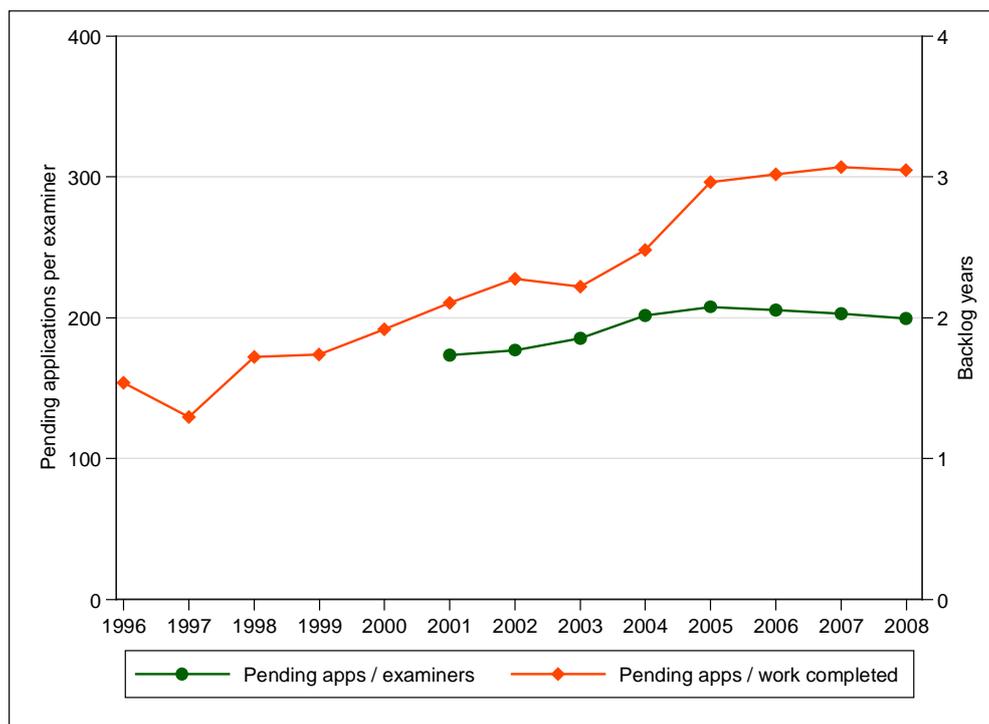


Note: Includes utility, plant, and reissue patents. Applications "awaiting examiner action" and "awaiting applicant response" refer to applications undergoing examination.

Source: *London Economics using patent office information.*

Although the number of pending applications has increased, the number per examiner has fallen over the past few years, as shown in Figure 44. The time it would take to clear the backlog increased significantly 1996 to 2005, but has remained relatively stable over the past three years.

Figure 44: USPTO workload 1996-2007



Source: London Economics using patent office information.

The USPTO representatives commented that backlogs are particularly pronounced in the telecoms group, which reflects both the increased number of applications (e.g. corresponding to the growth of cellular phone and internet technology) and “technology creep” whereby applications become more complex as the technology develops.

A4.2.6 Number of patent examiners

The USPTO has sought to respond to growing backlogs through a substantial recruitment programme, an aggressive focus on work-sharing, attempts to limit the number of claims submitted by applicants, and continuous process improvement.

The number of patent examiners employed by the USPTO has increased from 3,753 in 2004 to 6,005 in 2008 (representing a compound annual growth rate of approximately 13% per annum).⁵⁹ As a result of this increase, patent examiners grew from 55% of the total USPTO staff in 2004 to 64% in 2008.

⁵⁹ Patent examiners include examiners for utility, plant, reissue and design patents.

Annex 5 Procedure and trends at IP Australia

A5.1 Grant procedure

A5.1.1 Overview

Table 14: Outline of patent procedure at IP Australia	
Types of protection offered:	
Patents	Yes
Utility models	Yes (Innovation patents)
Length of protection (years) (patent/utility model)	20/8
Provisional applications	Yes
Separate search	No
Request for search required	NA
Request for examination required	6 months from direction to request examination
Acceleration possible	No

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: London Economics based on information from patent office annual reports, websites, and WIPO.

A5.1.2 Standard procedure

Applicants in Australia can file a provisional application for a standard patent, which is useful to establish a priority date. Applicants filing a provisional application to IP Australia are also able to request a separate search under section 15(5) of the PCT. Following filing, applicants with a provisional application then have 12 months to file a complete application (either in Australia or elsewhere). Applicants that have filed a provisional application are able to request a patentability search within 10 months of filing. The results of this are not made public, but provide the applicant with the opportunity to decide whether to pursue their application.

Publication of patents occurs 18 months after priority date in the Australian Official Journal of Patents (AOJP).

IP Australia has a system of deferred examination whereby examination does not occur unless the applicant requests it. Deferred examination thus provides applicants with some control over when their application is examined, provided they request examination within five years of filing. Depending on workloads, the Commissioner can also direct the applicant to request examination at an earlier date. At present, this usually occurs around

one to two years after filing. Following being directed to request an examination, applicants have six months in which to do so.

Replies to requests for examination are generally forthcoming within 14 months.⁶⁰ This can either be an adverse report, stating the reasons for rejection of the application, or a notice that the application has been accepted. If the application is accepted, the patent is republished in the AOJP. Other parties then have 3 months to start proceedings to show that the patent, if granted, would be invalid. However, fewer than 2% of accepted applications are opposed. If the grant is not opposed, the applicant is sent the patent certificate at the end of the opposition period.

Maintenance of Australian patents includes the payment of annual fees after the fifth anniversary.

IP Australia also issues innovation patents, which are similar to utility models in other jurisdictions. Innovation patents do not generally undergo substantive examination. However, the innovation patent only becomes enforceable if it is certified, i.e. undergoes substantive examination with a favourable finding. The term of an innovation patent is 8 years (compared to 20 years for a standard patent). Innovation patents account for around 5% of all applications to IP Australia. Third parties are able to directly request an examination of an innovation patent, but not for a standard patent application.

A5.1.3 Alternative award procedures

Applicants are able to request expedited examination free of charge, which allows them to “jump the queue” when it comes to their application being examined. This is only used for a very small proportion of applications, although there is some evidence that this has been increasing in recent years. In the first four months of 2009, 1.3% of applications have been subject to expedited examination, in comparison to 0.8% of applications in the previous calendar year.

IP Australia is currently trialling a Patent Prosecution Highway (PPH) agreement with the USPTO. As of the end of April 2009, around 27 requests had been made at IP Australia, and 4 at the USPTO.

Applicants that have a granted patent in one of a number of specified countries (including the USA, Canada, New Zealand and any country that is a signatory to the European Patent Convention) are able to request “modified examination”, under which the examination process is streamlined. Modified

⁶⁰ Under the Charter Service Level Commitments, IP Australia aims to issue first reports with 14 months of receiving the request for examination.

examination does not speed up the time to examination but actual examination is modified in accordance with the terms on which the application was examined and granted elsewhere. This offers a form of mutual recognition, but at present is little used, accounting for less than 2.5% of requests for examination. The reasons for these low numbers are not clear, but may reflect a lack of awareness (amongst applicants if not patent attorneys) or the fact that modified examination is seen as a weaker option.

Applicants that would qualify for modified examination, but whose foreign patent has not yet been granted, are able to defer examination if they expect the foreign patent to be granted soon. Deferring examination provides the applicants an additional nine months in which to request examination.

Applicants are able to postpone acceptance of an application for a period of up to 21 months from the date of the First Office Action. Similarly, following an adverse examination report, applicants have up to 21 months to achieve acceptance. A large proportion of applicants use these provisions to defer acceptance, although the reasons for this are not clear.

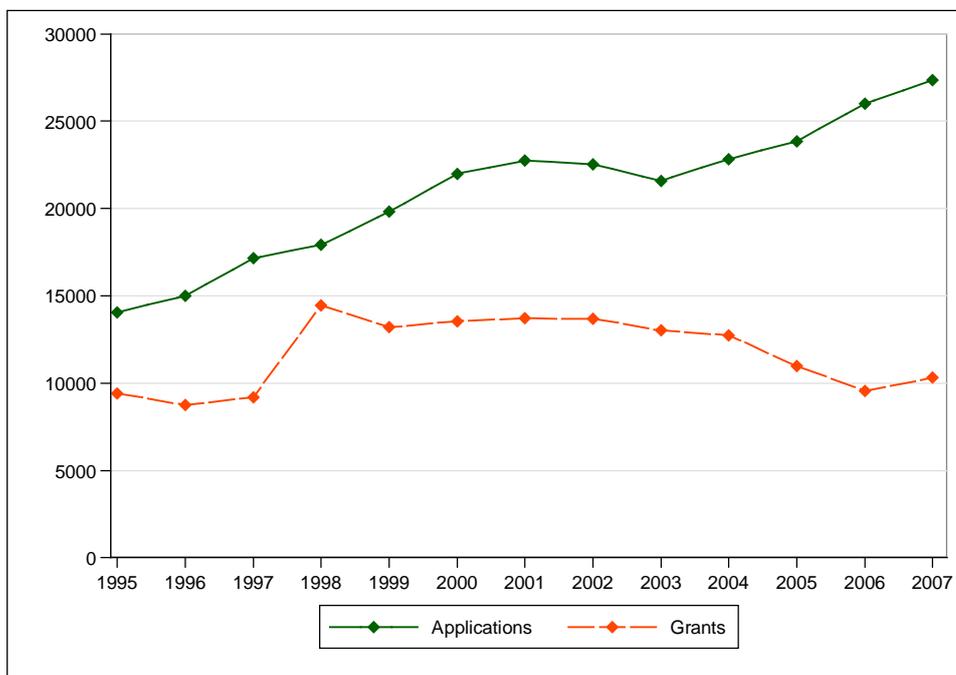
A5.2 Trends in patent activity

A5.2.1 Applications, examinations and grants

Patent applications to IP Australia increased consistently over the period, with total applications almost doubling from 14,061 in 1995 to 27,343 in 2007. Compound annual growth was around 6% over the period. This is displayed in Figure 45.

In contrast to the trend in patent applications, the annual number of patent grants in Australia has declined by 29% over the past nine years (following a surge in 1998). However, the number of grants did increase by 8% in 2007.

Figure 45: Trends in patent activity at IP Australia 1995-2007



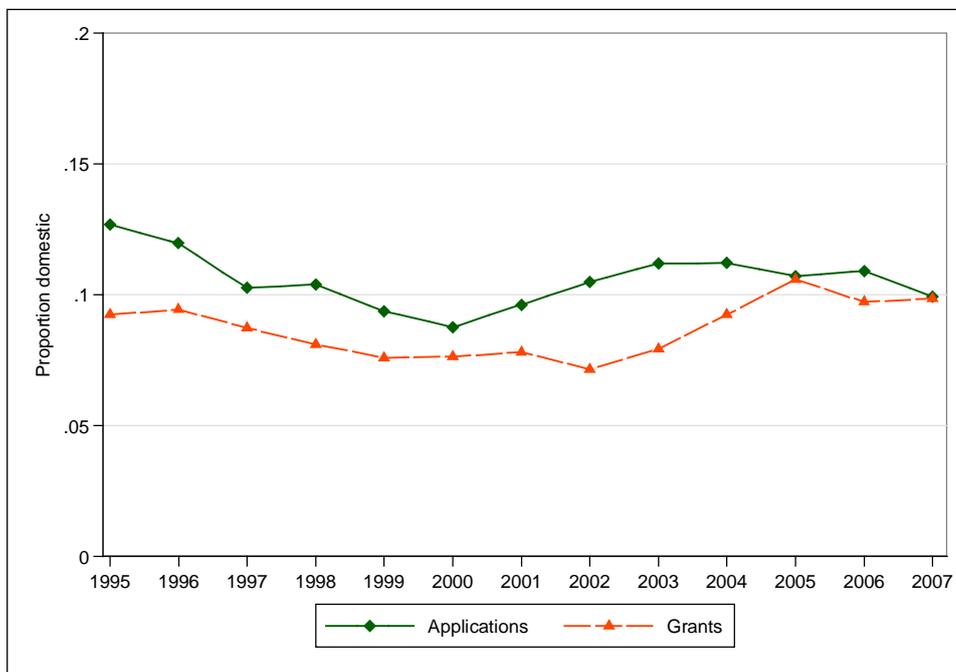
Source: London Economics using patent office information.

A5.2.2 Origin of applications

As shown in Figure 46 a very low (fewer than 15%) proportion of applications and grants at IP Australia are from / to domestic applicants. Similarly, our interview with IP Australia indicated that a very high proportion (circa 85%) of applications to IP Australia are second filings. There have been no noticeable changes in the country of origin of applications in recent years.

Interestingly, since the turn of the millennium however, the proportion of domestic applicants has increased slightly in terms of both applications and grants. Our discussion with IP Australia indicated that there is no clear single factor underlying this and it should be noted that many Australian inventors file their patent applications directly in foreign jurisdictions such as the US and Europe, which are their primary markets.

Figure 46: Origin of patent applications and grants 1995-2007

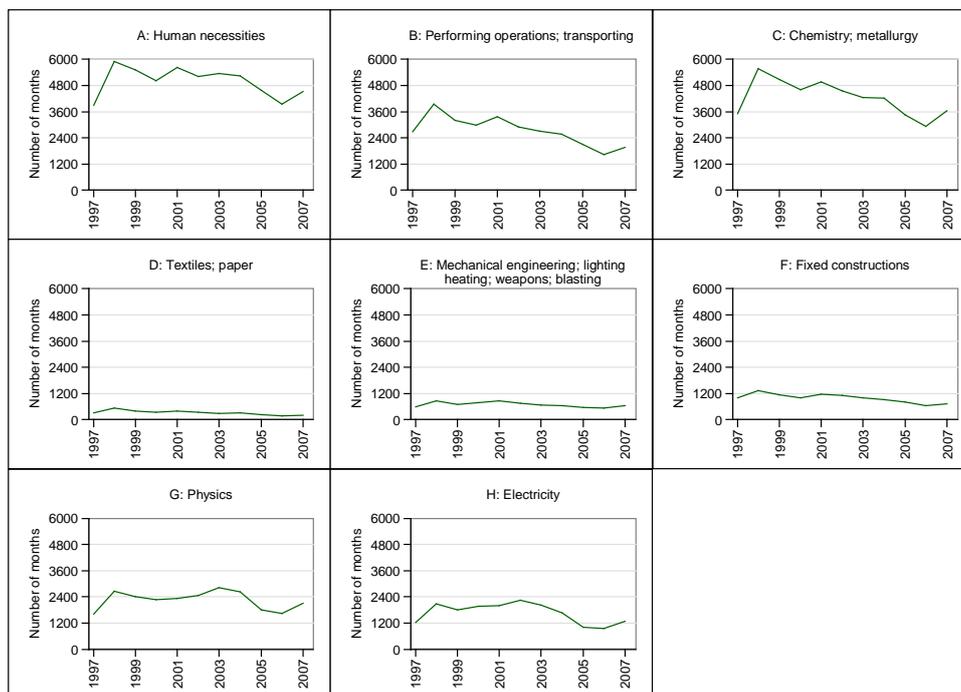


Source: London Economics using patent office information.

A5.2.3 Trends in different technology groups

The largest filings, in terms of the proportion of total applications received are in “Organic and Fine Chemicals” (10%), “Pharmaceutical and Cosmetics” (9%) and “Mechanical Engineering” (8%). By technology group, the most important source of patent grants at the IP Australia are the Human necessities and Chemistry; metallurgy groups (groups A and C), as shown in Figure 47. Generally however trends in the number of grants have been similar across the different technologies. In particular, as shown for the overall trend above, the number of grants has generally declined over the past ten years, but with a slight increase in 2007.

Figure 47: Patent grants by technology field 1997-2007



Note: Year plotted refers to year of grant.

Source: London Economics using PATSTAT data.

Although IP Australia has not examined trends by technology type in detail, no one type of technology has contributed noticeably to the growing number of applications received. IP Australia does allow patents for software and business methods (although with more restrictions than in the US)⁶¹. Business method patents do not, however, account for major increases in the number of applications seen in recent years.

A5.2.4 Patent backlogs and workloads

The number of pending applications at IP Australia has increased in recent years. However, as examiner productivity has also increased the overall impact on workload is not clear.⁶²

⁶¹ In Australia, the subject matter of business method patents is clearly stipulated in *Grant v Commissioner of Patents* [2006] FCAFC 120. A business method is patentable in Australia provided it involves a physical effect defined as a concrete effect or phenomenon or manifestation or transformation. A business method cannot be a mere scheme, abstract idea or intellectual information.

⁶² Information received through the interview with IP Australia.

Backlogs can have implications for patent quality, as examiners attempt to complete more examinations within the same timeframe (under pressure for increased efficiency).

IP Australia has made a number of proposals for changes to the patent grant procedure, as part of the Review of the National Innovation System. A number of these might be expected to impact on backlogs and workload at IP Australia, including:

- harmonising Australian patent law with international standards;
- fast-tracking patent applications where a patent for the same invention has been recognised in a recognised jurisdiction;
- tailoring examination so as to use work on the same application at other patent offices as much as possible;
- providing applicants the option of receiving an early search and validity opinion (prior to publication);
- allowing third parties to request examination, so as to reduce the potential from uncertainty where patent rights are pending; and
- reducing application time frames so as to maximise the amount of work available in other patent offices, and limit market uncertainty prior to grant.

A5.2.5 Number of patent examiners

IP Australia has looked to adapt to growing workloads through hiring more examiners (although it has been difficult to recruit as many examiners as desirable), retaining existing examiners and improving system efficiency. Recently a new patent examination centre has been opened in Melbourne (previously all examination staff were based in Canberra). As a result, the number of staff employed by IP Australia has increased significantly since 2004, following a previous decline. Between 2001 and 2004 the number of staff fell from 816 to 785, since which it has increased to 996 in 2008.⁶³

In addition to examiner recruitment, IP Australia has looked to forestall any decline in patent quality through a strong quality management system, and recently achieved ISO9001 certification. Also, IP Australia recently adopted the EPOQUE patent search system.

⁶³ Numbers include ongoing and non-ongoing staff, as at June of each year.

Annex 6 Procedure and trends at the CIPO

A6.1 Grant procedure

A6.1.1 Overview

Table 15: Outline of patent procedure at CIPO	
Types of protection offered:	
Patents	Yes
Utility models	No
Length of protection (years) (patent/utility model)	20/NA
Provisional applications	No
Separate search	No
Request for search required	NA
Request for examination required	5 years from filing
Acceleration possible	Yes

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: *London Economics based on information from patent office annual reports, websites, and WIPO.*

A6.1.2 Standard procedure

Initially applications to the CIPO are checked to ensure that they meet formalities (within 4 weeks of application) and classified according to the international patent classification (within six weeks of filing). After 18 months from the priority date, the application is laid open for public inspection.

Applications are only formally examined following the receipt of a request for examination (and payment of the relevant fee), after which they are queued in the order in which the requests are made. This must occur within 5 years of the application filing date (reduced from 7 years in 1996). Failure to request examination within 5 years results in the application being abandoned. The application may be reinstated by the applicant within one year of the abandonment. To re-instate an application, the applicant must make a request for re-instatement, take the action that should have been taken in order to avoid the abandonment, and pay the appropriate fees.

If there are problems with an application, applicants receive an Examiner's Report, which identifies any defects with the application and requisitions the applicant to amend the application to comply with the Act and Rules or to provide arguments as to why it does already comply within 6 months of the

requisition. Failure to comply with the examiner's requisition results in the abandonment of the application. An abandoned application can be reinstated (as discussed above).

When the applicant and the examiner reach an impasse in resolving disagreements related to whether or not an application complies with the Act and Rules, the application is rejected in an examiner's Final Action. The applicant has six months to respond to a Final Action otherwise the application is abandoned. If after the response the examiner still believes that the application does not comply with the Act and Rules then the application is forwarded to the Patent Appeal Board (PAB) for a review of the prosecution. The PAB after a review that may include a hearing writes a recommendation for the Commissioner either supporting the examiner's objection and to refuse to grant a patent or supporting the applicant and to return the application to the examiner for further prosecution. If the application is refused by the Commissioner, then the applicant may appeal the decision to the courts.

If there are no objections to an application, it passes to the Allowance stage. Recipients receive a Notice of Allowance, following which they have 6 months to pay the final fee. Failure to pay the final fee results in abandonment. Once the fee is paid, the patent is granted within 12 weeks. Following grant, any party can seek re-examination based on prior art documents.

Patents must be maintained through maintenance fees, the first of which is due no later than the second anniversary of application filing. Fees are then payable annually (although they can be paid in advance).

The CIPO also allows patents to be reissued, where an accident, inadvertence or mistake resulted in a defective patent by way of insufficient description or specification. Around 35-40 applications for re-issue are received each year.

A6.1.3 Alternative award procedures

Applicants with exceptional reasons (e.g. they expect imminent competition, or are seeking to establish a business following the award of the patent) are able to apply for an advanced examination. Compared to the US, it is relatively easy to obtain advanced examination in Canada (Ledwell and Sprigings, 2007). Accelerated applications are examined within 30 days of request for examination.

The numbers of applications for advanced examination are very low (around 1-2% of total requests for examination), despite the procedure being relatively inexpensive. It is also rare for third parties to request examination of a patent application, which suggests that the growing pendency at the CIPO (as discussed below) has not been perceived as a problem to date.

The CIPO is also involved in a three-year trial of a Patent Prosecution Highway (PPH) agreement with the USPTO (starting January 2008).

A6.2 Trends in patent activity

A6.2.1 Applications, examinations and grants

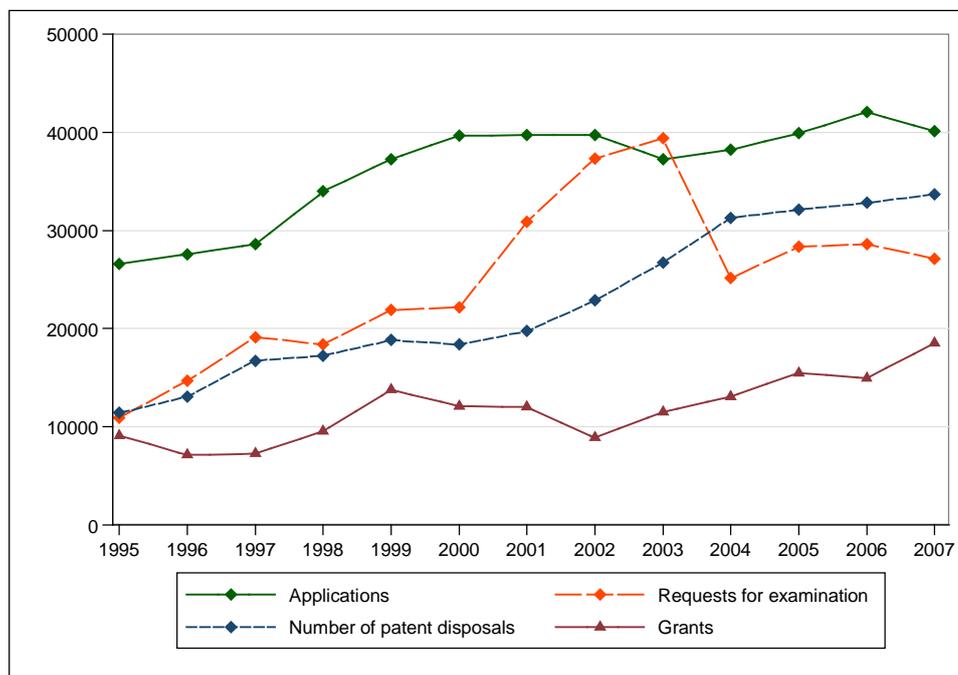
As shown in Figure 48 the number of patent applications to the CIPO has remained reasonably constant since 2000, following a sharp increase in the number of applications in the previous five years.⁶⁴ The number of applications grew at a compound rate of over 8% per annum between 1995 and 2000; whereas between 2000 and 2007, compound annual growth was under 1%.

Figure 48 also displays the number of examination requests and the number of applications disposed of by patent examiners in the CIPO each year. The most notable feature of this is the spike in the number of requests for examination between 2000 and 2003. This is predominantly explained by the reduction in the period in which applicants have to request examination (from seven to five years), which took place in 1996. As a result, during this period (until September 2003), two separate “cohorts” faced the same deadline to submit examination requests.

Aside from this temporary surge in requests for examination, there also appears to have been a long-term trend for an increasing number of requests for examination to occur each year. Over the entire period 1995-2007, the number of requests for examination grew at a compound annual rate of almost 8%. However, as indicated in the figure, the number of patent disposals has managed to keep pace with this, growing at a compound annual rate of over 9%. Further, since 2004 the number of disposals each year has exceeded the number of new requests for examination, implying a reduction in the stock of examinations awaiting first action. Inventory of applications awaiting a first action is currently about 74% of the 2004 levels.

⁶⁴ Data from the CIPO relates to years ending in March. Therefore, the data for 2006 (for example) relates to applications from April 2006 to March 2007.

Figure 48: Trends in patent activity at the CIPO 1995-2007



Source: London Economics using patent office information.

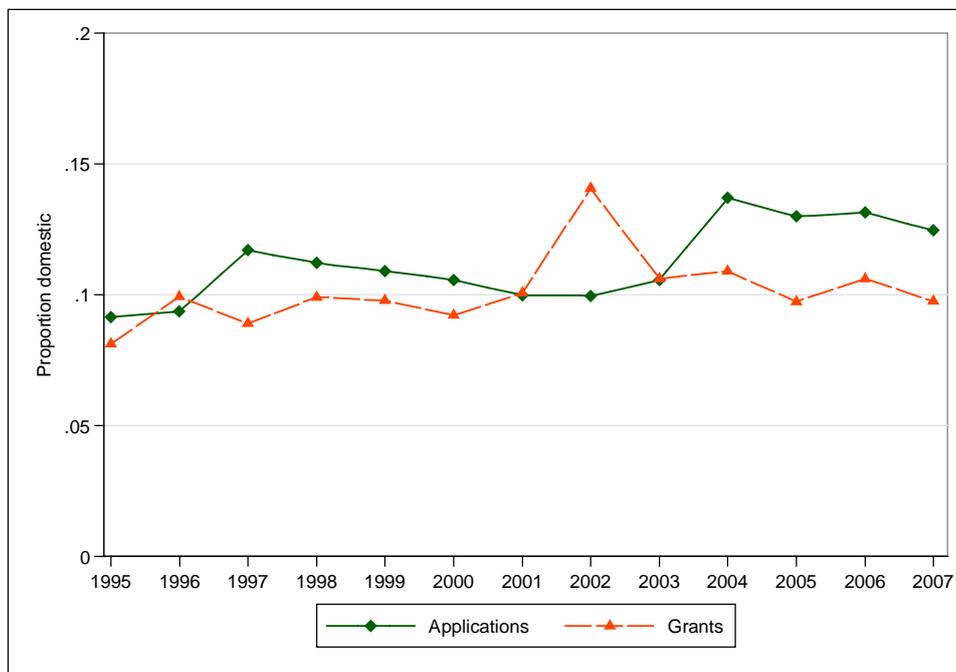
Over the past five years the number of reinstatements for abandoned applications with a request for examination has increased from around 2,000-2,500 to around 4,000 each year. This includes applications where applicants have failed to respond to an examiner within a six-month period. This could suggest that applicants are becoming more willing to extend the period between application and patent grant. However, to some extent, this growth is likely to reflect the overall increase in the number of examinations carried out each year.

A6.2.2 Origin of applications

Only a very small proportion (less than 15%) of applications and grants at the CIPO are made by domestic applicants, and most applications are second filings. However, as displayed in Figure 49, in the last five years domestic applications have represented a slightly higher proportion; increasing from around 10% of all applications in 2002 to around 12.5% in 2007.

Although around 75% of applications to the CIPO are via the PCT, the CIPO's representatives did not feel that the PCT has had a major impact on workload. In particular, this is supported by the fact that the major countries of origin for applications have remained fairly constant since the advent of the PCT.

Figure 49: Origin of patent applications and grants 1995-2007



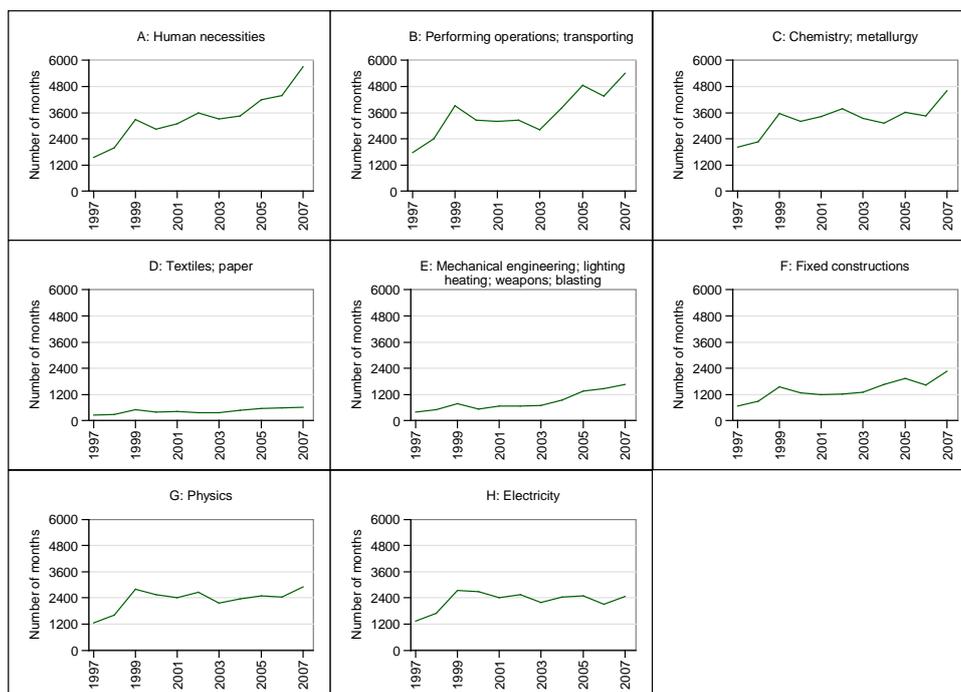
Source: London Economics using patent office information.

A6.2.3 Trends in different technology groups

Examiners at the CIPO are generally divided into five disciplines: Mechanical, Electrical, Biotechnology, Organic Chemistry, and General Chemistry. The amount of time examiners are given to dispose of an application varies across disciplines: examiners in the Organic Chemistry and Electrical disciplines are given 20% more time to dispose of an application than examiners in the Mechanical and General Chemistry disciplines, and examiners in the Biotechnology discipline are given 50% more time to dispose of an application than examiners in the Mechanical and General Chemistry disciplines.

By technology group, the most important source of patent grants at the CIPO are the Human necessities and the Performing operations and transporting groups (groups A and B). Overall, the individual technology groups appear to reflect the overall trends discussed above, with the number of grants growing in recent years, following the change in the examination request period.

Figure 50: Patent grants by technology field 1997-2007



Note: Year plotted refers to year of grant.

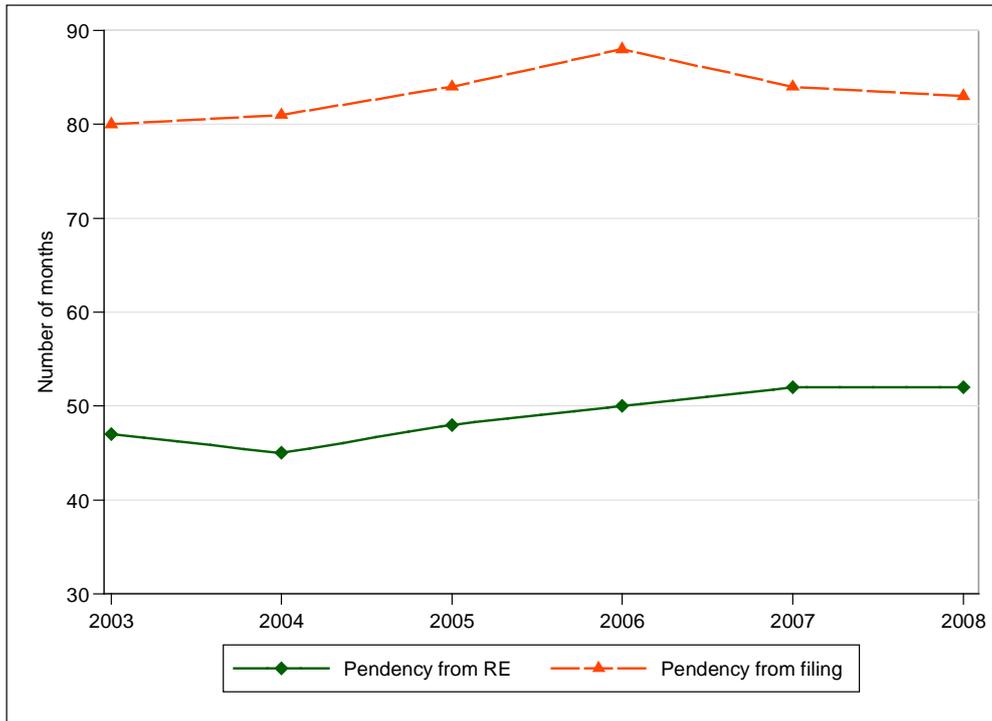
Source: London Economics using PATSTAT data.

A6.2.4 Patent pendency

CIPO monitors pendency and other turnaround times related to examination, such as to first action, from the date that the Request for Examination is made, since the office exercises no control as to when an applicant requests examination. As shown in Figure 51, pendency from request for examination has increased from 45 months in March 2003 to 52 months in May 2009, although there has been some decline over the past two years. This may reflect the reduction of the deferral period from seven years to five years (in 1996), and the consequent surge in examination requests that occurred between 2000 and 2003.

As noted above, since 2004 the number of patent disposals has exceeded the number of requests for examination and as a result, CIPO expects that pendency to first action will fall within the next two years in most examination disciplines. This is primarily as a result of increased examination capacity and also, to a lesser degree, due to the potential drop in application numbers following the onset of global recession.

Figure 51: CIPO reported patent pendency 2003-2008



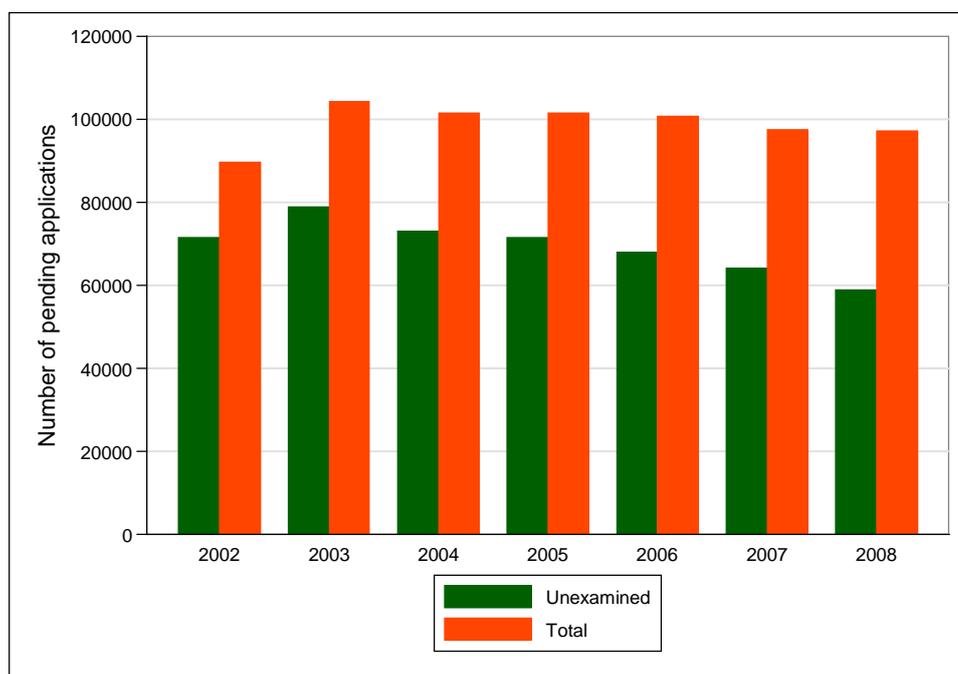
Note: Based on pendency for March of each financial year, with the exception of 2008, which is based on average within May 2009.

Source: London Economics using patent office information.

During the interview with CIPO it was mentioned that pendency has increased within the electrical division in recent years, due to a relative shortfall in hiring, and due to a larger-than-expected proportion of international applications falling within the electrical division (reflecting a global trend).

A6.2.5 Patent backlogs and workloads

The number of pending applications at the CIPO has declined since 2003, as shown in Figure 52. This reflects the figures for disposals and requests for examination discussed above.

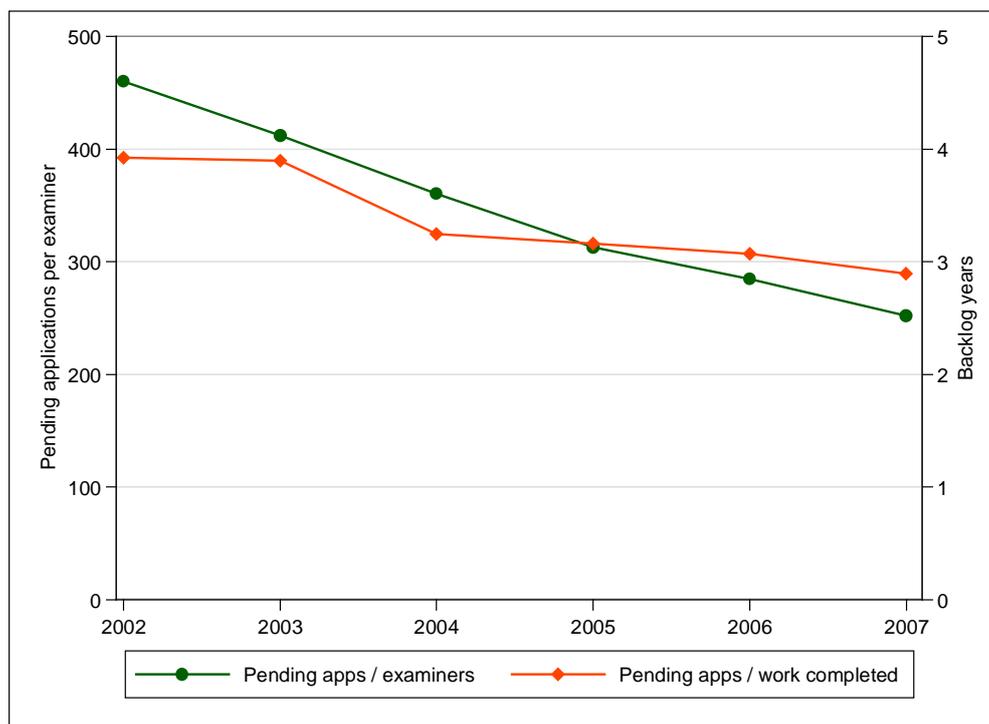
Figure 52: CIPO pending applications by type 2002-2008

Note: Includes applications in good standing only. Figure for 2002 based on number of pending applications in April 2003.

Source: *London Economics using patent office information.*

A similar trend is seen using other workload measures, as indicated in Figure 53, indicating that examination capacity has been increasing at a faster rate than the number of new requests for examination. In particular, this reflects the CIPO's aggressive recruitment strategy.

Figure 53: CIPO workload 2002-2007



Source: London Economics using patent office information.

Generally, the representatives of CIPO indicated that they believe that “backlog” refers to the difference between the existing workload inventory and the “steady state” inventory, where the steady state inventory exists when customer service targets can be met. In the CIPO, the expected number of examination requests is modelled, and the level of staff (and other inputs) is tailored accordingly.

Managing backlogs depends on matching office capacity to examine (such as the number of examiners, time allocated to non-examination functions) to the level of inputs (such as requests for examination and international examination responsibilities). Capacity can be influenced both by changing the number of examiners, but also by changing the patent examination procedure. In the CIPO, for example, extensive use is made of search results from other offices in order to expedite the examination process. Applications with no available search results from other patent offices would potentially impose a greater burden on the CIPO, however due to the deferred examination this is not a significant problem.

A6.2.6 Number of patent examiners

The CIPO has increased staffing levels significantly in recent years, with the total number of employees increasing from 654 in 2000 to 1,069 in 2007; and the number of patent examiners increasing from 150 in 2001 to 387 in 2007.

Annex 7 Procedure and trends at the SIPO

A7.1 Grant procedure

A7.1.1 Overview

Table 16: Outline of patent procedure at SIPO	
Types of protection offered:	
Patents	Yes
Utility models	Yes
Length of protection (years) (patent/utility model)	20/10
Provisional applications	No
Separate search	No
Request for search required	NA
Request for examination required	3 years from filing
Acceleration possible	Yes

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: London Economics based on information from patent office annual reports, websites, and WIPO.

A7.1.2 Standard procedure

Applications to the SIPO are published within 18 months of priority date. Examination of the patent however only occurs following a request for examination, which must be filed within three years of the priority date.

Following examination, applicants receive either a notification of pending refusal – offering the opportunity to make amendments to the application – or a decision to grant the patent. Eventually, if amendments are regarded as insufficient, a decision of refusal is issued, following which applicants must appeal to the Re-examination Board to continue their application.

Since 2001, granted patents can be challenged under the invalidation procedure at any point during the lifetime of a patent.

A7.1.3 Alternative award procedures

Applicants to the SIPO are able to request accelerated examination either for applications which are of importance to the national or public interest, or where the SIPO has itself initiated examination.⁶⁵

A7.2 Trends in patent activity

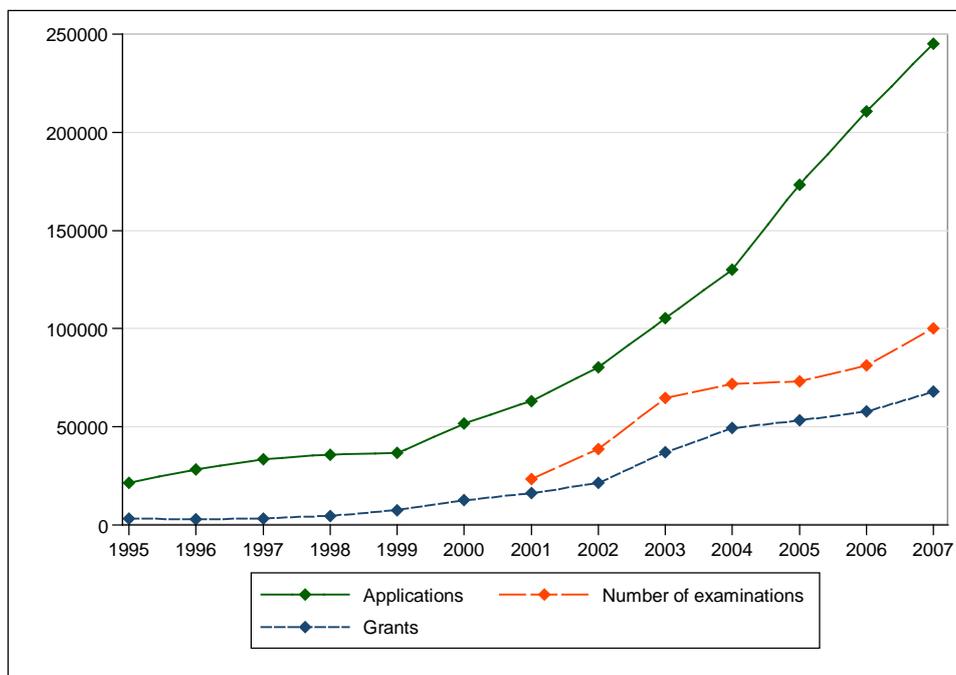
A7.2.1 Applications, examinations and grants

The number of patent applications in China has increased substantially since 1995, as shown in Figure 54. In particular, applications have grown rapidly since 1999, with the total number of applications reaching 245,161 in 2007, compared to 36,694 in 1999 – corresponding to compound annual growth of over 25% per annum.

Information on the number of patent examinations performed by SIPO is only available since 2001. As Figure 54 shows, the number has increased rapidly since 2001, with over 100,000 examinations carried out in 2007. In fact growth over this period has been at a similar pace to the growth in applications – with compound annual growth of over 25%. However, given the larger number of applications, this implies that the aggregate backlog of examinations has increased during the period.

⁶⁵ This information is based on Japan Patent Office (2008) *New intellectual Property Policy for Pro-Innovation: Intellectual Property System as Global Infrastructure*, Policy Committee on Innovation and Intellectual Property, Provisional English Version.

Figure 54: Trends in patent activity at the SIPO 1995-2007



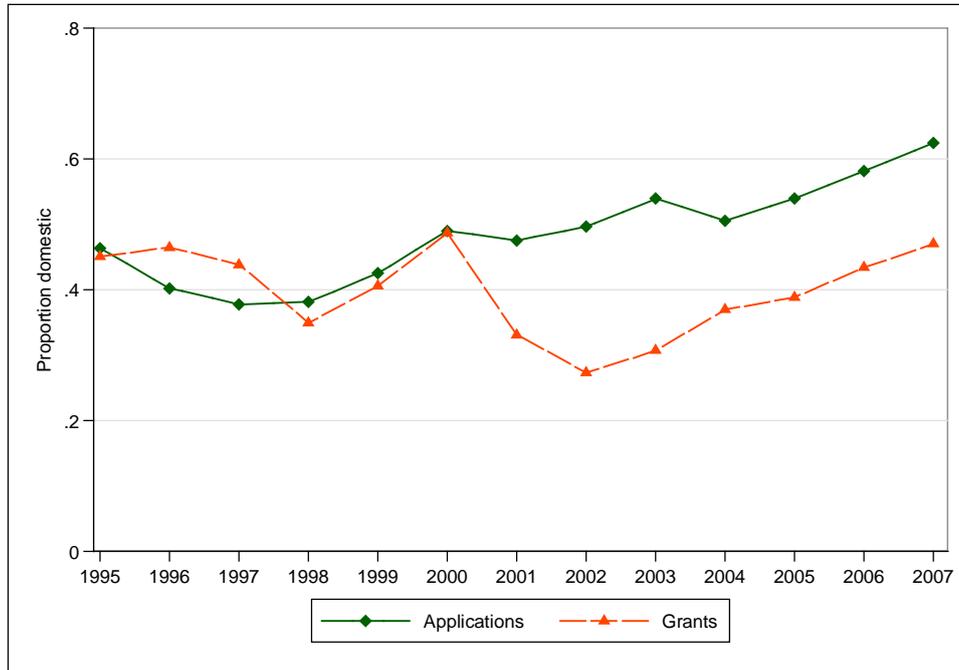
Source: London Economics using patent office information.

A7.2.2 Origin of applications

Interestingly, the growth in applications at the SIPO has been driven by both foreign and domestic applications. As shown in Figure 55 applications by domestic inventors overtook foreign applications for the first time (at least in this period) in 2003, since when they have continued to grow at a much faster rate, accounting for 62% of total applications in 2007.

As of 2007, foreign grants still represented more than half of the total patent grants made, but domestic grants represent an increasing proportion of the total – and given the applications trend noted above, are likely to overtake foreign grants in the near future.

Figure 55: Origin of patent applications and grants 1995-2007

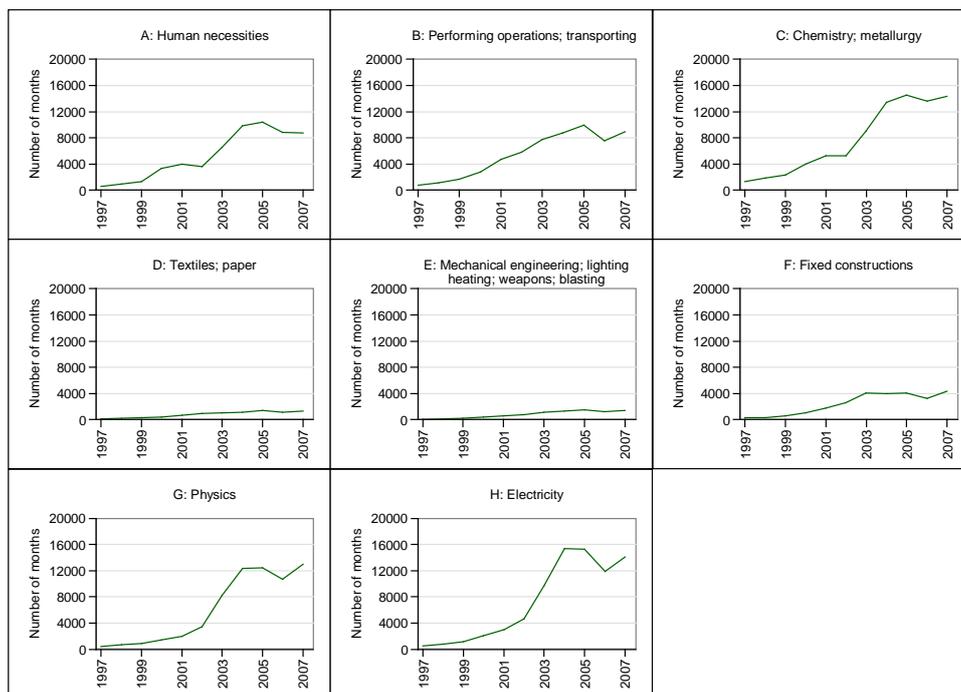


Source: London Economics using patent office information.

A7.2.3 Trends in different technology groups

As shown in Figure 56, the most important source of patent grants at the SIPO are the Chemistry; metallurgy and Electricity technology groups (groups C and H). There has been rapid growth in all the technology groups, reflecting the overall trends at SIPO. Although the number of grants in each of the eight technology groups fell in 2006, the total number of grants at the SIPO (displayed in Figure 54) grew substantially, suggesting that there may have been a change in the method of assigning applications to technology groups.

Figure 56: Patent grants by technology field 1997-2007



Note: Year plotted refers to year of grant.
 Source: London Economics using PATSTAT data.

A7.2.4 Patent pendency

Pendency information reported by the SIPO in their annual reports indicates that total pendency fell substantially from 53 months in 2001 to under 23 months in 2006. However in 2007 pendency increased to 26 months.

A7.2.5 Number of patent examiners

SIPO employed a total of 2,672 patent examiners in 2007 - an increase of 23% on the 2,170 employed in 2006. This represents the continuation of a rapid expansion in the size of the patent examination team, with SIPO also hiring 535 new examiners in 2006.

Annex 8 Procedure and trends at the DPMA

A8.1 Grant procedure

A8.1.1 Overview

Table 17: Outline of patent procedure at DPMA	
Types of protection offered:	
Patents	Yes
Utility models	Yes
Length of protection (years) (patent/utility model)	20/10
Provisional applications	No
Separate search	Only on request
Request for search required	NA
Request for examination required	Up to 7 years from filing
Acceleration possible	Yes

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: London Economics based on information from patent office annual reports, websites, and WIPO.

A8.1.2 Standard procedure

Filing an application and the request for examination are treated as separate processes at the DPMA. Applicants can either request examination together with filing (around 42-45% of all cases) or pay only a low fee for the application, with the option to request either an isolated search or a full examination within seven years (with accordingly higher fees). If no request for examination is filed within seven years after filing, the application is deemed to be withdrawn. If a request for examination is filed at the DPMA within four months from the priority date the DPMA aims to issue a first office action in time within the priority year.

Around 62-65% of cases for which examination is deferred are subject to a request for full examination. For a further 15-18 % of all cases only a separate search is performed; while around 20% of all cases require almost no examiner work, as the files are closed due to the seven years having elapsed.

After filing, all applications undergo an initial examination as to obvious deficiencies, including both checks for compliance with formal requirements, classification according to the International Patent Classification and also checks as to "obvious bars to patenting". This includes inter alia whether the

invention is susceptible to industrial application, concerns one invention only, or whether it is obviously excluded by law from patent protection (discoveries, scientific theories etc. or violation of *ordre public* or morality). A claimed status of addition in respect of another patent application is checked as well. If objections against an application are raised at this stage, applicants are invited to amend the stated defects, or to withdraw the application; otherwise the application will be rejected.

Before grant, patents must undergo an examination as to substantive patentability.⁶⁶ This occurs only after an effective examination request has been made, which, as mentioned above, can occur at the time of filing or at any point up to seven years following filing.⁶⁷ This stage includes *inter alia* the assessment of whether the invention is new and based on an inventive step. Applicants are informed of objections of the examiner via an official action, including setting a time limit to reply. The applicant can argue against the objections of the examiner and can file amended claims. Such an exchange of arguments and the filing of amended claims can happen multiple times, until the final decision of the examiner (grant or refusal).

A special service is provided for all applications within the priority year: either an isolated search or a first examination is provided by the DPMA within the first 8 to 10 months after the priority date (provided that the request for search or examination is filed within 4 months from the priority date). This service is commonly requested, and gives applicants low-cost assistance in considering whether to apply in other jurisdictions.

If the application is accepted as being patentable (following any necessary amendments), the patent is granted and the fact of the grant is published in the Patent Gazette ("Patentblatt" in German). Within three months of publication, as a rule, any person is able to give notice of opposition to the patent, following which the entire patent is re-examined (if the opposition is admissible).

Maintaining a patent requires the payment of annual fees from the 3rd to the 20th year after filing with the amount of the fee rising over time; for patent applications not yet granted or still under processing the same fees have to be paid.

A8.1.3 Alternative award procedures

Generally, applicants are able to accelerate their applications to the DPMA in a flexible way. Requests can be made at any stage of the examination

⁶⁶ If a request for search has been filed prior to the request for examination, this will be completed, and the results communicated to the applicant, prior to the initiation of the substantive examination.

⁶⁷ From the third year after filing, annual fees must be paid to maintain an application in force.

procedure, with no formal requirements or additional fees (requests are made informally). Where a substantiated request for accelerated processing is filed, priority is given to this procedure. Although requests for acceleration processing refer only to the next procedural step, usually further procedural steps are also speeded up, where the request is justified.

Upon request of the applicant the grant of the patent may be postponed up to a maximum of 15 months from the filing or priority date. A postponement may be useful if the applicant intends to file an application in countries not members of the Paris Convention for the Protection of Industrial Property, and if a previous publication of the invention in Germany is contrary to novelty in those countries. However, this possibility is very rarely used by applicants.

The DPMA is currently involved in a two-year trial of a Patent Prosecution Highway (PPH) agreement with the JPO (commencing March 2008) and a two-year trial with the USPTO (commencing April 2009). The DPMA also participated in the Utilisation Pilot Project (UPP) which was finished in 2008; with around about three quarters of all UPP files coming from the DPMA.

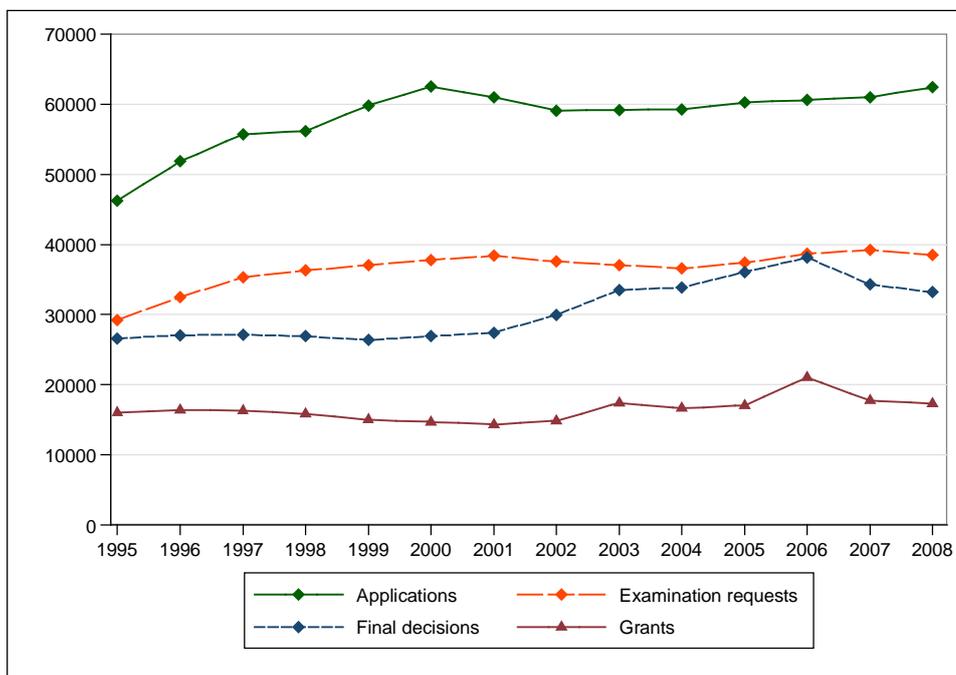
A8.2 Trends in patent activity

A8.2.1 Applications, examinations and grants

As shown in Figure 57, the number of patent applications to the DPMA each year has been relatively stable since 2000 in a range between 59,082 to 62,417 applications. Prior to this, the number of applications grew rapidly, at over 6% per annum, increasing from 46,212 in 1995.

The number of examination requests received by the DPMA each year has remained relatively constant between 1999 and 2008. Over the same period, until 2006, the DPMA has managed to consistently increase the number of examinations disposed of. In 2007 and 2008, however, the number of disposals has declined due mainly to a decreasing number of examiners, but as well as an increased number of isolated searches and an increased commitment of resources for the development of DPMA's own electronic file system. Each year, the number of final decisions has been lower than the number of examination requests, and the number of pending applications has increased accordingly. By 2008, more than 128,000 applications were pending examination.

Figure 57: Trends in patent activity at the DPMA 1995-2008



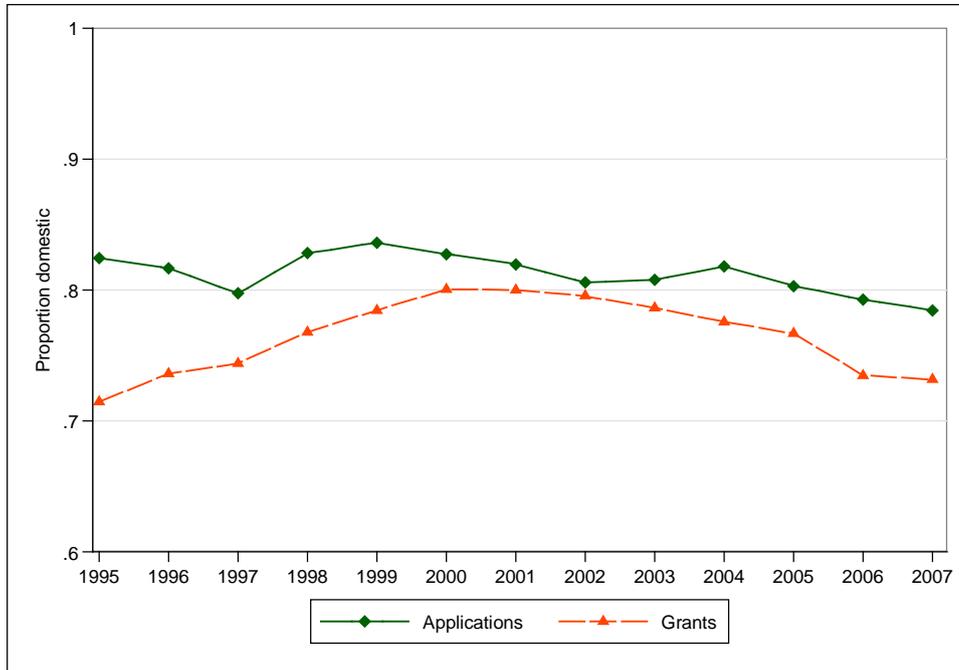
Source: London Economics using patent office information.

The number of grants made in 2007 (17,739) was higher than that made in 1995 (16,000), representing compound annual growth of 1.5% (Figure 57). However, there has been considerable variation during the period with a range of 14,351 to 21,034 grants per year.

A8.2.2 Origin of applications

Applications to the DPMA are dominated by domestic applications, as shown in Figure 58. However, this proportion has fallen in recent years, from representing 84% of all applications in 1999 to 78% in 2007. The proportion of grants made to domestic applicants is lower than the proportion of domestic applications: in 2007 73% of grants were to domestic applicants. Again, this proportion has fallen in the last few years (from a high of 80% in 2000 / 2001).

Figure 58: Origin of patent applications and grants 1995-2007

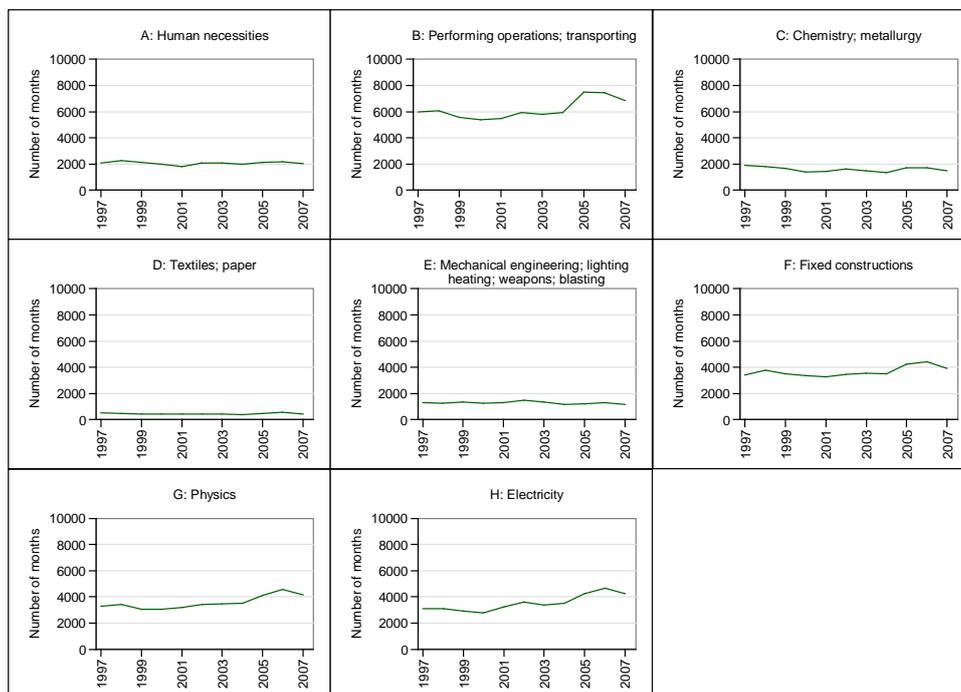


Source: London Economics using patent office information.

A8.2.3 Trends in different technology groups

As shown in Figure 59, the most important source of patent grants at the DPMA is the Performing operations; transporting technology group (group B). There is no notable difference in trends in the number of patent grants across the technology groups.

Figure 59: Patent grants by technology field 1997-2007



Note: Year plotted refers to year of grant.

Source: London Economics using PATSTAT data.

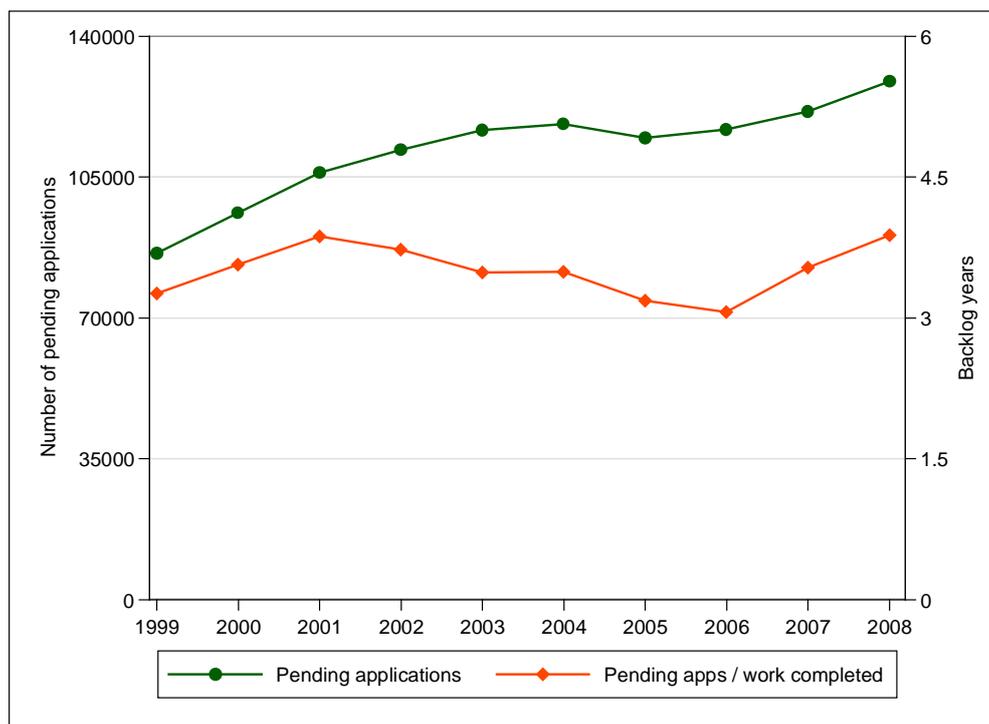
A8.2.4 Patent pendency

The DPMA reported that average pendency is approximately three years from the date of filing the request for examination.

A8.2.5 Patent backlogs and workloads

As shown in Figure 60, the number of pending applications has increased significantly since 1999, growing from around 86,000 in 1999 to more than 128,000 in 2008. Despite this, the time required to clear the workload fell between 2001 and 2006 before rising (from 3.1 years to 3.9 years) between 2006 and 2008, reflecting the fall in the number of disposals discussed above.

Figure 60: DPMA workload 1999-2008



Source: London Economics using patent office information.

A8.2.6 Number of patent examiners

In total, the DPMA employed approximately 2,500 staff in 2008, including around 700 patent examiners.

Annex 9 Procedure and trends at the UKIPO

A9.1 Grant procedure

A9.1.1 Overview

Table 18: Outline of patent procedure at UKIPO	
Types of protection offered:	
Patents	Yes
Utility models	No
Length of protection (years) (patent/utility model)	20/NA
Provisional applications	No
Separate search	Yes
Request for search required	12 months from filing
Request for examination required	6 months from publication
Acceleration possible	Yes

Source: London Economics based on information from patent office annual reports, websites, and WIPO.

A9.1.2 Standard procedure

Applicants for a UK patent file both an initial application and also a separate request for search (within 12 months of the priority or filing date). The UKIPO then carries out a preliminary examination to ensure that the application meets formal requirements, and performs a search of the prior art. The UKIPO aims to complete the preliminary examination within one month and the search within four months of receiving the relevant fees. Applicants are provided with the results of the search in a search report, giving them the opportunity to decide whether to continue or withdraw their application. Applications are published within 18 months of filing or priority (whichever is the earlier).

Applicants to the UKIPO must submit an examination request at any time up to six months following A-publication. Following examination, applicants are either informed that the patent will be granted, or are sent an examination report identifying the examiner's objections. This provides applicants with the opportunity to respond within a certain time period (usually four months).

If an application is accepted then the patent is granted, the application is published in its final form, and the applicant is sent the patent certificate.

Following grant, any person can apply for revocation of a patent on the grounds of patentability, prior art, or other grounds.

Maintenance of UK patents requires annual payment, the first of which is due near the fourth anniversary of the application filing date.

Unlike other patent offices, the UKIPO is required to process patent applications within four and a half years of priority date (or within one year of the first examination report being issued). This precludes very long pendency times for individual applications (as experienced at some patent offices), and limits some possible filing strategies (such as filing of divisional applications).

A9.1.3 Alternative award procedures

Applicants for a UK patent can apply for a combined search and examination so that the substantive examination occurs at the same time as a search within four months of filing. This provides applicants with the opportunity to amend their claims prior to publication. This is the most common method of accelerating the procedure, accounting for approximately 25% of searches. There is no additional cost to applicants of combining the two procedures.

The UK procedure also provides applicants with several other ways of accelerating the application process.

- **Accelerated search:** Applicants can apply for searches to be undertaken more quickly than the usual four months following the search request. However, given the generally short search pendency at the UKIPO, this is unlikely to have a significant effect on the time taken to process search requests.⁶⁸
- **Accelerated examination:** Applicants with a good reason can apply to have their examination carried out more quickly. In this case, the UKIPO looks to perform the examination within eight weeks. In the twelve months to March 2008, 260 accelerated exams were requested (around 6% of all examinations during the period).
- **Accelerated publication:** Earlier publication may be advantageous for applicants that are aware of a potential infringement of their invention.
- **Accelerated grant:** Applicants are also able to request that the actual patent grant is brought forward.

⁶⁸ The search can only be accelerated once it has reached a patent examiner.

To obtain either accelerated search or examination, applicants are required to provide a valid reason, with the UKIPO retaining discretion over whether this should be accepted. Common reasons include potential infringement of the invention, or that the applicant is currently negotiating to license the invention. Since May 2009, applicants have also been able to request accelerated processing for inventions that relate to environmentally friendly technology.

The UKIPO is also engaged in Patent Prosecution Highway (PPH) initiatives with the JPO (since July 2007) and the USPTO (since September 2007). To date this has only accounted for very few (less than one hundred) examinations per year, although this may increase now that the pilot initiatives have been rolled-on indefinitely.

A9.2 Trends in patent activity

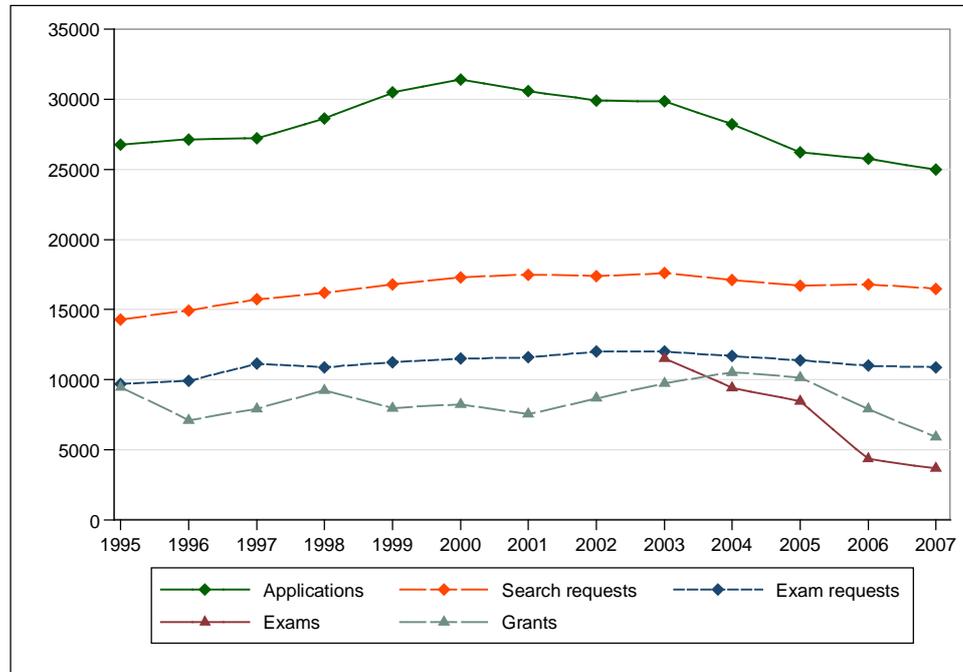
A9.2.1 Applications, examinations and grants

The total number of applications made to the UKIPO has been declining over the past few years, as shown in Figure 61. Having reached a peak of 31,412 applications in 2000, in 2007 24,999 applications were made – corresponding to a compound annual growth rate of approximately -3%. This may reflect a long-term trend of applications being filed at the EPO rather than national patent offices.

Interestingly, the numbers of requests in search and examination have not declined at the same rate as the number of applications. This suggests that workloads have not been affected despite the reduction in the number of applications.

It is notable that the numbers of requests for both search and examination are much lower than the number of applications, suggesting that a large proportion of applications do not progress far in the grant procedure. This may be in part a reflection of the fee structure at the UKIPO, where there is no fee for filing an application. Further, it is felt that many applicants use the UKIPO as a searching office only (i.e. they never have any intention of proceeding to substantive examination), due to fast search times and relatively low fees.

Figure 61: Trends in patent activity at the UKIPO 1995-2007

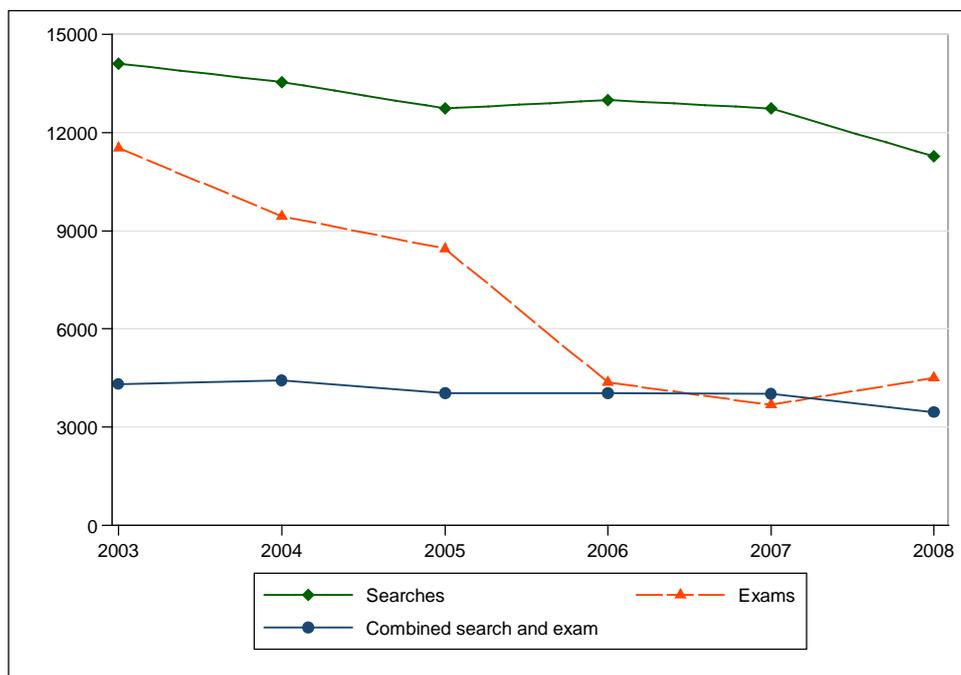


Source: London Economics using patent office information and PATSTAT data.

The number of patent grants by the UKIPO has been more volatile than the number of applications, with a sharp decline between 2005 and 2007 following a period of growth between 2001 and 2004.

This decline in the number of grants reflects the increasing emphasis the UKIPO has placed on reducing pendency to search in recent years: the target time to search was reduced from six months in 2003 to four months in 2005. As shown in Figure 62, as a result the number of examinations carried out by the UKIPO has fallen dramatically since that point.

Figure 62: Work carried out at the UKIPO, 2003-2008



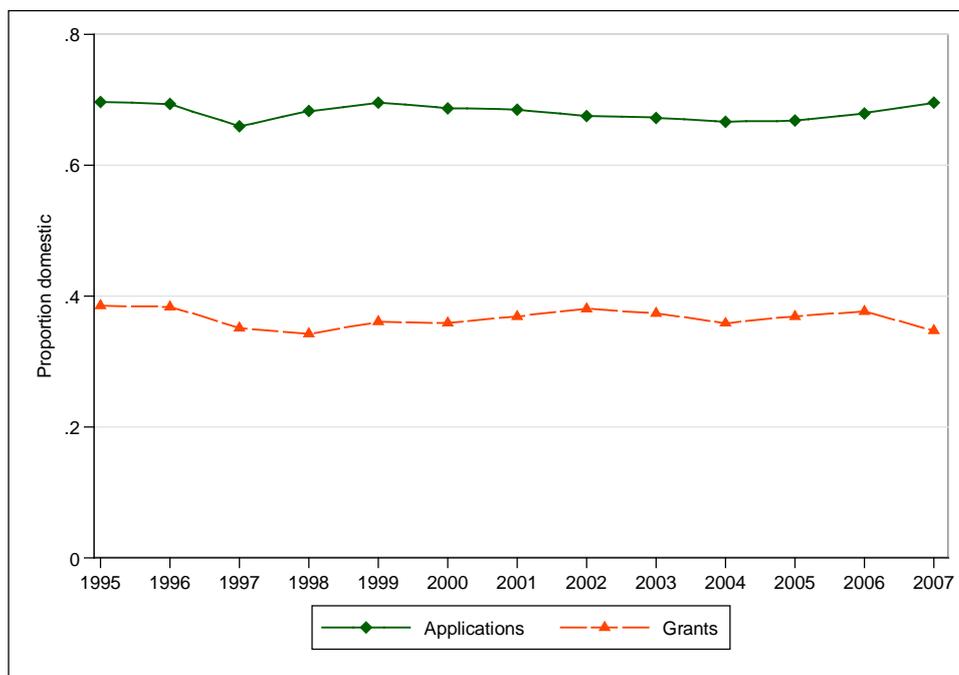
Source: London Economics using patent office information.

A9.2.2 Origin of applications

Domestic applicants accounted for approximately 70% of applications to the UKIPO in 2007, as shown in Figure 63. This is a slight increase compared to the proportion a few years ago, reflecting the fact that foreign applications have decreased by more than 12% since 2005.

It is also notable that domestic applicants comprise a much higher proportion of applications than grants. This suggests that domestic applicants are more likely to, for instance, use the UKIPO as a searching office only. Alternatively, it could reflect the fact that most applicants without legal representation (“private applicants”) are domestic. As the success rate (in terms of obtaining grant) for these applicants is much lower than for represented applicants, this could also explain the difference between the proportion of domestic applications and the proportion of domestic grants.

Figure 63: Origin of patent applications and grants 1995-2007

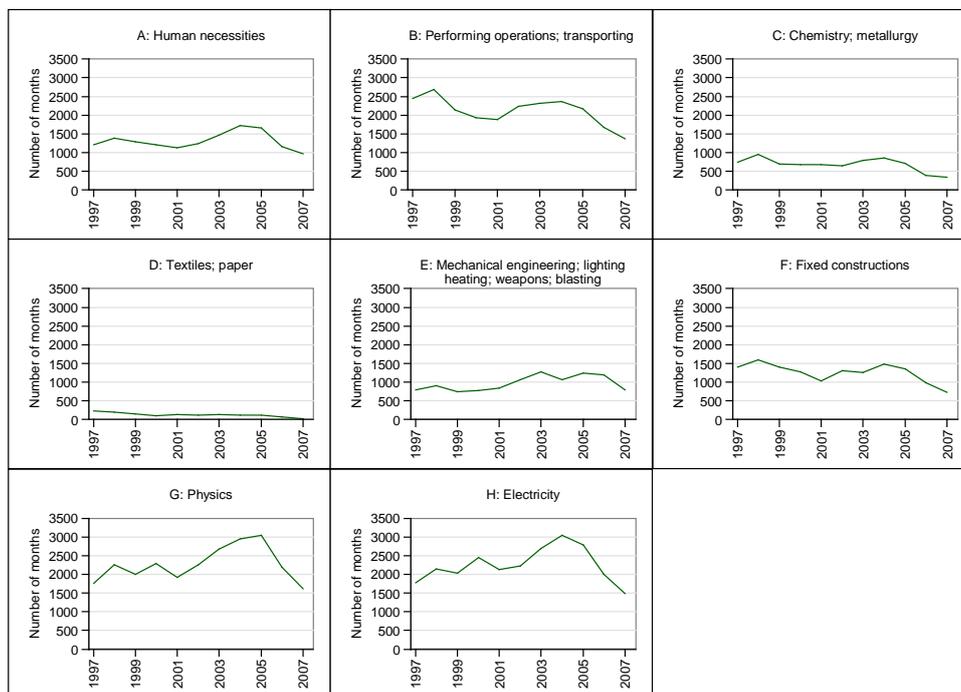


Source: London Economics using patent office information.

A9.2.3 Trends in different technology groups

As shown in Figure 64, the most important source of patent grants at the UKIPO are the Physics and Electricity technology groups (G and H respectively). Further both of these groups experienced significant increases in the number of grants between 2003 and 2005, before falling again in recent years. This is likely to be the result of several underlying trends, but one possibility is that this is related to the boom in the telecoms industry (technology for which is classified in both these fields) around the turn of the millennium. Another contributing factor may be the growth of the flat screen display sector (displays are generally classified in the physics sector, while electronic components fall within electricity).

Figure 64: Patent grants by technology field 1997-2007



Note: Year plotted refers to year of grant.
 Source: London Economics using PATSTAT data.

A9.2.4 Patent pendency

The UKIPO expect that pendency is likely to increase in the next few years, as the patents that have been delayed as a result of the emphasis on search are actually granted (this is directly related to the fall in grants commented on above).

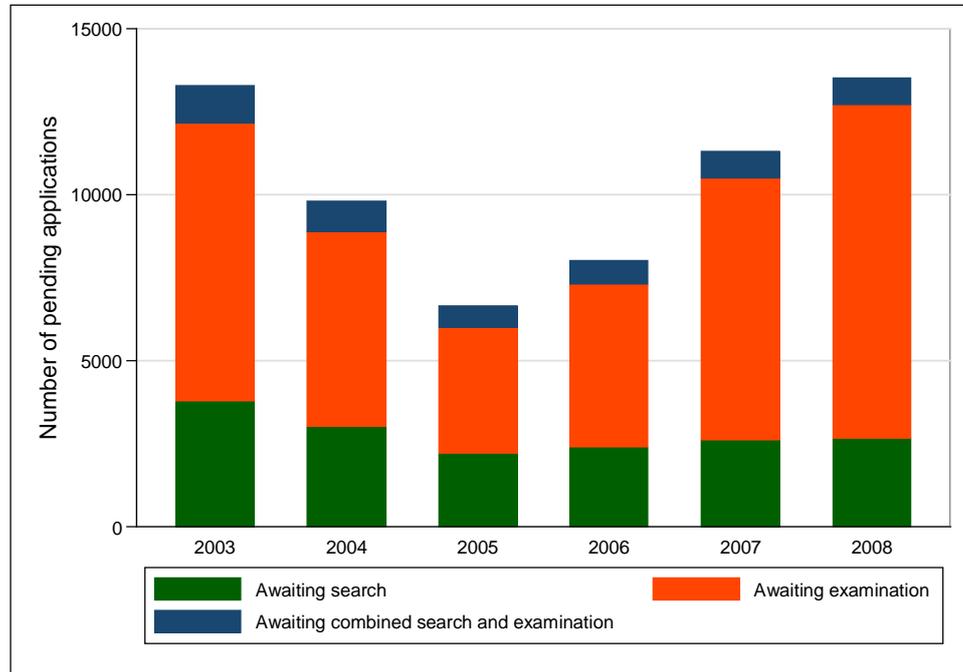
A9.2.5 Patent backlogs and workloads

The UKIPO does not use pendency or examination targets, and instead focuses on monitoring the level of demand - i.e. the number of requests for search or examination. Representatives of the UKIPO felt that the appropriate measure of a backlog is not the number of applications, but the "body of work paid for but not completed". In the case of the UKIPO, this includes both search and examination requests (as these are carried out separately) - but search requests would not generally be counted as backlog due to the very short time to search.

As of January 2009, the UK had 2,552 searches and 10,301 examinations pending. As shown in Figure 65, this was driven by the increase in the

number of pending examinations. More generally, the graph illustrates the shift in emphasis towards completing searches more quickly – with the number of pending searches falling to 2005, since when it has remained relatively constant

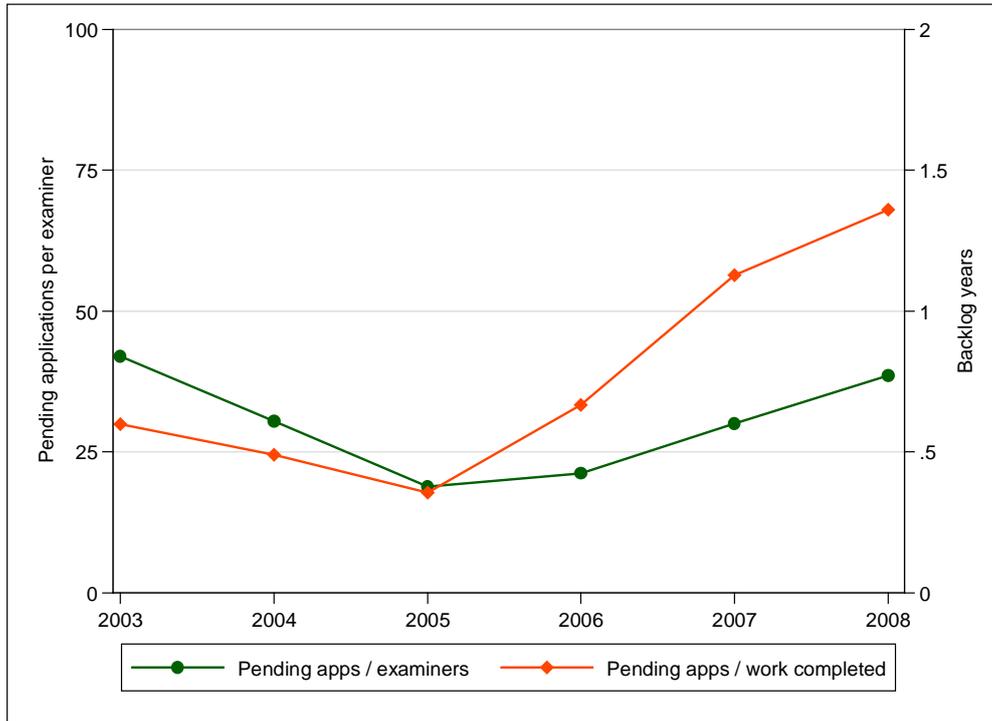
Figure 65: UKIPO pending applications 2003-2008



Source: London Economics using patent office information.

Figure 66 displays how workload at the UKIPO has changed over time. The trends are similar to the number of pending applications, with workload falling between 2003 and 2005 before growing between 2005 and 2008.

Figure 66: UKIPO workload 2003-2008



Source: London Economics using patent office information.

A9.2.6 Number of patent examiners

The UKIPO has recruited heavily in recent years, with the number of examiners increasing from 223 in 2004 to 281 in 2008. This followed a decline in the number of examination staff between 2002 and 2004. As of March 2009, the UKIPO employs 244 full-time equivalent examiners.

Annex 10 Procedure and trends at the IIPO

A10.1 Grant procedure

A10.1.1 Overview

Table 19: Outline of patent procedure at IIPO	
Types of protection offered:	
Patents	Yes
Utility models	No
Length of protection (years) (patent/utility model)	20/NA
Provisional applications	No
Separate search	No
Request for search required	NA
Request for examination required	4 years from filing
Acceleration possible	No

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: London Economics based on information from patent office annual reports, websites, and WIPO.

A10.1.2 Standard procedure

Patent applications are published in the Patent Office Journal just after 18 months from the date of filing of the application or the date of priority whichever is earlier. Early publication can be requested, on payment of the relevant fee. Early publication generally occurs one month after the date of request.

Applications are only examined following a request for examination. Requests must occur within a period of 48 months from the earlier of the application priority date or the application filing date.

A First Examination Report (FER) stating any objections or requirements is communicated to the applicant generally within six months from the later of the date of request for examination or date of publication. Any amendments to the application are then due within 12 months of the date of the FER.

Once all requirements are met (and not before six months of publication), applicants are issued a letter confirming the patent grant, the patent is registered, and it is published in the Patent Office Journal. Following this, any

person can oppose the grant within one year of publication. Maintaining patents requires payment of an annual fee.

A10.1.3 Alternative award procedures

There is no provision for accelerating examination at the IIPO, with applications examined in the order in which requests for examination are filed. The only exception to this is that applicants with PCT National Phase applications can make request examination before expiry of 31 months.

Applicants to the IIPO are able to submit a provisional application in order to establish a priority date.

A10.2 Trends in patent activity

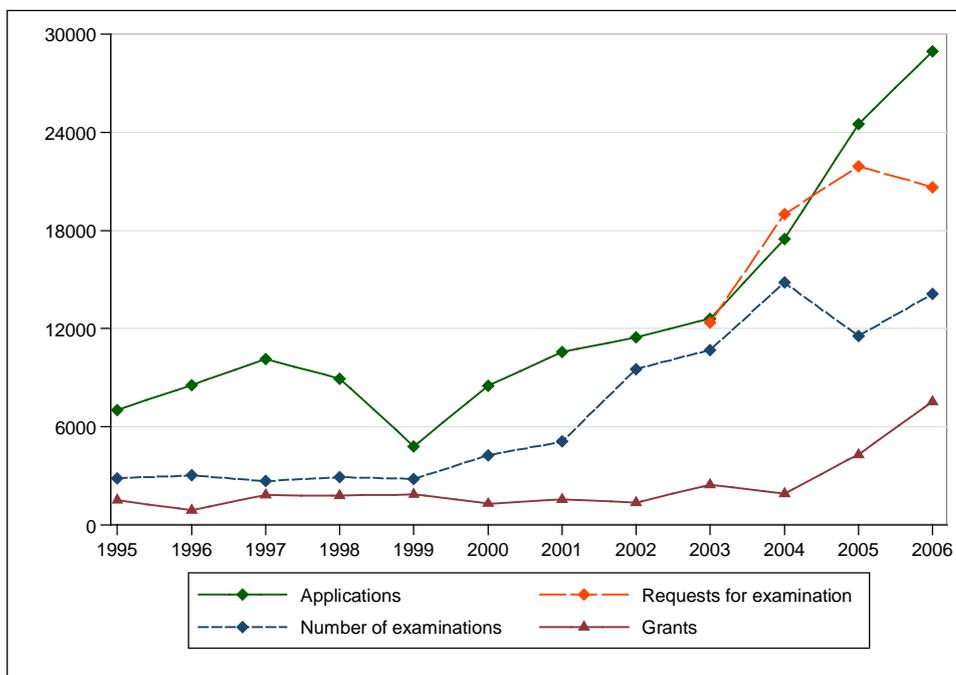
A10.2.1 Applications, examinations and grants

As shown in Figure 67, patent applications to the India Intellectual Property Office have increased rapidly over the past twelve years, with a total of 28,940 applications in 2006 (the most recent year for which data is available).⁶⁹ Since a major dip in applications in 1999, growth has occurred at a compound annual rate of around 37% (and at around 25% per annum from 2000-2006).

The number of examinations carried out by the Indian IPO has increased significantly since 2000, with compound annual growth of 22%. However, in the years for which data is available (2003-2006) this has remained below the number of requests for examination - implying that the total number of outstanding applications continues to increase.

⁶⁹ Data from the India Intellectual Property Office relates to years ending in March. Therefore, the data for 2006 (for example) relates to applications from April 2006 to March 2007.

Figure 67: Trends in patent activity at the IIPO 1995-2006



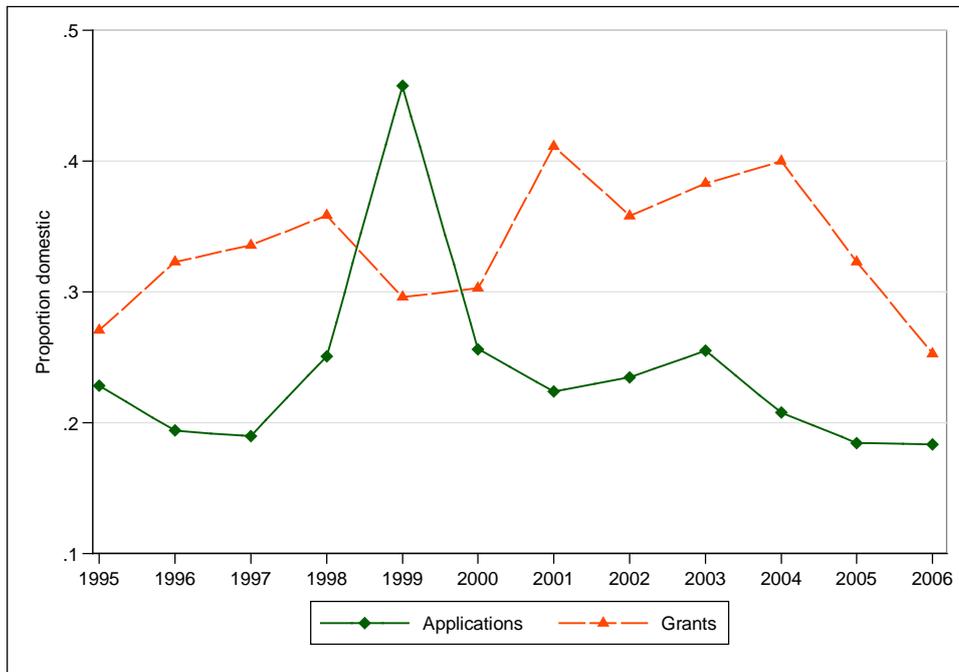
Source: London Economics using patent office information.

Patent grants in India have grown extremely rapidly over the past two years (by 126% and 75% respectively) as shown in Figure 67. However unlike applications, prior to this there does not appear to have been a trend increase in the number of grants made each year.

A10.2.2 Origin of applications

Figure 68 displays the proportion of applications received from and the proportion of grants made to domestic applicants each year. Interestingly, the proportion of grants made to domestic applicants is consistently higher than the proportion of applications made by domestic applicants (with the exception of 1999). Between 1995 and 2004, for instance, around 35% of grants were to domestic applicants, compared to the 24% of applications made by domestic applicants. However, it appears that this pattern may be changing, with 32% and 25% of patent grants made to domestic applicants in 2005 and 2006 respectively.

Figure 68: Origin of patent applications and grants 1995-2006

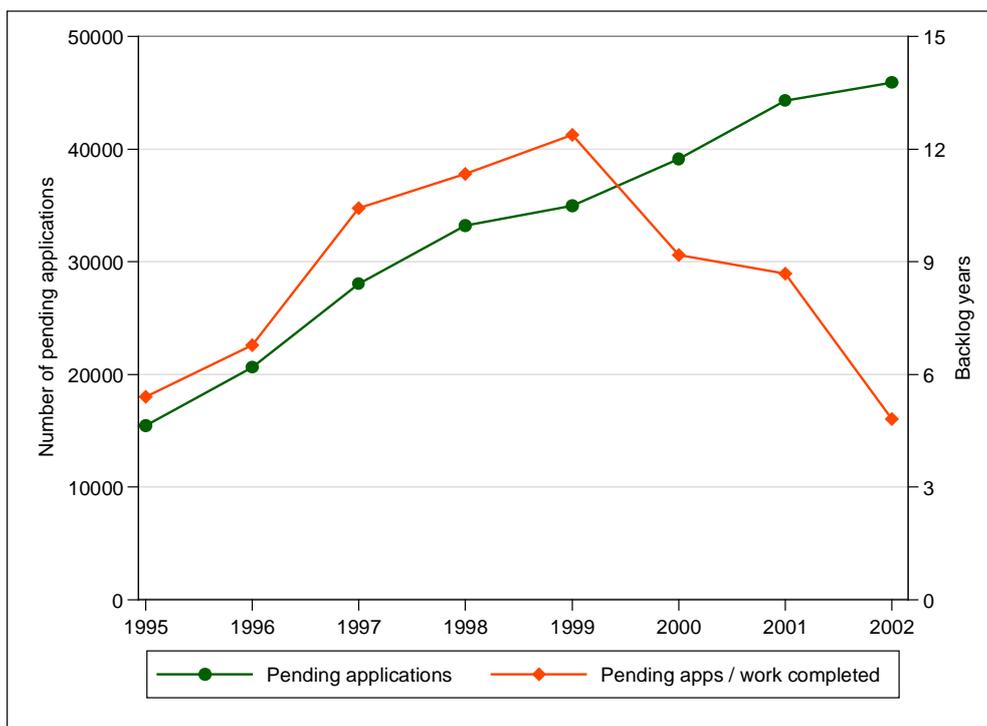


Source: London Economics using patent office information.

A10.2.3 Patent backlogs and workloads

The number of pending applications at the IIPO increased rapidly between 1995 and 2002, as shown in Figure 69, reaching more than 45,000 applications in 2002. However, workload has not followed the same trend, with the years required to clear the backlog falling from over 12 years in 1999 to under 5 years in 2002.

Figure 69: IIPO workload 1995-2002



Source: London Economics using patent office information.

A10.2.4 Number of patent examiners

The number of patent examiners at the IIPO increased rapidly from 2001 to 2003, reaching a peak of 172. Since 2003 the number of staff has declined slightly, to 133 in 2006.

Annex 11 Procedure and trends at the KIPO

A11.1 Grant procedure

A11.1.1 Overview

Table 20: Outline of patent procedure at KIPO	
Types of protection offered:	
Patents	Yes
Utility models	Yes
Length of protection (years) (patent/utility model)	20/10
Provisional applications	No
Separate search	No
Request for search required	NA
Request for examination required	5 years from filing
Acceleration possible	Yes

Note: The information in the table above has been compiled based on publicly available information; procedures not clearly documented in these sources are hence not included.

Source: *London Economics* based on information from patent office annual reports, websites, and WIPO.

A11.1.2 Standard procedure

After 18 months from filing or priority date, applications are published in the official "Patent Laid-open Gazette". The application is then taken up for examination only if a request for examination is made within 5 years from the filing date of the application.

If, following examination, an examiner decides to reject the application, a notice of preliminary rejection is issued; and the applicant is given an opportunity to submit a response to the preliminary rejection within a time limit designated by the examiner. If a sufficient argument or amendment to the application is not forthcoming, a final notice of rejection is issued.

If no grounds for rejection are found, applicants are issued a notice of decision to grant a patent. The applicant then has nine months to pay the registration fees. The patent is then published in the Patent Registration Gazette. Any person can then file an opposition against the registration of the patent within three months of publication.

A11.1.3 Alternative award procedures

The KIPO launched the “Customer-tailored Patent Examination System” in September 2008, under which scope for preferential examination (starting within 2.2 months of the request date) was extended to all applications (having previously been limited to 14 fields of technology).

The system also allows applicants to delay their applications, by specifying the commencement of an examination at any time in the period between one year and six months from the date of the examination request and five years from the filing date. An applicant can request a delay at the time of submitting an examination request or at any point in the following six months. This allows the applicant to estimate the time of grant with more precision, as KIPO commits to begin the examination no more than three months from the specified time.

The KIPO is also involved in Patent Prosecution Highway (PPH) agreements with the JPO, the USPTO and the DKPTO.

A11.2 Trends in patent activity

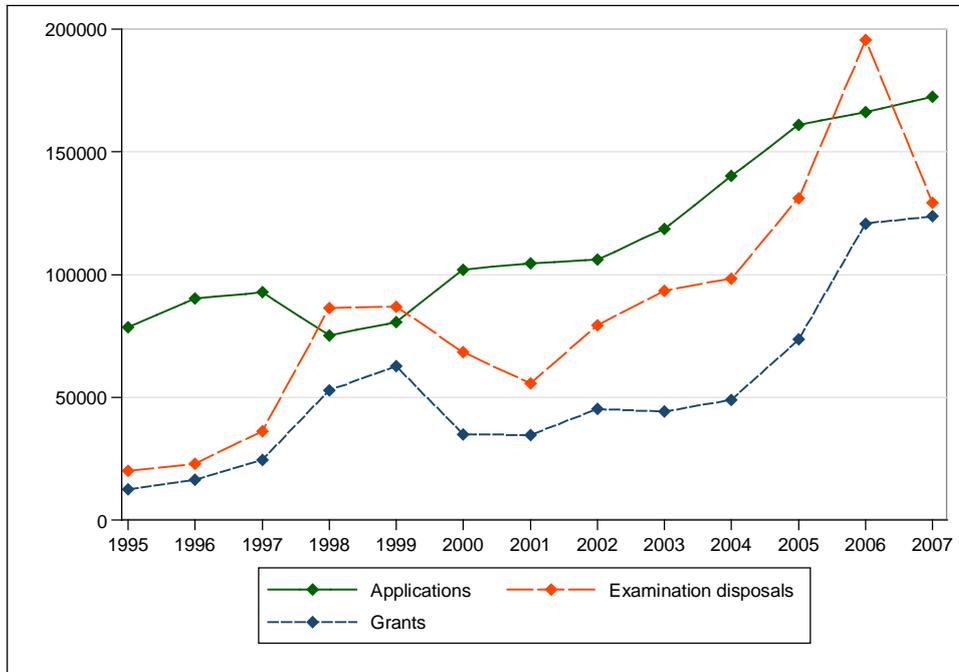
A11.2.1 Applications, examinations and grants

Patent applications to the KIPO have increased from 78,499 in 1995 to 172,469 in 2007, representing compound annual growth of approaching 7%. A notable feature of the growth in applications is the decline and subsequent surge in the number of applications from 1997 to 2000. The KIPO attribute this to domestic economic conditions, with the rapid growth in 2000 associated with economic recovery.⁷⁰

The number of examination disposals completed by the KIPO each year has grown considerably over the past 12 years, from 20,060 in 1995 to 129,147 in 2007. Despite this, however, disposals have been less than applications in almost every year, and the number of pending applications has continued to grow.

⁷⁰ See KIPO 2000 Annual Report.

Figure 70: Trends in patent activity at the KIPO 1995-2008

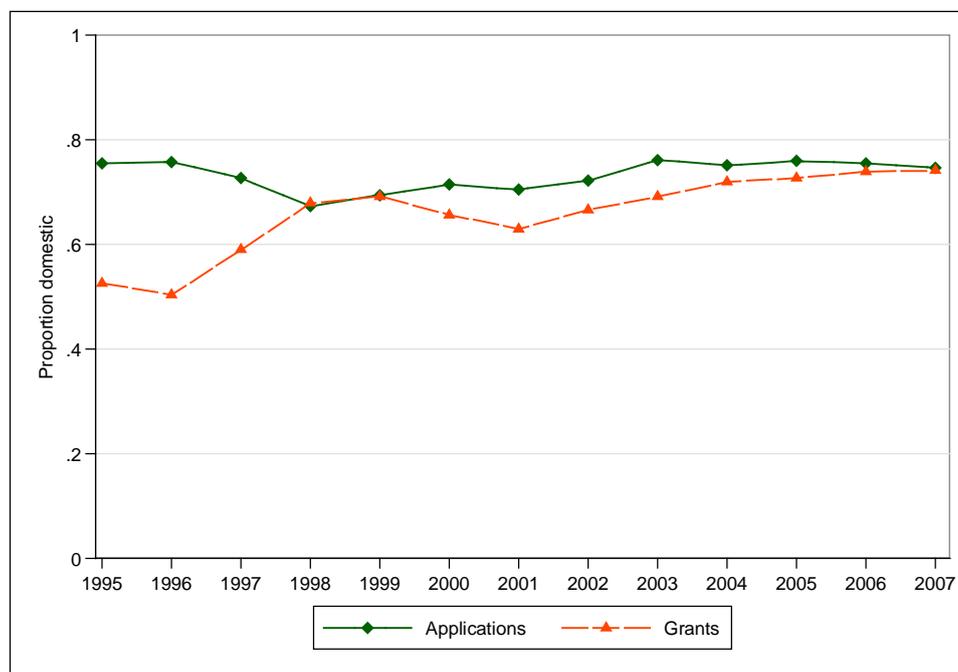


Source: London Economics using patent office information.

A11.2.2 Origin of applications

As Figure 71 indicates, applications to the KIPO are accounted for largely by domestic applications, comprising approximately 75% of all applications in 2007. The proportion of applications by, and particularly grants to, domestic applicants has risen significantly over the period.

Figure 71: Origin of patent applications and grants 1995-2007

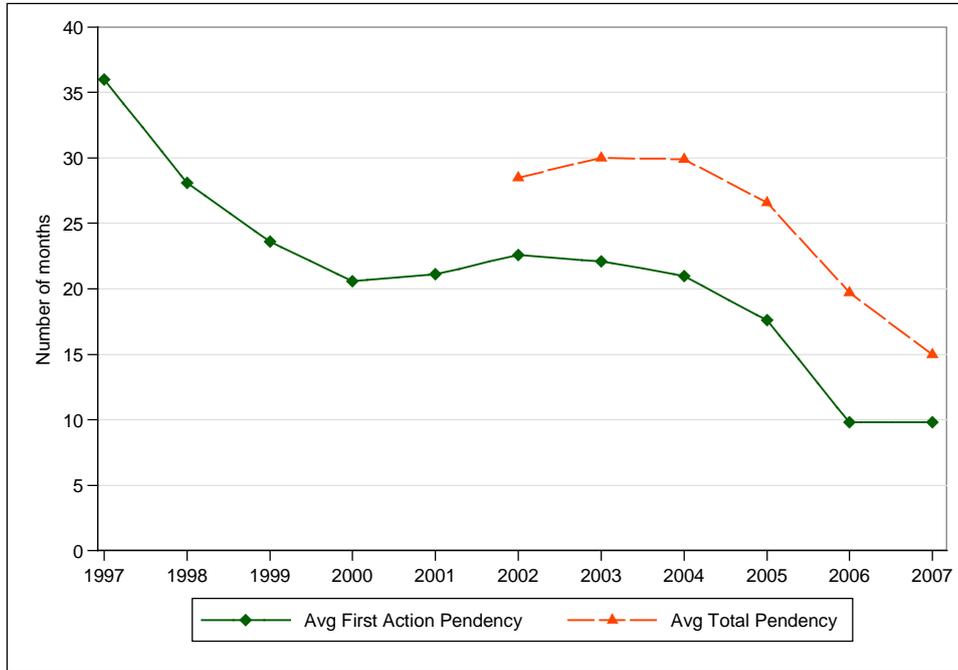


Source: London Economics using patent office information.

A11.2.3 Patent pendency

Information on pendency reported in KIPO annual reports (displayed in Figure 72) indicates that pendency has declined rapidly in recent years. Pendency is now at very low levels, reaching just 15 months in 2007.

Figure 72: KIPO pendency 1997-2007

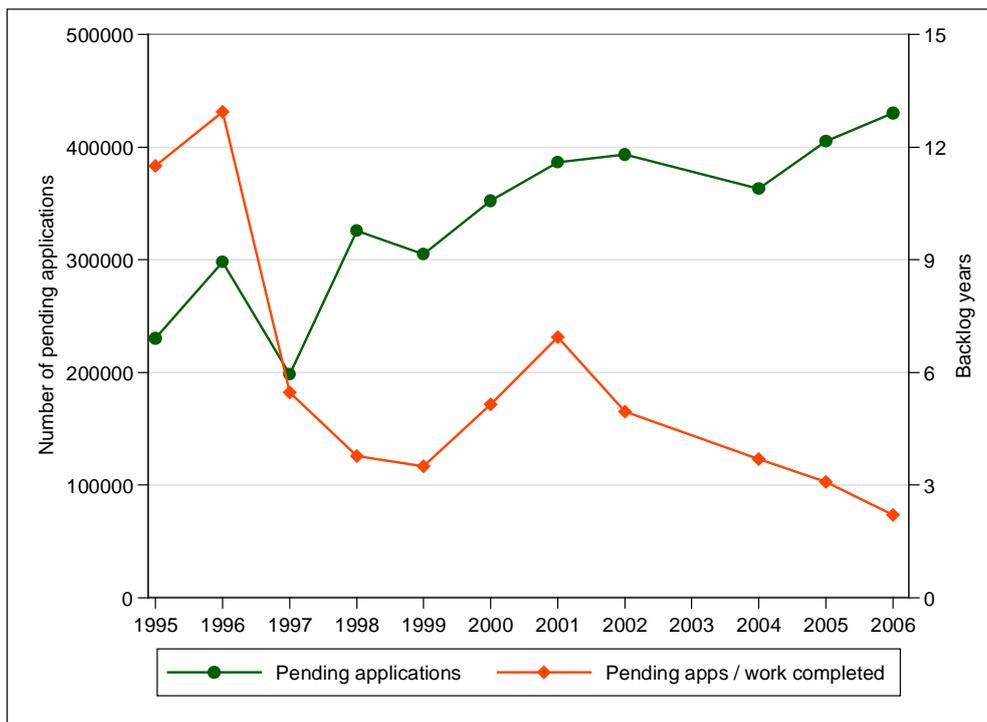


Source: London Economics using patent office information.

A11.2.4 Patent backlogs and workloads

Figure 73 displays recent trends in the number of pending applications and workload at the KIPO. As this shows, the number of pending applications has more than doubled in the last ten years (although it is important to note that the time series uses data from two separate sources). At the same time, however, the workload, as measured by the time required to clear the backlog has declined significantly, from over 12 years in 1996 to less than three years in 2006.

Figure 73: KIPO workload 1995-2006



Note: Information on pending applications taken from KIPO annual reports prior to 1995-2002, and from WIPO data 2004-2006.

Source: *London Economics using patent office information.*

A11.2.5 Number of patent examiners

The number of staff at the KIPO has been reasonably stable over the past few years, following a period of growth between 2000 and 2005. At the end of 2008 a total of 1,511 staff were employed, of which 659 were patent and utility model examiners (approximately 44% of the total).



London Economics

11-15 Betterton Street
London WC2H 9BP
Tel: +44 20 7866 8185
Fax: +44 20 7866 8186
Email: info@londecon.co.uk

London | Brussels | Dublin | Paris | Budapest | Valletta

Concept House
Cardiff Road
Newport
NP10 8QQ

Tel: 08459 500 505
Minicom: 08459 222 250
Fax: 01633 817 777

www.ipo.gov.uk

For copies in alternative formats please
contact our Central Enquiry Unit.

**When you no longer need this booklet,
please recycle it.**

Revised: Feb 10



INVESTOR IN PEOPLE



CUSTOMER
SERVICE
EXCELLENCE

The Government Standard