Application pendency times and outcomes across four patent offices*

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INTRODUCTION

In this paper, we describe two dimensions of the international patenting process: application outcomes and pendency periods. Our comparative analysis is based on a sample of 'matched' patent applications that were concurrently filed at the Australian Patent Office (APO), the Japanese Patent Office (JPO), the United States Patent and Trademark Office (USPTO) and the European Patent Office (EPO). That is, these applications cover the same subject matter. By using a matched sample, we are able to control for any systematic variation in both the quality of the invention underlying the application and the characteristics of the applicant which may both affect the examination outcome and duration. As a result, any remaining discrepancies in outcomes and duration should be due to differences in office procedures and protocols, legal positions such as those regarding patentable subject matter and other random unobservable local factors.

Although much of our analysis is descriptive since we document "what is" occurring in the patent offices, our analysis is embedded in a more normative issue of "what ought to be". That is, we are concerned with not just whether the patent offices *do* make the same decision to grant a patent for a unique invention, but whether they *should* make the same decision. From a legal perspective, there are good reasons to believe that patent offices should make the same decisions since the fundamental patentability requirements – novelty, inventiveness and utility – are common to all countries considered. From an economic perspective, there is also a strong rationale underlying the argument that different patent offices should make consistent decisions since disharmony in application outcomes reduces social welfare. To understand why, we need to place the disharmony issue in the context of the ultimate goal of the patent system which is to optimise the level of innovative effort of society.

In general, the more simple and straightforward is the patent system and the lower are the costs of using it, the more likely it is that the patent system will enhance innovative effort, all other things considered. From the perspective of our study, costs can be decomposed into two parts. First, the incremental increase in transaction costs associated with managing a complex network of differing patent rights across the globe and

secondly, the business uncertainty created by a pending application. Some of these costs may be associated with benefits, however, in this paper we make no estimate of any trade-offs such as between complexity and flexibility or examination time and accuracy of the examination decision.[1]

Our study is based on a set of 9,618 patent applications from the same patent family that were submitted to the APO, EPO, JPO and USPTO during the period 1990-1995. The matching criterion is that the applications must specify the same unique priority number. Thus, our sample covers applications *for the same unique inventions* (i.e. the same subject matter) that were sent to all four patent offices.[2] The chosen time period allows enough time so that all applications should have either been examined or withdrawn by the end of 2004. Using this sample, we examine i) how much disharmony there is across international patent offices in terms of examination outcomes and ii) how much variation there is in the time taken to examine an application.

There are a number of striking results from our comparison. First, we find that there is substantial variation across the offices in terms of examination outcomes. For example, Japan only grants 40 per cent of those applications that are granted by both the APO and the USPTO (although a large proportion of applications at the JPO are withdrawn). Compared to the other offices, the APO is the closest to the USPTO in terms of the relative proportion of patents granted. Secondly, we also find substantial variation in patent pendency periods across the patent offices. The time taken to *examine* an application (i.e. after the request to examine has been made by the applicant) is on average shortest at the APO (approximately 14 months) and longest at the EPO (approximately 42 months). However, the overall period in which the status of the application is pending, which also depends on the request lag, varies from 24 months at the USPTO to 88 months at the JPO.

[1] There may be some optimal examination length which balances the applicant's need for a fast decision with the office's obligation not to grant unpatentable inventions.

[2] In saying this, we acknowledge that the applications to each office may be different even if they cover the same underlying invention. That is, applicants considering submitting an application for a unique invention to both the EPO and the JPO may structure the number and scope of claims differently. However, we only observe the number of claims granted by each office (which is highly correlated across patent offices) – we can not ascertain whether each individual claim is identical.

BACKGROUND

The patent system is designed to stimulate investment in inventive activity by providing inventors a legal means to appropriate returns from their investment. Not all innovations are patentable, however, and patent offices conduct examinations to distinguish those that are novel and inventive (and should be patented) from those that aren't (and therefore shouldn't be patented). Critical to maximising the efficiency of the system is the minimisation of the costs its usage imposes on the (business) community. Over and above patent office costs and attorney fees, these may take two forms: complexity and uncertainty.

In order to highlight the magnitude of these costs, consider two worlds: one is a single patent office world and the other is a multi-office world. In the simple patent office world, there is one examination that is undertaken and the applicant knows whether they have legal protection across the entire globe. In such a world, the owner knows the scope of their rights as they apply in every market around the world. In a multi-jurisdiction world, the story is quite different. Since there are potentially some offices which grant and some which reject the patent application (and some which grant the patent, but narrow the scope of the claims), the task of managing the patchwork of patents around the globe is difficult. Detection of infringement in such as a world is more difficult in the latter case.

Our contention, then, is that the plurality of outcomes possible in a multi-jurisdiction system adds to the cost of managing a set of patent rights. An applicant, for example, seeking a patent in all OECD countries would have to submit applications to nine separate patent offices thereby giving 512 possible grant/reject outcomes. The greater is the variation in examination outcomes across patent offices, the more complex are the strategies which businesses need to consider prior to making an investment decision. In other words, disharmony in patent office decisions introduces distortions into firms' investment decisions. Furthermore, the more examinations one is subject to, the longer it

takes before the final scope of the applicant's international legal protection is known since it depends on the slowest examining patent office.[3]

The second type of cost arises from the uncertainty generated by the patenting process. Longer pendency periods increase the overall level of uncertainty in the business and R&D community. While uncertainty over one's own patent application may confer some private advantage, its advantage arises from creating uncertainty and confusion for its rivals. Overall, however, the result is a negative-sum game. That is, once we cancel out the gains that are purely at the expense of another business, there is a net loss of efficiency in the economic system as a whole. Ideally, a patent application decision should occur as soon as is practically possible after filing the complete standard application. Any (artificial) delay in whether an IP right exists or not imposes costs on businesses. Currently, there are two forms of delay in most patent offices. The first is caused simply because patent offices allow applicants to delay examination (the USPTO, where the examination process begins at filing, is an exception). In the EPO this delay is generally about 2 years and at APO this delay can be up to 5 years.[4] In the JPO, before late 2001 it was 7 years. The second form of delay is the time taken to examine the patent (including searching for prior art).

Considerable streamlining of patent systems across countries has occurred over the last 150 years.[5] This has been done to reduce costs and complexity for global businesses and reduce the negative inter-country effects associated with the market for knowledge. The reason for the latter is simple: there are strong unilateral incentives for each country to operate their patent system in a way that imposes costs on other countries and subsequently entails a net reduction in world welfare.[6] As a consequence of this

[3] In addition, there are the multiple patent office application costs and patent attorney fees, which may be as high as A$400,000.

[4] At the EPO, the applicant must request an examination within 6 months of the publication of the search report. The latter should be within 18 months of application. At the APO, applicants are given up to 5 years from filing to request an examination.

[5] With the signing of the Paris Convention of 1883, the patent system became the subject of one of the earliest international treaties covering economic matter.

[6] Each country has a natural motivation to tilt the rules of their patent system, if indeed they believe it is worth having at all, to favour local inventors over foreign inventors. If patenting is easy and cheap for local inventors but hard and expensive for foreigners, then not only will local inventors be amply protected from infringement, but copying or technology transfer from offshore inventors will not be penalised (free-riding occurs). However, this discrimination imposes costs, in terms of profits forgone, on foreign inventors. To avoid these negative-sum games, developed countries have devised and agreed on certain protocols

streamlining, patent systems across the world have become more similar over time, with certain fundamental rules now observed by an overwhelming majority of developed countries including all World Trade Organisation countries.

However, while there are some internationally synchronised protocols and application processes[7], there still remain separate and independent country-specific examinations.[8] Although the fundamentals of the examination are the same (all involve application, a search of prior art, examination, publication and grant), each of the patent offices still have slightly different patent examination processes. At the USPTO, for example, there is no provision for third-parties to oppose the patent grant. And at the EPO, an initial search for prior art is undertaken soon after filing whereas at the other offices, it is done much later. Thus, care must be taken when comparing pendency periods at the JPO with other offices. To provide a summary of the differences in the patent procedures, Figure 1 presents a flowchart of the stages of patent procedure in each office. Note that the flowcharts reflect current practice rather than the practices as they were in 1995.

To correctly compare international patent office outcomes, we must sift out factors associated with a particular applicant, the invention, the technology area, and unobservable random events and try to isolate office-specific factors. Figures based on aggregate patent statistics only give us a rough guide to patent office performance since each office ordinarily examines different sets of patent applications and associated inventions. Discrepancies therefore in the aggregate data may due to differences in the underlying quality of the invention not differences in the standards of application process in each jurisdiction. To isolate individual office effects therefore, we need to compare the examination outcomes across the offices for the *same set of inventions*. Any observed differences in outcomes for this 'matched' sample of applications should be due to 'office-effects' such as the disparity in examiners' skill levels and experience, discrepancies in legal and administrative procedures and drafting differences by local patent attorneys.

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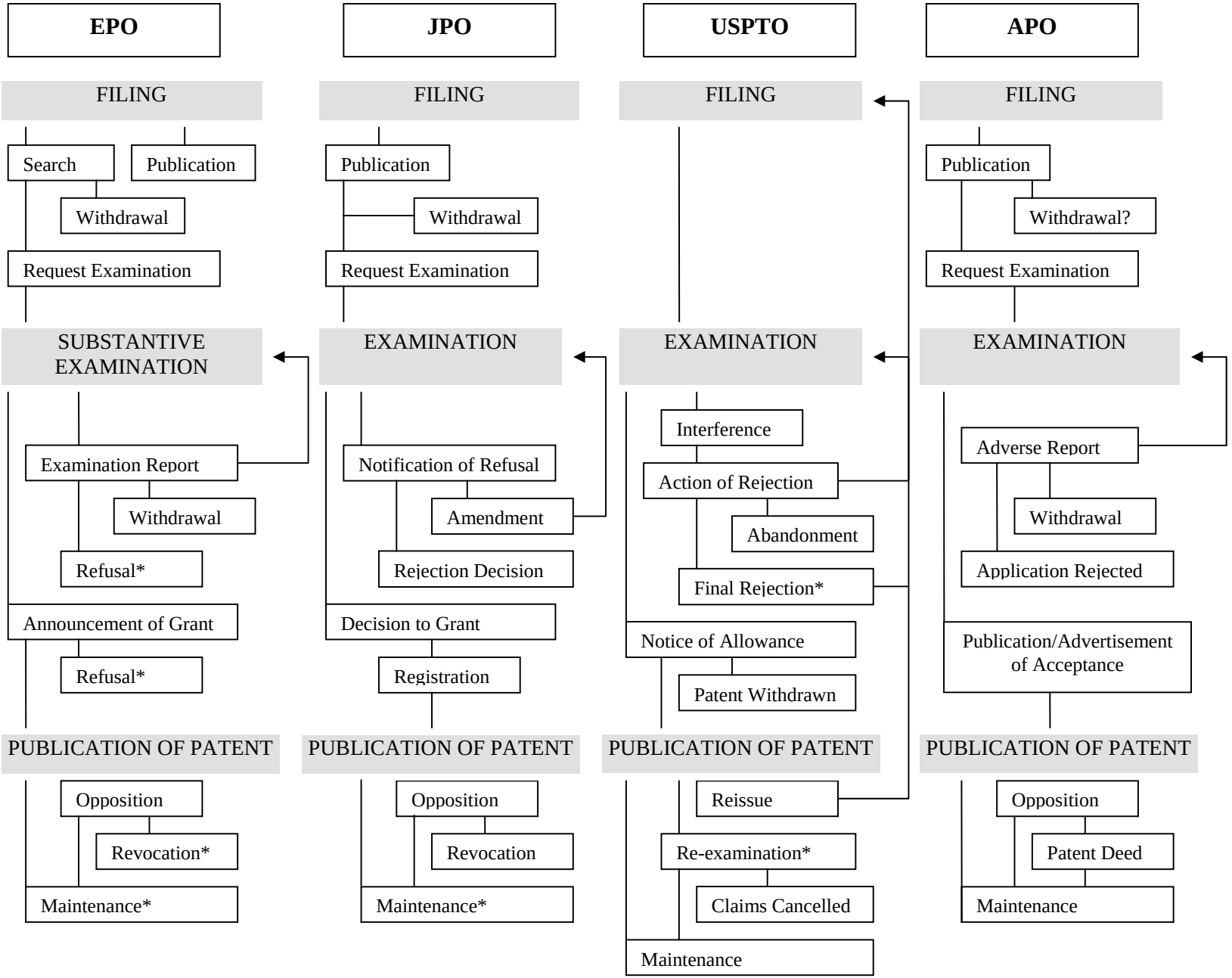
regarding the rules and processes for patenting, including restrictions on discrimination. If there is a very small domestic R&D sector and a significant (negative) technology gap with the rest of the world, then *a priori* a local economy has little to gain from a patent system.

[7] Such as the Patent Cooperation Treaty (PCT) and those operated by the European Patent Office.

[8] The EPO is an exception – it conducts a single examination for its 30 member states.

Figure 1: Patent Office Examination Flowcharts



DATASET CONSTRUCTION

In this paper, we analyse a dataset of 9,618 sets (i.e. families) of patent applications. Each set contains four non-PCT applications with a single, common priority number, with priority years inclusive of the period 1990-1995. Each of these four matched applications in each set was filed at the APO, the EPO, the JPO and the USPTO, respectively. The dataset was compiled from four sources: (1) the OECD Triadic Patent Family (TPF) Database; (2) the EPO's public access online database (esp@cenet); (3) the JPO's public access online Industrial Property Digital Library (IPDL) databases (Patent & Utility Model Concordance, English and Japanese versions, and the Japanese-only database); and (4) IP Australia's database.

The first database provides a list of triadic patent families, where a triadic patent family is defined as a set of patents taken in various countries to protect the same invention and for which "priority application must have at least one equivalent patent at the EPO, at the USPTO, and at the JPO."[9] To allow each office ample examination time, we used patents with priority years up to 1995 which, in effect, provides approximately eight years of examination time from the claimed priority application because we extracted the data from the online EPO and JPO databases at the end of 2004. In addition, we limit our data to those patent applications whose priority year is 1990 or later and are forced to use patents granted (rather than patent applications) for the US since the USPTO did not publish all patent applications at this point in time.

To ensure to the best of our ability that the application in each office related to the same invention, we only used patent families with a single priority application. We exclude patent families with multiple priorities because they may have multiple applications through divisionals, which would result in a variation in the applications filed across offices making comparing the outcomes problematic.[10] However, even with the single priority limitation, we still cannot be sure that any two patents granted by different

[9] Dernis, H. and Khan, M. (2004), 'Triadic Patent Families Methodology', STI Working Paper 2004/2, OECD, Paris.

[10] For similar reasons, we also drop any families involving continuation, continuation-in-parts, or divisional patent applications at the USPTO.

offices for the same invention are in fact identical because we do not observe the number (or scope) of claims granted by each office. Thus, we treat two patents granted by different offices for the same invention as identical even though we are aware that the scope of one may be narrowed relative to the other through the examination process. Finally, we limit our analysis to non-PCT filings only since it was impossible to extract information on PCT examination outcomes in the JPO.[11] To summarise, all 9,618 sets of four patent applications in our dataset relate to non-PCT complete patent applications with a single patent application filed at the EPO, JPO, APO and a single patent application *granted by the USPTO*.

PATENT APPLICATION OUTCOMES

The first dimension of international patent office comparison is applicaiton outcomes – how many of the 9,618 unique inventions that are granted a patent by the USPTO are also granted a patent by the APO, JPO and EPO? Do the observed granting rates vary by technology area? There are four possible applications outcomes at any point in time: pending, withdrawn, rejected, and granted. It is important to note that "withdrawn" and "pending" outcomes may be partly due to applicant behaviour since they can drag out the examination process. However, the "grant" and "reject" outcomes are entirely due to the decisions of the patent office.

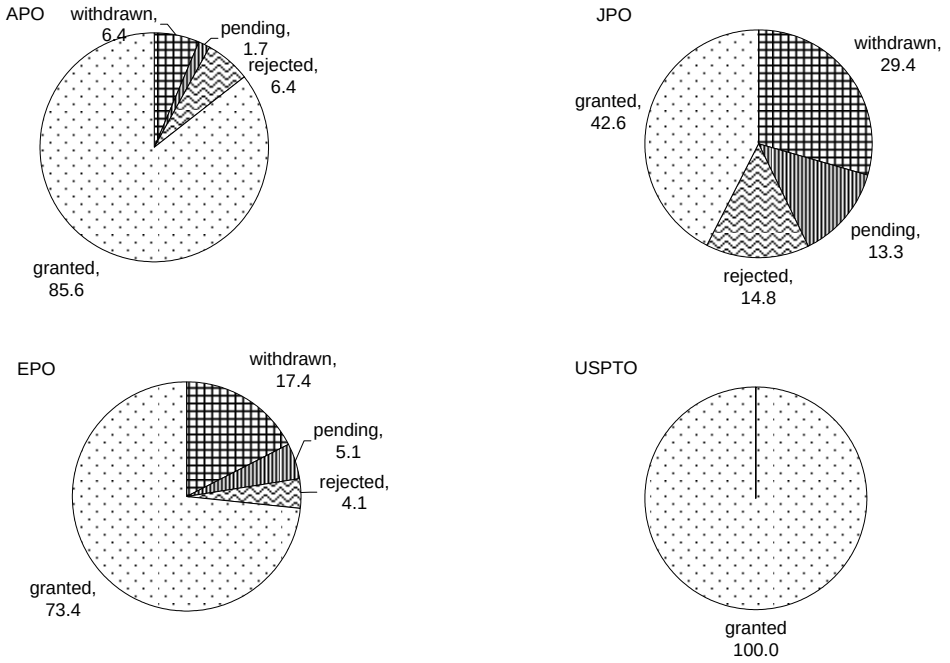
To provide an illustration of the differences in observed granting rates, Figure 2 presents pie-charts on the proportion of applications that are granted, rejected, withdrawn and still pending in each of the patent offices. Since we only observe patent grants in the US, the pie-chart for the USPTO depicts that 100 per cent of applications were granted.[12] Figure 2 suggests some interesting points of comparison. First, of the patent offices considered in this study, the APO is the closest to the USPTO in terms of patent examination outcomes: of those patents granted by the US, for example, 85.6 per cent have also been granted by the APO. On top of this, the APO only rejected a small proportion (6 per cent)

[11] However, PCT applications only represented 10 per cent of triadic patent families during this period.

[12] To provide a more complete picture, we would also present data on the applications rejected by the USPTO. However, these data are not available. Official USPTO statistics analysed by Quillen and Webster (2001; 2006) indicate that grant rates in the US are 80-90%.

of patents granted by the USPTO. By way of comparison, the EPO granted 73.4 per cent and rejected 4.1 per cent of those patents granted by the USPTO, while the JPO granted 42.6 per cent and rejected 14.8 per cent. The other important point to note is the large proportion of applications that are withdrawn at the EPO (17.4 per cent) and JPO (29.4 per cent). If these were taken out of our analysis, the comparison of grant rates across international patent offices would look far more harmonious. Although we do not know why so many applications are being withdrawn at the EPO and JPO (it could be an office effect or an applicant effect), the bottom line is that the multitude of outcomes is somewhat worrisome since it imposes unnecessary complexity on patent applicants.

Figure 2: International Patent Examination Outcomes, Matched Sample, 1990-1995



The number of patents rejected by the APO, JPO and EPO indicates that despite the push for greater harmonization in international patenting, there is still substantial disharmony. Since we do not observe the reasons for refusing an application, we are not sure whether the source of the disharmony is differences in the obviousness standard or differences in patentable subject matter. But, there is reason to believe that there may be differences in both aspects. With regard to differences in patentable subject matter, the EU did not

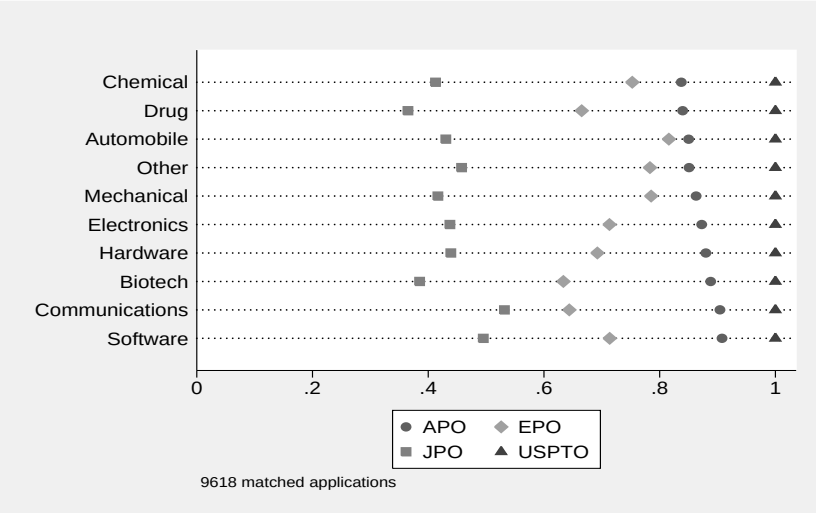
adopt the Biotech Directive until 1998 and it is widely-believed that there are differences in inventiveness standards particularly with regard to biotechnology patents.[13] Somewhat alarmingly, approximately 15 per cent of patents granted by the USPTO are still awaiting a decision at the JPO; more than 8 years after the application was originally submitted. These percentage grant rates – 100, 85.6, 73.4 and 42.6 for USPTO, APO, EPO and JPO respectively – are clearly different from the aggregate grant rates (90, 81, 65, 68) over the same period.[14]

In Figure 3, we breakdown the results reported above by technology area in order to determine whether the observed patent granting patterns are consistent across different technology classes. We collapse the IPC into ten technology areas: Biotech, Communications, Software, Automobile, Chemicals, Hardware, Drug, Electronics, Mechanical and Other.[15] The bottom axis in the graph shows the proportion of patents granted in each office. One of the main observations we can draw from this graphical representation is that there is very little variation in granting patterns across technology areas at the APO: in every area, the APO granted between 80 and 90 per cent of those patents granted by the USPTO.

By comparison, there is a lot more variation in the EPO's granting decisions– approximately 60 per cent of the biotech applications were granted, while more than 80 per cent of the automobile applications were granted. However, the EPO grant rate is lower than the APO grant rate *across every technology area*. Similarly, there is substantial variation in the decisions across technology areas in the JPO – the grant rates range from below 40 per cent to almost 60 per cent. Furthermore, the JPO is less likely to grant patent applications than both the APO and the EPO *across every technology area*.

[13] For evidence, see Michel and Bettels (2001), "Patent citation analysis: A closer look at the basic input data from patent search reports", *Scientometrics* 51(1), 185-201.
[14] It is not straight forward to estimate the USPTO since they do not publish details on applications. However Quillen and Webster (2006) have made extensive calculations to estimate annual grant rates.
[15] 'Biotech' is the biotechnology category. 'Drug' comprise other pharmaceutical and medically related patents, 'Chemicals' include the remainder of this group. 'Software', 'Hardware' and 'Communications' are components of the ICT group, 'Electronic' represents electrical and electronic technologies, 'Automobile' includes motors, engine, parts and transportation and 'Mechanical' consists of the balance of this group. Other is all remaining IPCs.

Figure 3: International Patent Office Grant Rates, by Technology, Matched Sample



Elsewhere, we conduct analysis to examine whether this can be explained by national strategic trade behaviour.[16] Technology areas where the JPO and the EPO seem particularly tough on patent applications are the drug and biotech industries (an alternative interpretation is that the USPTO is particularly liberal in granting patent grants in the drug and biotech industries). In terms of ordinal rankings of grant rates within each patent office, the drug industry was the lowest-ranked technology area in Japan, the 2nd-lowest in Australia and the 3rd-lowest in Europe. Similarly, the EPO and JPO are very tough on patent applications in the biotech industry that have already been granted by the USPTO.

Since this is bivariate analysis, we cannot explain why this effect occurs–there may be other unobserved factors (e.g. assignee country) which may explain the observed effect.[17] However, it causes some concerns for the US patent-holders in the biotech and drug industries since it implies that rivals in Europe, Japan and Australia are free to use the technology embodied in the US patent. One apparent area of "disharmony" between the APO, JPO and EPO is over Communication patent applications. Both the APO and the

[16] See Palangkaraya, A., Jensen, P.H., and Webster, E. (2005). "Determinants of international patent examination outcomes", Melbourne Institute Working Paper 6/05, University of Melbourne.
[17] In an earlier paper (see Palangkaraya et al. 2005, op cit), we show that the JPO/EPO/USPTO are all more likely to grant an application from a Japanese/European/American inventor respectively, *ceteris paribus*.

JPO are relatively liberal when it comes to granting applications in this technology area, while the EPO is relatively tough.

It is also interesting to know whether the APO, EPO and JPO are rejecting the same patent applications. To determine this, Table 1 presents cross-tabulations of APO-EPO application outcomes and APO-JPO application outcomes. The Table reveals a relatively high level of harmony between the APO and EPO but lower levels of agreement between the APO and the JPO. The shaded cells in Table 1 give the percentage of outcomes in agreement between each pair of offices. Overall, 68.1 per cent of applications granted by the USPTO are also granted by the APO and EPO, while only 40.1 per cent of applications granted by the USPTO are also granted by both the APO and JPO.

Table 1: Cross Tabulation of APO/EPO and APO/JPO Examination Outcomes (Conditional on USPTO Grant)

	Outcome at other office				
Outcome at APO	Withdrawn	Pending	Rejected	Granted	Total
			EPO		
Withdrawn	3.2	0.5	0.3	2.4	6.4
Pending	0.8	0.1	0.1	0.7	1.7
Rejected	3.2	0.4	0.4	2.3	6.4
Granted	10.2	4.0	3.2	68.1	85.6
Total	17.4	5.1	4.1	73.4	100.0
			JPO		
Withdrawn	4.0	0.6	0.7	1.1	6.4
Pending	0.9	0.1	0.4	0.3	1.7
Rejected	3.8	0.6	1.0	1.0	6.4
Granted	20.8	12.1	12.7	40.1	85.6
Total	29.4	13.3	14.8	42.6	100.0

The data also show that there is no simple, linear relationship between examination thresholds across patent offices. Given that the APO grants a higher proportion of patents in our sample than both the EPO and JPO, one might expect there to be patents that are granted by the APO and rejected by the EPO and JPO. And this is exactly what we observe: 3.2 per cent of applications granted by the USPTO and APO are rejected by the EPO, while 12.7 per cent of those granted by the USPTO and the APO are rejected by the JPO. What is perhaps more surprising is that some of the applications rejected by the APO are actually granted by the EPO (2.3 per cent) and JPO (1.0 per cent). However, both these observations point to the fact that an applicant that has been rejected by the

APO need not necessarily assume that it will be also rejected at the EPO and JPO. The other somewhat surprising observation to be made from Table 1 is that in both the EPO and JPO, a high proportion of all applications are withdrawn. Although we don't know the exact reason for this, it is possible that the applicants received notification from the patent office that the application was unlikely to be successful (i.e. that they must substantially narrow their claims in order to get the patent granted). To the extent that this interpretation is correct, such withdrawn applications may be considered to be "quasi-rejects".[18]

Another plausible interpretation is that applicants simply find out more about the potential commercial potential of their invention and, in the event that this information suggests there is little potential, the applicant simply chooses not to proceed any further with the examination. One possible problem with this interpretation is that it doesn't explain why withdrawal rates are *higher* at the JPO and EPO than at the APO. Given that the European and Japanese markets are far more important than the Australian market, one might have expected the exact opposite. If the "market information" explanation has any merit, it must answer why an applicant would choose to withdraw an application from the EPO but not the APO.

One point we have been silent on up until now is how the application outcome varies with the importance of the patent and the number of claims, which is presented in Table 2. When we talk of the "importance" of the patent, we mean the ratio of forward/backward citations which has been shown in the literature to be a good proxy for the size of the inventive step. It is determined by the number of citations received divided by the average number of citations received for that technology area, year and US inventor status.[19] The first two columns of Table 3 present the mean characteristics

[18] An alternative interpretation is that because applicants have 7 years at the JPO to decide whether to request an examination, they are able to collect more information about the market potential for their invention. When this information is revealed, they choose whether to proceed with the examination or not. Thus, withdrawn applications may have more to do with applicant behaviour than with office behaviour. Given the high proportion of applications withdrawn at the EPO and JPO, disentangling the office/applicant behaviour explanations is an interesting avenue for further research.

[19] Albert, M.B., Avery, D., Narin, F. and McAllister, P. (1991), "Direct validation of citation counts as indicators of industrially important patents", *Research Policy* 20, 251-59. Karki, M.M.S. (1997), "Patent citation analysis: A policy analysis tool", *World Patent Information* 19(4), 269-72.

according to whether the patent was granted by the office or not,[20] the third indicates whether the difference in means was statistically significant (no star means we *cannot* reject the hypothesis that the two means are the same). The fourth column indicates the direction of the differences, where significant. A few points are noteworthy. First, the citation ratio is significant and positive for the three offices, which means that when they reject a patent that is (eventually) granted by the USPTO, it tends to reject patents with a smaller inventive step. Secondly, three offices are more likely to grant an application that makes *fewer* claims.

Table 2: Application Outcomes by Average Citations and Claims

		Non-grant	*Grant*	*Significant difference*	*Effect on grant*
APO					
	Ratio of citations	0.92	1.01	***	+
	Number of claims	15.13	13.96	***	-
EPO					
	Ratio of citations	0.91	1.03	***	+
	Number of claims	15.19	13.76	***	-
JPO					
	Ratio of citations	0.92	1.11	***	+
	Number of claims	14.54	13.60	***	-
USPTO					
	Ratio of citations	na	1.00		
	Number of claims	na	14.13		

PATENT PENDENCY PERIOD

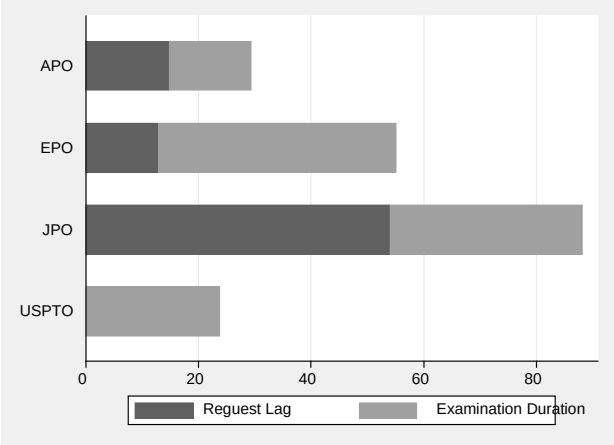
The total period of uncertainty over the status of a patent application – the pendency period – has two components. The first is a 'request lag', in which applicants are entitled to receive all the advantages associated with a 'patent pending' but not required to subject their application to official scrutiny (examination).[21] In the EPO and JPO these were 2 and 7 years respectively during the 1990-95 period. As mentioned earlier, the JPO has since reduced this period to 3 years. In the USPTO, all applications are simultaneously

[20] A non-grant here means any application that is rejected, withdrawn or still pending.
[21] We define the "request lag" as the number of months between the filing date and the request to examine date.

taken as a request to proceed with examination. The request lag is less clearly defined at the APO but is generally taken as 3-4 years. Subject to these regulated maxima, the request lag is mainly a function of the applicant's behaviour (although the patent office may also direct applicants to request examination based on their workload).

The second period of uncertainty is the time taken to examine the application – the "examination duration".[22] This duration depends on how long it takes to conduct the international search for prior art[23]; the examiners' time spent understanding the application; the allowed number and type of permitted responses and revisions by the applicant; and the number and type of permitted appeals processes by third parties. Accordingly, the examination duration depends on the resources and efficiency of the patent offices; the number and scope of interactions and revisions permitted by the office and the number and scope of interactions and revision actually taken advantage of by the applicant or third party. Thus, it is a combination of "office" and "applicant" effects.

Figure 4: Average Patent Pendency Period across Offices



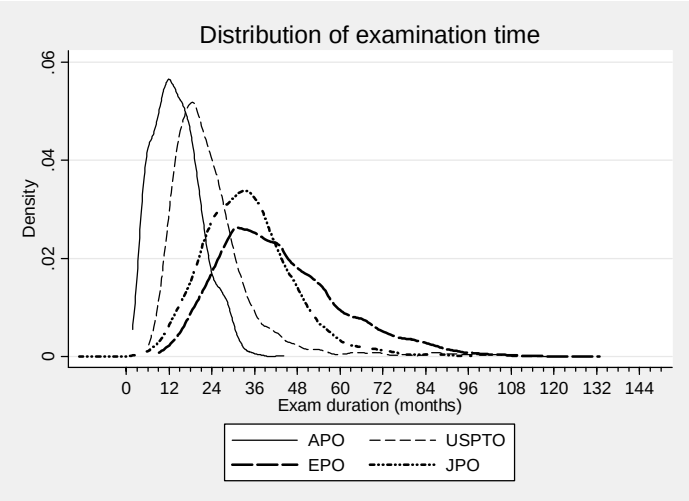
When we compare duration times, bear in mind we are comparing applications for the *same* invention by the *same* applicant at different offices. As we can see from Figure 4, the USPTO has the shortest overall pendency period (i.e. the sum of the request lag and examination duration), while the APO has the shortest average examination duration and

[22] We define the "examination duration" as the number of months between the request to examine date and the first announcement of the decision by the patent office.
[23] The exception is the EPO where the prior art search is undertaken before examination.

the EPO has the longest average examination duration. While the long request lag in the JPO is a function of its institutional arrangements, it suggests that, given the opportunity, a large proportion of applicants opt for the longest pendency period possible. That is, there appears to be some (commercial) motivation in perpetuating uncertainty over one's own patent applications since an applicant can always choose to have their application examined at any stage.

We also conduct a comparison of the distribution of examination duration across each of the four patent offices, the results of which are presented in Figure 5. The results suggest that there is a clear ordinal ranking in terms of examination duration: overall, the EPO has the longest examination times, with the bulk of applications examined by month 60 *after the examination request date*. The APO, on the other hand, has the shortest examination times with the majority of examinations completed by month 36. There is a long tail in the distribution as some applications at the USPTO took 130 months for a final decision.

Figure 5: Comparative Examination Duration Distributions across Patent Offices



In Table 3, we present outcomes by the average request lag and examination duration. The results indicate that while the request lag is related to grant status in the EPO and JPO but not the APO. Granted applications in the EPO and JPO tend to have shorter

request lags that those that are not eventually granted. This suggests that applicants who are less sure about the eventual success of an application are more likely to take advantage of the full pendency period. In other words, they delay their decision to have their application examined, possibly for strategic reasons. Finally, there were only significant differences in the examination duration by grant and non-grant outcome at the APO. Granted patents tended to be 'known' much earlier than rejected or withdrawn applications at the APO.

Table 3: Examination Outcomes by mean Request Lag and Examination Duration

	Non-grant	*Grant*	*Significant difference*	*Effect on grant*
APO				
Request lag	14.99	14.76		none
Examination duration	24.38	13.64	***	-
EPO				
Request lag	15.36	12.11	***	-
Examination duration	43.56	42.07		none
JPO				
Request lag	68.12	42.77	***	-
Examination duration	34.30	34.12		none
USPTO				
Request lag	na	0		
Examination duration	na	23.78		

Note: *** (significant at 1% level), ** (significant at 5% level), * (significant at 10% level)

CONCLUSIONS

In this paper, we conduct a simple examination of the state of play with regard to two dimensions of the international patent process: application outcomes and duration. Specifically, we examine the extent of "harmony" across four patent offices—the APO, the EPO, the JPO and the USPTO—in terms of application outcomes (pending, withdrawn, rejected, and granted) and the application pendency periods (duration between filing and final outcome dates and between examination request and final outcome dates). To do so, we utilize more than 9500 sets of matched patent applications filed at the four offices – that is, we take the same inventions and examine whether they are have been granted by all of the offices and the time taken to reach a decision.

On the two dimensions we examine, our evidence suggests that there are substantial differences across international patent agencies. We argue that these findings are somewhat alarming because of their potential effects on the uncertainty faced by patent applicants, especially when it is linked to the overall rate of innovative activity. Given that much of the examination is simple duplication of the work done by other offices (every office conducts their own novelty tests for example), one possible way to improve the efficiency of the examination process may be greater cooperation between patent offices. The evidence presented here suggests that much more should be done to improve the efficiency and effectiveness of patent examination procedures.

With increasing pressure on all international patent examination agencies to improve efficiency and to reduce the backlog of patents pending, it is interesting to examine the tradeoffs associated with the duration of the patent examination process. The APO may adopt a zero request lag similar to the USPTO. Another approach to improve efficiency might involve the patent office providing incentives to its examiners to conduct faster examinations, which may be achieved by means such as relying on prior art searches conducted by other patent offices or application of a less rigorous test of inventive step. On the surface, this may be an appealing approach – for one, it minimizes the duplication of expenditure associated with each patent office around the world conducting separate, independent prior art searches. This alone could save a small patent office tens of millions of dollars a year. However, conducting fast patent examinations also embodies some potential costs – perhaps it would increase the number of patents granted that are eventually found to be invalid, and that these patents are more likely to be used to be build patent thickets and the like. Given the ongoing furore in the United States regarding the perceived lowering of patent quality may also have led to an explosion in patent litigation, it may be unwise to follow the USPTO's example.

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