August, 2007

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This is a reprint of the article as it appeared in:
Federal Circuit Bar Journal, Vol. **17**, No. 1, pp. 1-30, August 2007.

Abstract - This paper draws attention to fundamental deficiencies in studies that have been relied upon as authoritative sources on patent grant rate comparisons among national patent offices. The two prominent studies analyzed here had employed erroneous methods to compare patent grant rates, resulting in false high indications of such rates at the U.S. patent office compared to foreign patent offices. The three identified categories of analysis errors found in these studies were (i) the misapplication of conditional probability; (ii) miscounting invention applications; and (iii) failure to account for patent obsolescence and application attrition due to the widely differing delays among national patent offices. These errors over-estimate the U.S. patent grant rate by tens of percents, creating a pervasive misconception that such studies prove that examination at the U.S. patent office is the least rigorous among national patent offices. A subsequent section of this paper presents the results of a study that correctly estimates the patent grant rate for applications filed in the U.S. patent office as being in the range of 60% to 76%. Finally, it is shown that the scope and average number of claims in patent applications differ substantially among national patent offices. It is concluded that these differences render even accurate patent grant rate comparisons among national patent offices of very little probative value as indicators of examination rigor and patentability standards.

Keywords**:** patent, grant rate, patent application success probability, allowance rate, patent statistics, claims, national comparisons, patent quality, claim examination, patentability standards, probability, conditional probability

JEL Classifications**:** C11, C13, O34, O57

Suggested Citation**:**
Katznelson, Ron D., "Bad Science in Search of 'Bad' Patents", *Federal Circuit Bar Journal*, Vol. **17**, No. 1, pp. 1-30, August 2007. Available at SSRN: http://ssrn.com/abstract=1007629

Bad Science in Search of "Bad" Patents

Ron D. Katznelson*

Introduction

The patent grant rate is a measure frequently used to compare national patenting authorities. It is an estimate of how often patent applications ultimately mature into patents and is equal to the ratio between the number of granted patents for inventions and the number of applications filed for those inventions. Several observers have suggested that the patent grant rate is indicative of patent quality, implying that lower quality patents (patents of dubious validity) are more likely to have been issued under a national patent system that has higher grant rates. While the validity of this premise and the probative value of grant rate comparisons are questioned in Section III below, this paper is mostly concerned with the validity of the *methods* used to obtain and *compare* patent grant rate estimates. Several authors have suggested that a lack of examination rigor at the United States Patent and Trademark Office (USPTO) leads to a grant of what some call "bad" patents that would otherwise not issue,[1] thereby increasing the patent grant rate. These authors

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[1] Adam B. Jaffe & Josh Lerner, Innovation and its Discontents: How our Broken Patent System is Endangering Innovation and Progress, and What to do About it 34–35 (2004) ("[T]he PTO has become so overtaxed, and its incentives have become so skewed towards granting patents, that the tests for novelty and non-obviousness that are supposed to ensure that the patent monopoly is granted only to true inventors have become largely non-operative."); Comm. on Intellectual Prop. Rights in the Knowledge-Based Econ., Nat'l Research Council of the Nat'l Acads. 54 (Stephen A. Merrill et al. eds., 2004), *available at* http://www.jonesday.com/files/upload/A_Patent_System.pdf ("The committee believes that high [patent] acceptance rates, especially if increasing over time relative to comparable rates in other industrialized countries would be reason to look more closely at examination quality."); Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U. L. Rev. 63, 75 (2004) (arguing that continuation applications permit the applicant to wear down the examiner and obtain a bad patent that

associated high patent grant rates with lower examination quality. Because comparative estimates of patent grant rates appear to form the underlying factual predicate for such conclusions about U.S. patent examination quality, the quality and correctness of such comparative estimates must be evaluated first. This paper analyzes two prominent studies that unfortunately employed erroneous methods of analysis, resulting in false conclusions regarding USPTO patent grant rates. It is shown below that these studies employed bad science to find erroneous statistical evidence that was used by some observers to prove that the USPTO grants, what they suggest are, "bad" patents. While this paper draws no conclusions on USPTO examination quality (which may need improvement), it shows that the methods used to conclude that the USPTO issues "bad" patents are seriously flawed.

I. Bad Science Applied in Patent Grant Rate Estimation

In a recent article published in this Journal,[2] Paul Jensen, Alfons Palangkaraya and Elizabeth Webster (Jensen et al.) provided results of their statistical patent grant study comparing patent grant rates among national patent offices. Their article leads readers to conclude that the USPTO has the highest grant rate as compared to the European Patent Office (EPO) or the Japanese Patent Office (JPO). Jensen et al. conclude from their results that there is a substantial amount of disharmony between the USPTO and the other trilateral patent offices because only 37.7% of the patent applications granted by the USPTO were also granted by the EPO and the JPO.[3] This note shows that their method for comparing patent grant rates among patent offices is fundamentally flawed and that it produces *false* indications of higher grant rates in the USPTO compared to other patent offices. This paper was written in part because such misleading results by Jensen et al. were used

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the USPTO would otherwise refuse to grant); Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 Nw. U. L. Rev. 1495, 1495–96 (2001) (discussing how "bad" patents get through the examination system); Minoo Philipp, *Patent Filing and Searching: Is Deflation in Quality the Inevitable Consequence of Hyperinflation in Quantity?* 28 World Pat. Info. 117, 117–121 (2006) (suggesting that many "doubtful" patent applications are being filed and granted, increasing workload and reducing efficiency, leading to deflation in patent quality). *See generally* John R. Thomas, *The Responsibility of the Rulemaker: Comparative Approaches to Patent Administration Reform*, 17 Berkeley Tech L.J. 727, 727 (2002) (discussing the declining quality of patent examination and suggests certain reforms at the USPTO based on experiences of foreign patent offices).

[2] Paul H. Jensen et al., *Disharmony in International Patent Office Decisions*, 15 Fed. Cir. B.J. 679, 698 (2006) (suggesting that much "disharmony" exists between the trilateral patent offices).

[3] *Id*. at 692.

in recent congressional testimony[4] as evidence that there exists substantial disparity in rigor or patentability standards between the USPTO and other foreign patent offices. The testimony implied that such examination rigor and patentability standards are the least demanding in the United States. While there is no doubt that the USPTO should improve patent examination quality (as should other patent offices), the comparative methods of Jensen et al. and that of others mentioned below, produce false results and are themselves in need of substantial quality improvements to merit consideration.

In an attempt to analyze data for the same inventions, the Jensen et al. study selected a population of patent applications that were *granted* by the USPTO and for which they found counterpart applications in the EPO and the JPO. Jensen et al. then looked for the fraction of such counterpart applications that were also granted in the EPO or the JPO. Clearly, within this given patent applications base comprised of 100% USPTO grants, even if the EPO was *ten times more lax* compared to the USPTO in granting patent applications, Jensen et al. could not have obtained for the EPO any grant rate that exceeds 100% of the application base in their selection. By definition, *under any circumstances,* their method could not have found that the USPTO ever grants fewer patent applications than the JPO or the EPO even if the USPTO had the highest rigor and the most demanding patentability standards. They simply set themselves up to find grant rates in the EPO and the JPO that are no higher than the USPTO.

Another way of looking at their defective paradigm is by positing a symmetrically identical paradigm but with the USPTO and the EPO roles reversed. Assume that Jensen et al. had alternatively used an ensemble of applications selected on the basis of having been *all granted* in the EPO and had looked for the fraction of the corresponding U.S. counterpart applications that were also granted in the USPTO. In this case, they would have found that only less than 100% of the EPO granted patents were also granted by the USPTO. According to their logic, Jensen et al. would have had to infer that the EPO grants more applications than the USPTO—an opposite conclusion to the one arrived at in their study. Clearly, this shows that their method is

[4] *Patent System Revision: Before the Subcomm. on Courts, the Internet, And Intellectual Prop. of the H. Comm. on the Judiciary*, 110th Cong. 2, 4 (2007) (statement of Daniel B. Ravicher, Executive Director, Public Patent Foundation):

> There are several sources to help determine the current level of quality for U.S. patents, and all of them paint a very *clear* picture that patent quality today in America is *extremely poor*. . . . The [Jensen et al.] study found that the counterparts to patent applications issued in the U.S. were only issued by the [EPO] 72.5% of the time and by the [JPO] only 44.5% of the time. This *evidence* shows that the U.S. Patent Office is indeed granting a very high proportion of patents. (emphasis added).

fundamentally flawed. Bad science can produce any result sought by those who practice it.

This first error that Jensen et al. committed can be categorized as a fundamental misapplication of conditional probabilities. As explained below, they have constructed a *conditional* statistical ensemble of patent applications without applying the statistical analysis required by the laws of conditional probability theory. However, Jensen et al. cannot be "credited" with being first to misapply conditional probability in making patent grant rate comparisons. There is 'prior art' to such bad science. Jensen et al. appear to have followed a similar misleading practice used in earlier studies by researchers at the Organization for Economic Cooperation and Development (OECD).[5] The OECD estimates of USPTO grant rates are significantly higher than for other patent offices, reaching the 90% levels.[6] The OECD authors have likewise committed an error in the category of conditional probability, as seen below. Furthermore, the OECD studies further skewed the U.S. grant rate results upwards by applying incorrect criteria for counting USPTO grants of applications for inventions, committing the second category of analysis errors. The third category of analysis deficiencies in both the Jensen et al. study and the OECD studies is the uncorrected bias due to the obsolescence of patents and the materially different time horizons and delays incurred in each national patent office for claim examination and grant. Each of these three error categories will be addressed in detail below.

A. Misapplication of Conditional Probabilities

Not surprisingly, by the very conditional selection of their application sample, Jensen et al. reported that the EPO or the JPO grant only a fraction of the applications for patents granted by the USPTO. Jensen et al. reach a remarkable conclusion that because the EPO or the JPO did not grant all the

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[5] Catalina Martinez & Dominque Guellec, *Overview of Recent Changes and Comparison of Patent Regimes in the United States, Japan and Europe*, *in* Patents, Innovations and Economic Performance: OECD Conference Proceedings 127, 145 (2004), *available at* http://miranda.sourceoecd.org/vl=1839920/cl=23/nw=1/rpsv/~6681/v2004n13/s1/p1l [hereinafter OECD (2004) study] (suggesting that the difference between USPTO and EPO grant rates for patents with U.S. priorities also applied at EPO was around 30% but that the estimated EPO grant rate for patents first filed in the U.S. has remained about 6-8% below the general average grant rate at the EPO). The same data was reported in an earlier publication. Org. for Econ. Co-operation and Dev., Patents and Innovation: Trends and Policy Challenges 18–19 (2003), *available at* http://www.oecd.org/dataoecd/48/12/24508541.pdf [hereinafter OECD (2003) study].

[6] OECD (2003) study, *supra* note 5, at 18–19 (suggesting that the patenting requirement may have been lower in the United States than in Europe during the 1980s and 1990s).

applications of the USPTO sample grants, there is lack of parity in patenting standards or examination rigor. However, Jensen et al. did not pursue the symmetrically reciprocal path to report in a similar way the grant probability in the USPTO for a statistical sample of patent applications selected on the basis that they were all granted in foreign offices. So for example, starting from a conditional sample of patent applications that were all granted in the EPO and also filed in the USPTO will result in having a non-zero fraction of such applications that receive *no* USPTO grant because there is always a non-zero probability of abandonment or of a rejection by any examiner corps. Jensen et al. seem to expect that parity in standards and rigor can only be indicated by a finding that *all* patent applications in the sample granted by the USPTO will also receive a grant in the EPO. Likewise, their logic would necessarily mean that under parity, *all* patent applications in the alternative conditional sample of EPO grants must receive a grant in the USPTO. It can be shown that such inference is fundamentally flawed as it can only apply in two trivial cases. The first is the trivial case of identical examiner corps, examining identical applications under identical rules, sending identical office actions and receiving identical applicants' responses thereto—namely, the case of identical patent offices. The second trivial case is one wherein each patent office grants *every* application it receives, i.e. 100% grant rate at each patent office. Clearly, a logic that does not apply to any case but these unreal trivial cases is fundamentally flawed.

Comparing patent grant probabilities of distinct patent offices on the basis of *conditional ensembles* is theoretically possible, *provided* caution is exercised by proper application of probability theory. As shown below, a study that analyzes the grant probability at the USPTO of a sample population of applications having foreign priority applications that were all granted in foreign jurisdictions must also be undertaken if conditional ensembles are to be used.[7] The conditional probability analysis error of the studies cited above is briefly explained without loss of generality in the context of only two national patent offices, the USPTO and EPO. The multilateral case involving more than two national patent offices can be shown to follow similar considerations.

Focusing on the Jensen et al. study, consider only the set of patent applications that were filed in *both* patent offices. Let $P(\mathbf{U})$ and $P(\mathbf{E})$ be the probabilities that such patent applications are granted in the USPTO and in the EPO respectively. These probabilities are the grant rates that scholars and policymakers attempt to use in comparing the relative performance of the respective patent offices. Denote by $P(\mathbf{E}|\mathbf{U})$ the *conditional* probability

[7] Such study may now be undertaken based on published U.S. patent applications applied since 2000. *See infra* note 13. However, proper grant censoring "attenuation" weighting is required to account for pending applications.

that a patent application in the set was granted in the EPO *conditioned on* (or given that) it was granted in the USPTO. Similarly, denote by $P(\mathbf{U}|\mathbf{E})$ the *conditional* probability that a patent application in the set is granted in the USPTO *conditioned on* (or given that) it was granted in the EPO. Evidently, for such a set of applications filed in both offices, Jensen et al. observed only estimates of the *conditional* grant probability $P(\mathbf{E}|\mathbf{U})$ from which they erroneously infer conclusions attributable to the relative values of the total probabilities $P(\mathbf{U})$ and $P(\mathbf{E})$ without obtaining estimates of $P(\mathbf{U}|\mathbf{E})$. However, the simple mathematical connection between total probabilities and conditional probabilities has been known since 1763, the year that the Reverend Thomas Bayes published his now celebrated theorem on conditional probabilities.[8] Bayes' theorem states:

$$P(\mathbf{U}\,|\,\mathbf{E})\,P(\mathbf{E}) \;=\; P(\mathbf{E}\,|\,\mathbf{U})\,P(\mathbf{U}) \tag{1}$$

Thus, to assess the relative values of $P(\mathbf{U})$ and $P(\mathbf{E})$, one must use *both* conditional probabilities, as the manipulation of Equation 1 shows:

$$\frac{P(\mathbf{U})}{P(\mathbf{E})} = \frac{P(\mathbf{U}\,|\,\mathbf{E})}{P(\mathbf{E}\,|\,\mathbf{U})} \tag{2}$$

On this ground alone, the one-sided data set in the Jensen et al. study foreclosed any opportunity to obtain a meaningful comparative indication, as it lacked estimates of both conditional probabilities.[9]

The OECD studies also reported on patent grant probability comparisons and estimated that the USPTO grant rates are significantly higher than those of the EPO, reaching the 90% levels for some years.[10] For the reasons explained below, these estimates and comparisons are also wrong.

In estimating the grant rate in the USPTO, the authors of the OECD study selected applications that were filed in the EPO claiming U.S. priorities. Their database tool then tracks these U.S. priority applications in the U.S. grant database, and they purported to obtain an estimate of how many

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[8] Thomas Bayes, *An Essay Toward Solving a Problem in the Doctrine of Chances,* 53 Philosophical Transactions Royal Society 370 (London, Royal Society 1763), *reprinted in* 45 Biometrika 296 (1958), *reprinted also in* Facsimiles of Two Papers by Bayes (W. Edwards Deming ed., Hafner Publishing Co. 1963); *See also* Athanasios Papoulis, Probability, Random Variables, and Stochastic Processes 39 (McGraw Hill 1965) (Equation 2-38).

[9] Of course, in obtaining estimates for use in Equation 2, researchers should exercise caution and statistical care in obtaining reliable estimates of $P(\mathrm{E}|\mathrm{U})$ and $P(\mathrm{U}|\mathrm{E})$ because, by definition, they would be likely based on different ensembles of inventions. Hence, steps should be taken to ensure statistical similarity of these two ensembles by testing other control attributes of the ensembles.

[10] OECD (2004) study; *supra* note 5, at 145 fig.7.5; OECD (2003) study, *supra* note 5, at 18–19 fig.7.

of these U.S. priority applications received a U.S. patent grant. They divided the number of U.S. priorities in EPO applications for which the USPTO database shows a grant, by the total number of U.S. priorities in EPO applications.[11] By that, they believed to have obtained a U.S. grant rate estimate "for U.S. priorities that subsequently led to filings at the EPO."[12] Deferring to Section I(B) the discussion on the erroneous use of 'priorities' rather than applications, it becomes clear that the OECD study actually attempted to obtain a *conditional* U.S. grant probability but compared it to the *total* EPO grant probability $P(\mathbf{E})$. To explain how the OECD studies compared apples-to-oranges, consider only a set of all U.S. patent applications in a given study period. What the OECD study attempted to estimate over this application set, was the probability that a U.S. patent application was granted, *given* that, or *conditioned* on it also being filed in the EPO, claiming U.S. priority. Denote this conditional probability by $P(\mathbf{U}|\mathbf{F}_E)$. Let $P(\mathbf{F}_E)$ be the probability that a U.S. application is also filed in the EPO claiming U.S. priority (whether or not it received any grant anywhere), and denote by $P(\mathbf{F}_E|\mathbf{U})$ the conditional probability that a U.S. application was also filed in the EPO claiming U.S. priority *given* that it had received a U.S. grant. This posteriori conditional probability $P(\mathbf{F}_E|\mathbf{U})$ may be obtained by examining all U.S. grants and deriving the fraction of the corresponding applications that have EPO counterpart applications that claim U.S. priority. In contrast, the probability $P(\mathbf{F}_E)$ may be obtained by inspecting the set of U.S. applications (not grants) and obtaining the fraction of applications having an EPO counterpart application claiming U.S. priority. Such estimates could be made for applications filed since 2000 due to the passage of the *Domestic Publication of Foreign Filed Patent Applications Act of 1999*,[13] which made public all U.S. applications that were also filed internationally. By applying Bayes' theorem to the event probabilities in this case, one obtains:

$$P(\mathbf{U}) = \frac{P(\mathbf{U} \mid \mathbf{F}_E)P(\mathbf{F}_E)}{P(\mathbf{F}_E \mid \mathbf{U})} \tag{3}$$

As Equation 3 shows, a correction by a factor of $k = P(\mathbf{F}_E)/P(\mathbf{F}_E|\mathbf{U})$ is required in order to use $P(\mathbf{U}|\mathbf{F}_E)$ to obtain an unbiased estimate of $P(\mathbf{U})$ for comparison with $P(\mathbf{E})$. The value of the factor k is likely significantly less than 1, i.e. $P(\mathbf{F}_E|\mathbf{U}) > P(\mathbf{F}_E)$. This is because U.S. patent applicants that

[11] OECD (2004) study, *supra* note 5 at 144 fig.7.5; OECD (2003) study, *supra* note 5, at 19 fig.7.

[12] *See id.*

[13] Pub. L. No. 106-113, § 1000(a)(9), 113 Stat. 1501, 1535 (codified at 35 U.S.C. § 122(b) (2000)) (allowing the publication of U.S. Patent applications for the first time in March 2001).

carried an application through a U.S. grant are more likely to have valued their invention and filed in the EPO compared to U.S. applicants of *all* U.S. applications in the ensemble, including those that have not received a U.S. grant. The OECD studies failed to mention or introduce the correction[14] factor k in discussing the comparison with $P(\mathbf{E})$.

From the above discussion, it is clear that the use of conditional ensembles by Jensen et al. and by the OECD authors, demands careful use of conditional probability analysis, with ancillary conditional probability estimates that are often difficult to obtain. It is therefore suggested here that the correct and reliable methods for obtaining patent grant rates is to follow the direct method shown in Section II. This method also properly avoids the second analysis deficiency category of prior studies as discussed below.

B. Miscounting Invention Applications

The problem of using the OECD study to estimate the true value of $P(\mathbf{U})$ or even the true conditional probability $P(\mathbf{U}|\mathbf{F}_E)$ is further compounded by its authors' use of erroneous methods of counting the applications underlying the grants they observe. On the one hand, it appears that the OECD authors estimated correctly the total probability $P(\mathbf{E})$—the EPO grant rate. The EPO grant rate they obtained is simply the result of dividing the number of applications for which a grant date is shown in the EPO database by the total number of applications[15] and not just the total number of priorities. Therefore, it appears that the OECD tool correctly counts as two distinct applications a divisional application and its parent application in the EPO, because the database contains distinct EPO applications even if they have a common *priority application*. On the other hand, U.S. applications received no such treatment by the OECD authors. As far as the OECD tool was concerned, U.S. patents claiming a common priority parent were *all* a grant of one application—the priority parent application found in the EPO database. But the EPO database only contained U.S. *priorities* and for U.S. patents, the OECD authors confused *priorities* with applications and failed to determine the number of unique applications that led to individual grants at the USPTO. The OECD authors also failed to distinguish between U.S. patent grants that issued from a parent priority application and those that issued from its descendent applications.

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[14] *See* OECD (2004) study; *supra* note 5; OECD (2003) study, *supra* note 5 (failing to mention the requirement of correction by a corrective k factor). The fact that U.S. applications were made public after 2000 should have been a reason to note the likelihood of an unknown upward bias. In any event, the correction factor can be numerically evaluated for application years starting at 2000.

[15] OECD (2004) study, *supra* note 5, at 144.

U.S. Patents often cite a *chain* of priority application numbers, listing applications that are still in prosecution (Pending), or those abandoned in the process of continuations. Priority references also include provisional applications that never receive examination, let alone a grant. U.S. applicants are careful not to omit any application including non-granted applications from their priority list in order to preserve their chain of priority.[16] Thus, on the face of a granted U.S. patent, a reference may be made to application(s) that *have not* yet received a grant or that would *never* receive a grant. However, the OECD database tool makes a determination that any application number that appears on a granted U.S. patent has been granted simply because it appears as a priority application on the face of a granted U.S. patent. The only U.S. priority applications that the OECD tool deemed non-granted or abandoned for purposes of identifying the non-grants are those priority application numbers that were never referred to in any granted U.S. patent. In that way, the OECD tool over-estimates U.S. patent grants because it counts the mere *mention* of priority applications as grants and because it does not actually make the direct connection between a granted U.S. patent and its unique application number. This OECD approach of treating a *priority* disclosure application as *the* application for every patentable invention disclosed in such priority disclosure is apparently based on a misconception of the U.S. patent system and therefore further increases the false high indications of U.S. grant rates.

To demonstrate the distorted results produced by the OECD author's patent grant rate comparisons, consider for example a particular U.S. priority based patent family shown in Table 1 for which this author happens to be the inventor. Had it been utilized today, the OECD tool would identify three distinct EPO applications shown at the bottom of the table, consisting of the first EP application and its two subsequent divisional applications, all claiming priority of the original U.S. '752 application. Of these three EPO applications, the OECD tool would find that only two were granted and would therefore arrive at a 66.6% EPO grant rate. In contrast, the USPTO counterpart grant rate calculation by the OECD tool would identify in the EPO database *only one* U.S. priority application (the '752 application) because all other nine U.S. applications are not listed in the EPO database.

[16] 35 U.S.C. § 120 (2000) (providing that under certain conditions an application is entitled to the priority of an earlier application "if it contains or is amended to contain *a specific reference* to the earlier filed application") (emphasis added).

Table 1. U.S. and European patent applications for inventions by Ron D. Katznelson that claim the priority of U.S. Serial No. 07/818,752.

Patent Application Type	Patent Application Number	Title	Patent / Publication No.	Granted
US Applications				
Original	07/818,752	Multichannel Television Signal Scrambling and Descrambling System and Method		NO
Continuation	08/233,212	Multichannel Television Signal Scrambling and Descrambling System and Method	**5,430,799**	4-Jul-95
CIP	08/256,379	Multichannel Television Signal Scrambling and Descrambling System and Method		NO
Continuation	08/433,135	Simultaneous Multichannel Television Access Control System and Method	**5,754,650**	19-May-98
Continuation	08/534,340	Multichannel Television Signal Scrambling and Descrambling System and Method		NO
Continuation	08/662,504	Broadband Television Scrambling and Descrambling System	**5,864,621**	26-Jan-99
Continuation	09/080,621	Multichannel Digital Signal Generation Method and Apparatus	**6,148,320**	14-Nov-00
Continuation	09/236,765	Method and Apparatus for Level and Phase Control of a Plurality of RF Signals	**6,175,630**	16-Jan-01
Continuation	09/712,096	Multichannel Digital Signal Generation Method and Apparatus	**6,731,757**	4-May-04
Continuation	10/639,146	Multichannel Quadrature Modulation	**20040052370**	Pending
European Applications				
First EP	93903401.3	Multichannel Television Signal Scrambling And Descrambling System And Method	**EP622003**	17-Oct-01
Division	1104853.5	Method and Apparatus for Generating a Multichannel Signal	**EP1115248**	30-Mar-05
Division	5006721.4	Multichannel Quadrature Modulation	**EP1553776**	Pending

Source: USPTO and EPO web site databases.

The OECD tool would then find that the '752 U.S. priority application is mentioned in at least one of the granted U.S. patents shown in the table and would therefore conclude that *all U.S. priorities* received a grant, yielding a U.S. grant rate of 100%. However, as Table 1 shows, there were ten U.S. patent applications in this example, all claiming the '752 priority. These include the original application, a Continuation-In-Part (CIP) and eight continuations. Of these, only six U.S. patent applications were granted, yielding a grant rate of 60% (and a maximum of 70% if the pending application issues).

It is important to note that in this example, each U.S. application had prosecuted distinct groups of claims directed at different inventive elements. As evident from an examination of the claims in the U.S. patent applications listed in Table 1, they were directed at a wide array of inventive elements, *all* having been disclosed in the original '752 priority parent application and the '379 CIP application. Claimed separately with distinct groups of claims in each application, these inventions included, but were not limited to, the following: novel methods for compatible descrambling of television signals, multichannel scrambling and descrambling of television signals, broadband processing of such signals, simultaneously controlling access to a plurality of TV signals, multichannel signal generation, system for level and phase control

of a plurality of RF signals, system for multichannel quadrature modulation, and methods of using mathematical shortcuts for efficient digital signal processing of RF signals. Hence, these constituted not one application for one invention but several applications for several inventions, resulting in several patents. Treating them as if they were one item, as the OECD study does, is clearly wrong because these applications were not "recycled" versions of the parent application.

The erroneous OECD analysis yielding 100% U.S. grant rate for the case shown in Table 1 is demonstrably wrong because the OECD authors focus on *priorities* rather than *applications*. Their repeated use of the phrase "grant rate for U.S. priorities" is indicative of their confusion. Patents are not granted for *priorities* but for claims in patent *applications*. The OECD authors ignore the basic fact that a priority application is identified in a subsequent patent application only in reference to its *disclosure* because the specification of a parent application must support claims made in a later continuation or divisional application. That, however, does not mean that the claims of the later continuation or divisional application reflect a repeated effort as to claims of the parent. In analyzing whether a given patent application is a repeated effort, one must look at the claims of the application, not the specification or the priority. It is the *claims* that define the invention, not the priority reference or the specification.[17] The claims made in the patent are the sole measure of the *grant* and distinct applications for distinct claims should be separately tallied because they are subject to independent opportunities of receiving a grant or

[17] The Federal Circuit Court of Appeals recently provided a clear reminder of this fact in Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc. 381 F.3d 1111, 1115–16 (2004) ("It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." (citing Aro Mfg., Co. v. Convertible Top Replacement Co., 365 U.S. 336, 339 (1961) ("[T]he claims made in the patent are the sole measure of the grant."); Altoona Publix Theatres v. Am. Tri-Ergon Corp., 294 U.S. 477, 487 (1935) ("Under the statute it is the claims of the patent which define the invention."); Smith v. Snow, 294 U.S. 1, 11 (1935) ("[T]he claims of the patent, not its specifications, measure the invention."); Cont'l Paper Bag Co. v. E. Paper Bag Co., 210 U.S. 405, 419 (1908) ("In making his claim the inventor is at liberty to choose his own form of expression, and while the courts may construe the same in view of the specifications and the state of the art, they may not add to or detract from the claim.") (citation omitted); White v. Dunbar, 119 U.S. 47, 52 (1886) ("The claim is a statutory requirement, prescribed for the very purpose of making the patentee define precisely what his invention is; and it is unjust to the public . . . to construe it in a manner different from the plain import of its terms."); Merrill v. Yeomans, 94 U.S. 568, 570 (1876) ("[The statutorily required] distinct and formal claim is, therefore, of primary importance, in the effort to ascertain precisely what it is that is patented to the appellant in this case."); SRI Int'l v. Matsushita Elec. Corp. of Am., 775 F.2d 1107, 1121 (Fed. Cir. 1985) (en banc) ("It is the claims that measure the invention.")).

a rejection even if they rely on a common priority disclosure for support. If that were not the case, applicants relying on a common priority would not have to file new applications for separate claim examination.

Divisional applications are filed in the USPTO in response to a restriction requirement on an application issued by an examiner. In such action, the applicant is informed that there are claims directed to different inventions, and the applicant must chose among different groups of claims. Claim groups not initially elected may be prosecuted in later divisional applications, which by definition are directed to different inventions. This is why the claims of divisional applications are insulated from obviousness-type double-patenting rejections.[18] A CIP application discloses new matter and an applicant would not file a CIP only to seek claims for subject matter fully disclosed in the parent application, but he/she rather would direct claims to the new matter introduced in the CIP. By definition then, these two types of applications are made for different inventions than claimed in prior applications.

Absent an examiner's restriction, applicants usually cannot submit follow-up claims directed to different aspects of their invention in a divisional application. Instead, applicants initiate continuation applications to do so. Typically, claims in a continuation application are of different scope than in the parent application, and, as such, not directed to the same invention. In a small fraction of cases upon allowance of continuations, examiners may require applicants to file a terminal disclaimer[19] disclaiming the term of the allowed patent beyond the term of the parent patent. Examiners require such terminal disclaimer if they believe that, although not identical, at least one examined application claim is not *patentably distinct* from claim(s) of the applicants'

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[18] 35 U.S.C. § 121 (2000) which states:

> A patent issuing on an application with respect to which a requirement for restriction under this section has been made, or on an application filed as a result of such a requirement, shall not be used as a reference either in the Patent and Trademark Office or in the courts against a divisional application or against the original application or any patent issued on either of them, if the divisional application is filed before the issuance of the patent on the other application.

Id.

[19] U.S. Patent & Trademark Office, Manual of Patent Examining Procedure § 804, ¶ 8.33, at 800-24 (8th ed., rev. Aug. 2006) which states:

> A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Id. The other effect is that the ownership of both patents must remain vested in the same party. *See id.* ¶ 8.34.

parent. Lack of such distinction is found if the examined application claim is either anticipated by, or would have been obvious over, the issued claim(s) of the parent. This, however, does not mean that such claims are directed to identical inventions. In any event, issued patents with terminal disclaimers make up less than 3% of issued patents,[20] making these occurrences numerically insignificant. Moreover, upon such rare occurrences, applicants seldom challenge the examiner's request for terminal disclaimers due to their desire to advance prosecution without creating a record of claim distinction between their patents. Hence, it is generally incorrect to state that allowance of a continuation application reflects patenting of the same invention as presented in the claims of a parent application.

The only exception to the above observation may be in continuation applications specifically intended to permit applicants to continue the prosecution of claims submitted in prior applications. These are Continued Prosecution Applications (CPAs)[21], Rule 129 Continuations[22] and Requests for Continued Examination (RCE) applications.[23] Unlike regular continuation application,

[20] Letter from Thaddius J. Carvis, President, N. Va. Patent Lawyers Club, to Jon Dudas, Under Sec'y of Commerce for Intellectual Prop. and Director, USPTO at 3 (May 3, 2006), *available at* http://www.uspto.gov/web/offices/pac/dapp/opla/comments/fpp_continuation/nvplc.pdf.

[21] CPA practice was pursuant to 37 C.F.R. § 1.53(d) (1998-2003) and was not applicable to provisional applications, during reexamination or to any utility or original plant applications filed on or after May 29, 2000 (including reissue). Changes to Application Examination and Provisional Application Practice, 65 Fed. Reg. 14865, 14866 (Mar. 20, 2000) (amending § 1.53(d)(1)(i) to provide that CPA practice under § 1.53(d) did not apply to applications (other than design) if the prior application has a filing date on or after May 29, 2000) (codified at 37 C.F.R. pt. 1).*See also* 37 C.F.R. § 1.53 (2003-2005). After establishing the RCE practice, effective July 14, 2003, the USPTO eliminated the use of CPAs except for design patents. Elimination of Continued Prosecution Application Practice as to Utility and Plant Patent Applications, 68 Fed. Reg. 32376 (May 30, 2003) (codified at 37 C.F.R. pt. 1).

[22] Continuation applications pursuant to 37 C.F.R. § 1.129(a) (1995-2007) have been applicable only to original utility or original plant applications filed before or on June 8, 1995, and which have been pending for at least two years as of June 8, 1995. 37 C.F.R. § 1.129 (1995-2007). Changes to Implement 20-Year Patent Term and Provisional Applications, 60 Fed. Reg. 20195 (Apr. 25, 1995). Although, as Appendix A shows, there is still a trickle of Rule 129 applications, these date limits virtually made Rule 129 practice date-wise mutually exclusive with RCE practice. *See infra* note 23.

[23] RCE under 35 U.S.C. § 132(b), pursuant to 37 C.F.R. § 1.114 (2000-2007) is in fact continued examination of the same application that enables an applicant to purchase additional examination cycles for new claim amendments after the examiner issues a final rejection. 35 U.S.C. § 132(b) (2000); 37 C.F.R. § 1.114 (2000-2007). As of August 16, 2000, RCEs must be filed after the prosecution of an application is closed but is not applicable to provisional applications, design applications, applications filed before June 8, 1995,

these types of specialized continuations do not receive a new application number or a new application date upon their filing. Thus, in computing grant rates, it would be appropriate to exclude CPAs, Rule 129 and RCE applications from the tallies of applications for patent grants, as they nominally reflect a resumption of an incomplete prosecution of pending claims. However, it is wrong to generalize and say that *every* continuation is merely a "recycling" of a prior application.

The OECD authors cannot be "credited" with being first to miscount patent applications and apply the "application recycling" theory in making patent grant rate estimates. There is 'prior art' to such incorrect treatment of non-original patent applications. A few years before the publication of the OECD studies, Cecil Quillen and Ogden Webster published in 2001 a study using the "application recycling" theory as part of a series of studies on USPTO grant rates.[24] These earlier studies found USPTO grant rates as high as 97%, not surprising for a method formulated to technically produce grant rates exceeding 100%. To their credit, Quillen and Webster have subsequently acknowledged their incorrect methods and have applied "correction" factors in an attempt to rectify the error.[25] However, their correction method did not address the underlying erroneous premise, and inaccuracies remain in their newer analysis, still producing an exaggerated USPTO grant rate of about 85%. The deficiencies of the Quillen et al. papers and the misuse

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or during reexamination. 37 C.F.R. § 1.114 (2000-2007). *See also* Request for Continued Examination Practice and Changes to Provisional Application Practice, 65 Fed Reg. 50092 (Aug. 16, 2000) (codified at 37 C.F.R. pt. 1).

[24] Cecil D. Quillen, Jr. & Ogden H. Webster, *Continuing Patent Applications and Performance of the U.S. Patent and Trademark Office*, 11 Fed. Cir. B.J. 1, 10 (2001) (finding that USPTO allowance rate for fiscal years 1993–1996 was as high as 95%) [hereinafter Quillen & Webster, *Continuing Patent Applications*]. *See also* Cecil D. Quillen et al., *Continuing Patent Applications and Performance of the U.S. Patent and Trademark Office—Extended*, 12 Fed. Cir. B.J. 35, 38, 50 (2002) (extending the data to fiscal year 2000 and applying "corrections" and finding USPTO grant rates in the order of 85%) [hereinafter Quillen et al., *Extended*]; Cecil D. Quillen, Jr. & Ogden H. Webster, *Continuing Patent Applications and the U.S. Patent and Trademark Office—Updated*, 15 Fed. Cir. B.J. 635, 635–36 (2006) (the most recent study updating to FY 2005) [hereinafter Quillen & Webster, *Updated*]; Cecil D. Quillen, Jr., Senior Advisor at Cornerstone Research, Abolish Continuing Patent Applications?, Address at the Patent Quality Conference of the Intellectual Property Owners Association 8–9 (Apr. 19, 2004) *available at* http://www.ipo.org/AM/Template.cfm?Section=IPO_Patent_Quality_Conference&Template=/CM/ContentDisplay.cfm&ContentID=8725.pdf (extending the updated information to FY 2002).

[25] Quillen & Webster, *Updated*, *supra* note 24, at 642–43, 660–61 (providing an additional calculation and corrections deriving an alternate patent allowance rate estimate in the 85% range in the 2002 study, and between 80–87% in the 2006 study).

of their biased results by others are beyond the scope of this paper as they have been addressed extensively elsewhere.[26] In this regard, it is disturbing that years after a correction had been made to the Quillen & Webster 2001 paper (by Quillen et al.'s own 2002 publication and by Clarke's 2003 paper), the OECD authors relied on, and cited only the 2001 Quillen and Webster paper. They maintained a citation of Quillen's "application recycling" theory as a background to their work,[27] thereby repeating the application miscounting error.

Unfortunately, the "application recycling" theory has not vanished from patent quality discourse and it continues to be held by some who comment on USPTO grant rates. In a recent paper on USPTO grant rate calculations, Bruce Kaser[28] resurrects the "application recycling" theory and argues that the USPTO grants patents at a rate much higher than its publications indicate. While his criticism of the distortions in the USPTO method of using the output allowance disposition rate as if it were a grant rate is well placed, his own alternative treatment of the grant rate is actually more distorted.

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[26] In response to the first Quillen and Webster paper (published in 2001), Robert Clarke of the USPTO published a paper pointing out that their analysis was incorrect. Robert A. Clarke, *U.S. Continuity Law and its Impact on the Comparative Patenting Rates of the US, Japan and the European Patent Office*, 85 J. Pat. & Trademark Off. Soc'y 335 (2003). Clarke provided data and analysis indicating a grant rate of about 74%, in substantial agreement with the results obtained here in Section III. *Id*. at 340. Unfortunately, even well after Quillen & Webster's "correction" in their second paper (2002), it was their older 95% USPTO allowance rate that was mostly cited as the grant rate of the USPTO. Critics published accounts of how Quillen and Webster's 2001 information was misused for years, including detailed analyses of the methods used by Quillen and Webster, as well as by Clarke: *See* Lawrence B. Ebert, *How High are the Grant Rates at the USPTO?*, 86 J. Pat. & Trademark Off. Soc'y 568, 568-69 (2004); Lawrence B. Ebert, *Patent Grant Rates at the United States Patent and Trademark Office*, 4 Chi.-Kent J. Intell. Prop. 108 (2004); Lawrence B. Ebert, Comment, *Patent Grant Rates at the United States Patent and Trademark Office*, 4 Chi.-Kent J. Intell. Prop. 186 (2005) (discussing in detail the errors in Quillen and Webster's papers). *But see* Quillen et al., *Extended*, *supra* note 24 (including their rebuttal, update and most recent account of the USPTO grant rate estimate controversy).

[27] *See* OECD (2004) study, *supra* note 5, at 144 (quoting Quillen's 2002 FTC/DOJ testimony) which stated:

> A unique feature of the U.S. patent system is the ability to file continuing applications which claim filing dates of earlier applications and *start the examination process all over again*. There is no limit on the number of such "refilings" and the only way the Patent Office can rid itself of a determined applicant is *to allow* his or her patent application. (emphasis added).

Id.

[28] Bruce A. Kaser, *Patent Application Recycling: How Continuations Impact Patent Quality & What the USPTO is Doing About It*, 88 J. Pat. & Trademark Off. Soc'y 426 (2006).

His broad-brushed characterization of *all* non-original applications including CIPs and divisions as "recycled" applications treats them all as RCEs.[29] In Kaser's view, divisional, CIP, and RCE filings add up to "recycled patent applications"[30] which he identifies with one original application, ignoring the possibility that they are directed to different inventions. Like his predecessor "application recycling" theorists, Kaser ignores the invention-based distinction between RCEs, which continues prosecution of claims presented before, and other non-original applications with new claims. The remarkable aspect of Kaser's assertions is that he is mindful of the claim content distinction between RCE applications and that of CIP and divisional applications. Nevertheless, he dismisses the fact that the latter applications must claim distinct subject matter as "hair-splitting," largely irrelevant to grant rate analysis.[31] By Kaser's distorted logic, one would also view as "hair-splitting" any distinction between *any* set of patent applications filed by a common inventor for different inventions that do not claim the same priority. Kaser's logic would similarly have to count all these applications as one attempt at patenting by this applicant. A clear indication that the "application recycling" theory is flawed in obtaining the fraction of applications that receive a grant, is its inherent capacity to produce grant rates that exceed 100%. Indeed, as pertaining to the case shown in Table 1, using Kaser's method of miscounting applications results in one application – the priority parent application, for the grant rate denominator. According to Kaser's method, the numerator in this case would be six, the number of issued U.S. patents, resulting in an absurd grant rate result of 600%.

Given the aforementioned studies' errors of over-estimating USPTO grant rates by miscounting applications, caution should be exercised in relying on their findings. Further caution should also be exercised by ensuring proper accounting for patent claim obsolescence and the temporal examination and grant factors discussed in the following section.

C. Patent Claims Obsolescence and the Differing Processing Times in National Patent Offices

National patent offices have differing time spans for examination and prosecution of claims submitted in patent applications. Examination in the USPTO is automatic and every non-provisional application enters the ex-

[29] *Id.* at 429 ("[A]pplicants elect to not exit the USPTO and file requests for "continuing examination" ("RCE") or *related versions* of continuations") (emphasis added). *See also id.* at n.12 (identifying continuations "in part" ("CIPs") and divisional applications as patenting attempts indistinguishable from that of the priority application).

[30] *Id.* at 432 (discussing the 120,000 "recycled applications" of FY 2005).

[31] *Id.* at 429 n.12.

amination queue. Applicants having U.S. application priority may delay the application for the same invention in foreign countries while preserving their priority date. Many elect to use the full permissible delay period of 2.5 years from their U.S. priority application date prior to filing in the EPO or JPO.[32] Thereafter, unlike the procedure in the USPTO, a specific request for claim examination must be made. Such a request may be filed no later than 2 years (or 31 months via the PCT) in the EPO[33] and up to 7 years in the JPO[34] from the original filing date in order to prevent abandonment. In the sample reported by the Jensen et al. study, the median times to request examination in the EPO and the JPO were 2.5 years and 5.75 years respectively.[35]

Unlike U.S. patent applications of which 100% are examined, not all patent applications in foreign patent offices are followed-up by requests for examination; thus a fraction of such applications do not even reach the examination stage, where a decision on the merits of their claims can be rendered. The fractions that reach the examination stage in the trilateral offices are shown in Figure 1. As explained below, claim obsolescence results in a greater fraction of application abandonment in patent offices that permit longer delays for examination requests. As shown above, 85%–90% of applications filed at the EPO enter examination after a median of 2.5 years and only 50%–60% enter examination at the JPO after a median of 5.75 years from the application date. So at the outset, without even considering patentability standards or examination rigor, there is an unequal attrition of applications from the

[32] *See* World Intellectual Prop. Org., Time Limits for Entering National/Regional Phase Under PCT Chapters I and II (2006), *available at* http://www.wipo.int/pct/en/texts/pdf/time_limits.pdf. Under Chapter I-Article 22 or Chapter II-Article 39(1) of the Patent Cooperation Treaty (PCT), applicants using the PCT path can enter into the national application phase in the JPO and the EPO after a delay of 30 months or 31 months respectively from their U.S. priority date.

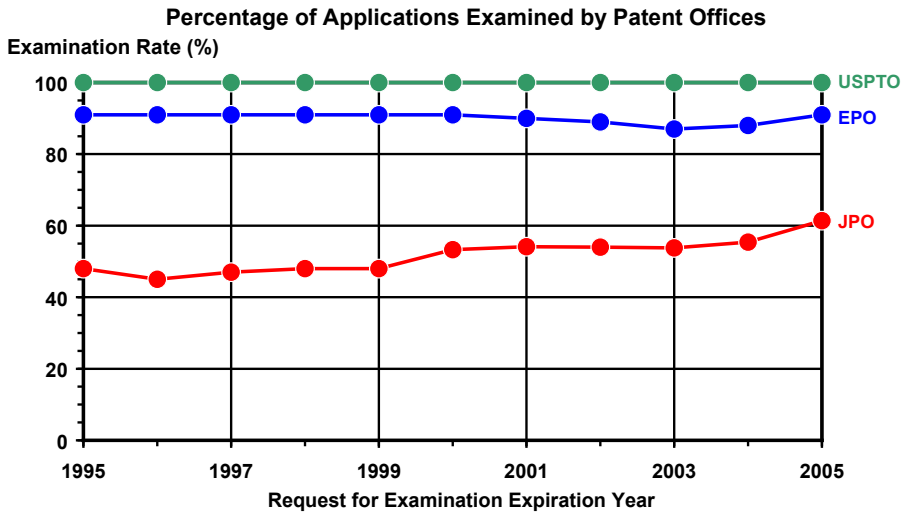
[33] Article 94(3) European Patent Convention provides that an application is deemed withdrawn if examination request is not filed within 6 months of the publication of the search report in the EP Bulletin. Convention on the Grant of European Patents art. 94(3), Oct. 5, 1973, 1065 U.N.T.S. 199. The search report is made public by the EPO typically with the publication of the application which takes place eighteen months after the priority date of the patent application.

[34] Tokkyohô [Japanese Patent Act], Law No. 121 of 1959, art. 48-3, translated in World Intellectual Prop. Org. Database of Intellectual Prop. Legislative Texts—Japan, Patent Law 11–12 (1994), *available at* http.wipo.int/clea/docs_new/pdf/en/jp/jp006en.pdf. Article 48-3 of the Japanese Patent Act was amended as of October 1, 2001, shortening the deadline for requests for examination from 7 years to 3 years after the filing date. Sonoda & Koyayashi Intellectual Prop. Law Firm, Major Amendments to the Japanese Patent Law Since 1985 1–2 (Aug. 12, 2002), *available at* http://www.patents.jp/Archive/20030210-02.pdf.

[35] Jensen et al., *supra* note 2, at 692 n.43.

pool of possible grants among the patent offices. This unequal attrition does not end at the examination phase entry.

Figure 1. Patent examination rate by reporting year. Examination rate is the proportion of those applications, for which the period to file a request for examination expired in the reporting year, that resulted in a request for examination up to and including the reporting year.



Source: Trilateral Patent Offices, note 36.

Subsequent to a request for examination, an added delay is introduced due to examination pendency prior to grant or disposition. Compared to the average pendency delays in the USPTO, examination pendency delays in other patent offices were sometimes incrementally longer by as much as 2 years in the EPO and up to 5 months longer in the JPO.[36] Therefore, the cumulative delays in filing applications, requesting examination and examination pendency resulted in these foreign offices engaging in prosecution exchange with the patentee some 5 to 8 years later than the USPTO. Without being indicative of any difference in the quality of examination or patentability standards, this relative delay factor significantly contributes to differences in observed grant probabilities. Unfortunately it has thus far received no consideration in prior works on patent grant rate comparisons.[37]

[36] Trilateral Patent Offices, Trilateral Statistical Report 2005 Edition (2006), *available at* http://www.trilateral.net/tsr. The pendency details are available only in the "Statistics on the Procedures" table in the web annex at http://www.trilateral.net/tsr/tsr_2005/web_annex/web_annex.xls ("Procedures" sheet).

[37] *But see* Clarke, *supra* note 26, at 336–39 (noting the incorrect foreign pendency delay values assumed by Quillen & Webster for correlating the number of applications with the

A review of patent renewal studies shows that patents gradually become obsolete, and only a fraction of all patents are renewed by their owners to their full statutory term.[38] In recent years only 83% of U.S. patents are renewed 4 years after grant, 65% are renewed after 8 years of life and only 45% after 12 years of life.[39] Consider a set of identical patent applications submitted in all three offices and granted by the USPTO. By the time their prosecution commences later at the EPO and later still at the JPO, a growing fraction of these patent claims become obsolete and worthless to their owners. Some applications never advance to examination, as Figure 1 shows. For those that do, the examination process involved an exchange between a patent office and an applicant. After further delays, applicants have control over the grant rate during these exchanges by simply not pursuing claim allowance for patents that they deem obsolete. In other words, it is known from U.S. patent renewal data cited above, that approximately 17% of U.S. patents are not renewed at the 4-year renewal window. So why would applicants of these 17% of U.S. patents that forfeit their obsolete U.S. patent at the 4-year mark pursue allowance of counterpart claims abroad?[40] Given the EPO and JPO progressive delays in granting decisions after the USPTO, even if examination rigor and patentability standards were identical in all offices, patent obsolescence alone would cause a fraction of the U.S. priority based patents to be abandoned and to receive no EPO grant. For the same reason, but later in time, even a larger fraction will be obsolete and receive no grant in the JPO. This trend is indeed what the Jensen et al. and the OECD studies found but erroneously attributed the skew to "disharmony" or other speculations.

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number of issued patents after such delay). Unlike the point raised by Clarke directed at temporally matching the correct applications to their respective patents that issue after a longer delay, the issue here is rather the fundamental difference in the time frame after the invention is conceived that applicants are required to make an abandonment decisions.

[38] Ron D. Katznelson, *Patent Continuations, Product Lifecycle Contraction and the Patent Scope Erosion* 24-25. Presented at the Intellectual Property Spring Seminar, Laguna Niguel, CA (Southern California Law Associations, June 8–10, 2007), *available at* http://ssrn.com/abstract=1001508 (discussing in Section 4.2.1, trends of patent claim obsolescence and patent renewal statistics).

[39] U.S. Patent and Trademark Office, Performance and Accountability Report for Fiscal Year 2005 63, *available at* http://www.uspto.gov/web/offices/com/annual/2005/2005annualreport.pdf.

[40] For example, both the Jensen and the OECD studies do not exclude from their tally any U.S. patents that lapsed due to non-renewal prior to the date of their foreign withdrawal. *See generally* Jensen et al., *supra* note 2; OECD (2004) study; *supra* note 5. Lists of such expired U.S. patents may be obtained in the notice section of the USPTO Official Gazette at http://www.uspto.gov/web/offices/com/sol/og/index.html.

It becomes clear that any unbiased and reliable comparative study of grant rates across national patent offices must also contain proper account of patent longevity factors. Initially, when attempting to compare patent examination procedures and rigor, one should exclude the attrition of patent applications that do not reach the examination phase and thereby avoid treating them as if they had contained claims that have been rejected on the merits. A more meaningful grant rate comparison would be based only on applications that actually entered the examination phase.

Given the fundamental analytical flaws in the use of conditional probabilities, miscounting applications and the lack of proper accounting for longevity factors as detailed above, the findings of Jensen et al. and the OECD studies *must be rejected.* The OECD studies have been known for a longer time, and thus have been a source of misinformation cited[41] as having supplied evidence that the patenting requirements are lower in the United States than in Europe. The Jensen et al. study also appears to be a source of such patenting rigor misinformation.[42] The credibility of statements made by those who relied on the OECD and the Jensen et al. studies should therefore be questioned. In contrast, a correct method for estimating grant rates is presented below.

II. Measurement of USPTO Patent Grant Rates

This section presents a straightforward and direct method of estimating the patent grant rate in the USPTO based on the number of patent applications filed in a given year and the number of patents issued at any time *from such applications*. The number of patent applications filed each year can be obtained from the USPTO web site.[43] However, in its patent application count, the USPTO lumps together the numbers for original applications, continuation

[41] *See* Nat'l Research Council of the Nat'l Academies, *supra* note 1, at 54; Jensen et al., *supra* note 2, at 686; Quillen, *supra* note 24, at 11–12; Quillen & Webster, *Updated*, *supra* note 24, at 645, 648 (citing the OECD (2004) study, *supra* note 5). *See also* Jaffe & Lerner, *supra* note 1, at 143, (while no specific reference to the OECD papers was made, the OECD studies' priority applications were mentioned and defined as "important inventions," and Jaffe and Lerner then adopt the OECD erroneous assumption that U.S. patents only issue from priority applications, thereby characterizing the OECD data finding an increased grant rate as indicative of reduced patent quality at the USPTO).

[42] *See supra* note 4; Quillen & Webster, *Updated*, *supra* note 24, at 654 (citing the Jensen et al. findings, *supra* note 2 and thus wrongly inferring that "[t]hese findings suggest that examination rigor at the EPO is higher than at the USPTO, and that examination rigor at the JPO is higher than at either the USPTO or the EPO").

[43] *See* U.S. Patent and Trademark Office, U.S. Patent Activity Calendar Years 1790 to the Present, http://www.uspto.gov/web/offices/ac/ido/oeip/taf/h_counts.pdf (other information can be found at the USPTO Statistical Information page at http://www.uspto.gov/web/offices/ac/ido/oeip/taf/index.html).

applications, Continuation-In-Part (CIP) applications and Divisional applications. The numbers for continuations include all types of continuations and thus CPAs, Rule 129 and RCE applications should be subtracted from the total number of applications in order to avoid double counting as new applications the prosecution resumption of claims filed in prior applications. Data in which application types are separately broken down was obtained from the USPTO response[44] to a Freedom of Information Act (FOIA) request filed with the USPTO. In addition, data from a recent slide presentation by the USPTO that provided annual continuation applications count,[45] was used to the extent it corrected prior errors in the FOIA data. For the purposes of estimating grant rate, the number of applications for distinct inventions was obtained by subtracting the number of CPAs, Rule 129 and RCE applications from the total number of utility patent application count available from the USPTO annual reports. The aggregate number of hits in response to specific composite queries[46] to the USPTO database available on its web site was used for determining the number of such applications that were granted.[47] The ratio of the resultant granted number and the number of applications filed with the USPTO each corresponding fiscal year[48] is defined herein as the grant rate[49]

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[44] Letter from Robert Fawcett, Program Manager, USPTO, to Cecil Quillen (Dec. 22, 2005) (on file with Federal Circuit Bar Journal) (regarding USPTO-FOIA Request No. 06-062).

[45] U.S. Patent & Trademark Office, Proposed Rule Changes to Focus the Patent Process Involving Continuations, Double Patenting and Claims, slide 9 (Mar. 29, 2006), *available at* http://www.uspto.gov/web/offices/pac/dapp/opla/presentation/connipla032906.ppt.

[46] For example, the number of granted utility patents from applications filed in FY 1995 were obtained by the number of hits found by the search string "APT/1 AND APD/oct-1-1994->sep-30-1995" inserted in the Advanced Search box at the USPTO site: http://patft.uspto.gov/netahtml/PTO/search-adv.htm. The search was repeated for each fiscal year.

[47] Approximately 10,000 patents are missing from the USPTO web based database for the period under study here. Given that approximately 2.9 million patents issued from applications filed in this period, the omission of these patents produced a negligible error in the grant rate estimates. USPTO Full-Text Database Contents missing patents, http://www.uspto.gov/patft/help/umiss.txt.

[48] The USPTO fiscal year ends on September 30. *See generally* 31 U.S.C. § 1102 (2000).

[49] *But see* Trilateral Patent Offices, *supra* note 36, at 58; U.S. Dep't of Commerce, Office of the Inspector General, USPTO Should Reassess how Examiner Goals, Performance Appraisal Plans, and the Award System Stimulate and Reward Examiner Production 15 n.17 (2004), *available at* http://www.oig.doc.gov/oig/reports/2004/USPTO-IPE-15722-09-04.pdf. These reports define the grant rate as the number of applications that were granted during the reporting period, divided by the number of disposals in the reporting period (applications granted plus those abandoned). A similar indicator used here and in the literature is the output allowance rate defined as the number of applications

and is plotted in Figure 2 and tabulated in Appendix A. Also shown in the figure, is the USPTO output allowance disposal rate, which is equal to the ratio between the number of allowed patent applications in a fiscal year to the number of patent application disposals (allowances plus abandonments) in that fiscal year. For this purpose, the numbers for the allowed utility applications and the disposals of such applications were obtained from the annual reports of the USPTO, wherein the total number of disposals is the sum of allowances and abandonments.

The grant rate results obtained here are in substantial agreement with Clarke's results[50] and in substantial disagreement with both the OECD results mentioned above and with the highly quoted results of Quillen and Webster.[51] Unlike the direct methods applied here to obtain the data of Figure 2, Quillen & Webster used an indirect approximate measure based on an assumed two-year prosecution time lag, and by their "correction," did not distinguish between original applications and the related continuations for their estimates. In contrast, the results in Figure 2 are based on each and every granted patent's actual front-page parameters, indicating it being granted *at any time* from a *unique* application filed in the specified fiscal year.

The grant rate data for later years (not shown) is not fully reflective of the actual grant rate because it is "censored" and disproportionately attenuated due to a progressively larger portion of applications that are still pending final office action. However, it is safe to conclude that in a span of 17 years ending in 1998, the grant rate increased from about 60% to 76%. There is some evidence that this increase in grant rate is *not* an indication of the relaxation of USPTO examination rigor or of its patentability standards, but rather an indication of the *reduced scope* of allowed claims[52] and of the increased number of claims per application. Under fixed patentability standards, claims having reduced scope receive higher grant rates and applications with increased number of claims are more likely to be granted, as explained below.

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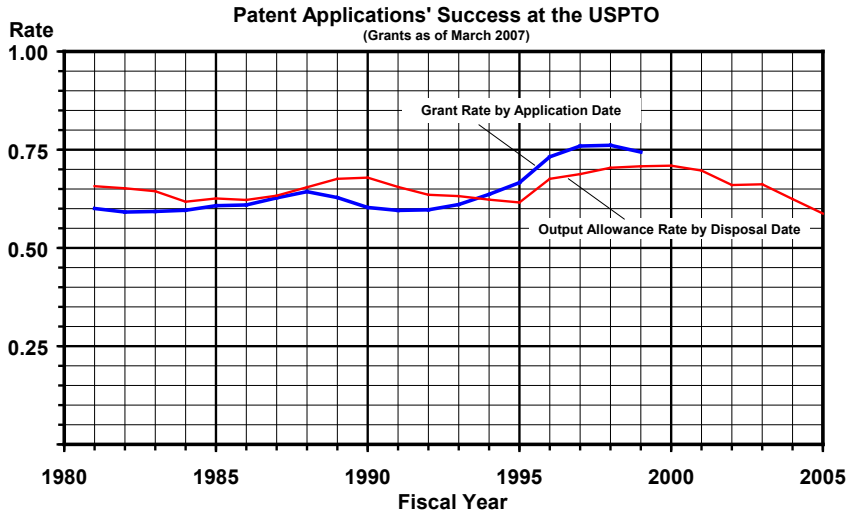
that were allowed during the reporting period, divided by the number of disposals in the reporting period (applications allowed plus those abandoned). The output allowance rate or the Trilateral Offices' grant rate may be biased in periods of increasing or decreasing applications because pendencies to grants and pendencies to rejections or abandonments can differ substantially. *See infra* note 53 and accompanying text. Furthermore, not all "allowances" result in a patent grant.

[50] Clarke, *supra* note 26, at 340, 343.

[51] *But cf.* Quillen & Webster, *Continuing Patent Applications*, *supra* note 24, at 21 tbl.7 (suggesting the grant rates were 97%); Quillen et al., *Extended*, *supra* note 24, at 38 (suggesting a grant rate of 85%); Quillen & Webster, *Updated*, *supra* note 24, at 661 (suggesting a grant rate of 87%).

[52] Katznelson, *supra* note 38 (discussing the patent scope erosion in Section 4.3).

Figure 2. The USPTO patent grant rate by application filing year and output application allowance rate by disposal year. Note that the grant rate for application years from 2000 to 2005 are not shown because the results for these years are censored due to a progressively larger portion of applications that are still pending final action. The output allowance rate by disposal year at the USPTO is generally not a reliable indication of actual grant rate (see text).



Source: USPTO data and FOIA data (see text).

Although in 1999, Figure 2 indicates a slight reversal of the trend for grant rate increases, it may be premature to conclude that the actual grant rate past the year 2000 had reversed trends and declined significantly as the output allowance rate indicates. The reason is that unlike the grant rate measure, which is based on a specific application base regardless of when they were allowed, the USPTO output allowance rate is a measure based on somewhat different populations of applications that are being disposed of in a given year. This is because pendencies of allowed applications are longer than that of abandonments by an average of several months.[53] In a temporally growing

[53] Deitmar Harhoff & Stefan Wagner, Munich School of Management, Working Paper Presentation on Modeling the Duration of Patent Examination at the European Patent Office 10 (Nov. 25, 2003), *available at* http://www.merit.unimass.nl/epip/papers/Harhoff_Wagner_Pres.pdf (showing that EPO granted patent applications have median pendencies that are about 30% longer (one year longer) than pendencies of withdrawn (abandoned) applications); data on pendency differentials at the USPTO are only available for the years 1994-95, when pendency was about two-thirds of what it is today: *See* U.S. Gen. Accounting Office, Intellectual Property: Comparison of Patent Examination Statistics for Fiscal Years 1994 and 1995 3 (1997), *available at* http://www.gao.gov/archive/1997/rc97058.pdf, (showing that issued patents had pendencies of 21.3 and 21.0 months for 1994 and

rate of application filings, the number of allowed applications disposed of in a given year is unfortunately compared to the number of abandoned applications emanating from a later and larger pool of applications. Therefore, for a fixed fraction of abandoned applications, a larger number of abandonments will be used in the allowance rate denominator, thereby biasing the computed allowance rate downwards. This downward allowance rate bias is progressively more significant numerically with increasing application pendency, which is precisely what the USPTO is going through in the last few years. Additional downward bias in the output allowance rate compared to the grant rate is due to the USPTO inclusion of unknown number of CPAs, Rule 129 and RCE applications in the number of dispositions. Therefore, the extent to which actual grant rate declined after 2000 is yet to be ascertained in the coming years.

III. Patent Grant Rate Comparisons Among National Patent Offices Are of Little Probative Value

Even with correct estimation methods, attempts to compare patent grant rates among national patent offices are inevitably of little probative value for characterizing any differences in examination rigor or patentability standards among such offices. This is because the meaning and facts underlying a patent grant differ substantially among national patent offices. There is no such thing as "normative" grant rate or "low enough" grant rate associated with proper examination rigor. Many factors affect the likelihood that a patent application will mature into a patent grant and these factors can vary greatly among nations. One of the factors in applicants' decision to complete prosecuting their patent applications is the cost incurred in the various phases of patenting. Large differences in additional expenses for examination, translations or maintenance annuities often cause patentees to abandon their applications in midstream in one national venue but not in another. For example, the total average cost per claim of European patents that designate 13 EPO member countries, is 5 to 10 times more expensive than that of U.S. patents.[54] Other important differences in the meaning of a patent grant are the differing types and average number of claims presented in patent applications and the differences in their scope. Therefore, a mere grant of a patent is an arbitrary and meaningless measurement unit of the granted rights. Rather, it is the specific *claims* and their scope that define the grant. The likelihood of a pat-

1995 respectively, whereas abandoned applications had pendencies of only 18.3 and 17.9 months respectively for the same years).

[54] Bruno van Pottelsberghe de la Potterie & Didier Francois, *The Cost Factor in Patent Systems* 4 (Univ. Libre de Bruxelles, Solvay Bus. Sch., Ctr. Emile Bernheim, Working paper No. WP-CEB 06-002, 2006).

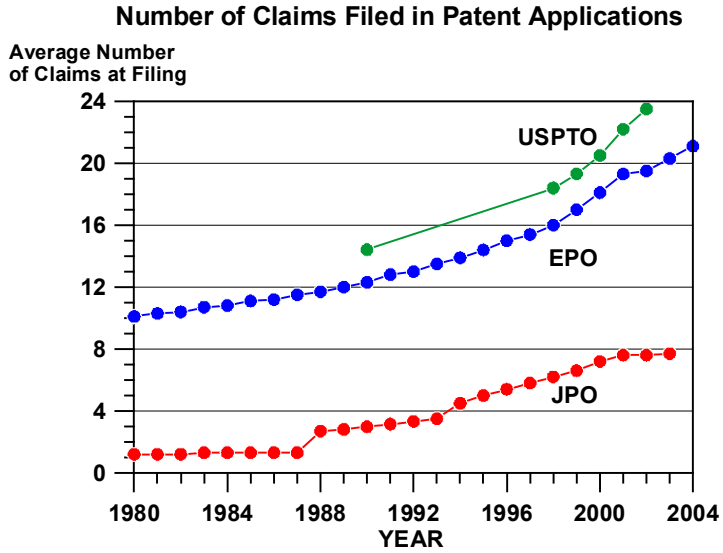
ent grant with at least one claim greatly depends on the number of claims submitted in an application for examination. The average number of claims in applications filed at the USPTO, EPO and the JPO differ substantially as shown in Figure 3. For example, it was not until 1988 that the JPO allowed applicants to obtain patents with more than one claim.[55] As seen in the figure, historically, the USPTO has had the highest average number of claims filed in patent applications.

It should be noted that under identical examination rigor and standards for claim allowance at national patent offices, the differing average number of claims in patent applications would result in different patent grant rates. To see this in a simple example, consider an invention covered by two independent claims, each of which has an identical but statistically independent probability of 50% of being rejected by each patent office. The inventor files the claims in two distinct patent applications in the JPO, each having a single claim, and files the same two claims in one patent application at the USPTO.

Clearly, each claim has a 50% chance of surviving in either patent office, and a patent will be issued in any application for which at least one claim is allowed. Because each patent application at the JPO contains one claim, each JPO patent application has a 50% chance of being granted, resulting in an average patent grant rate of 50%. For the single USPTO application with two claims, there are four equally likely possible outcomes: (i) both Claim 1 and Claim 2 allowed; (ii) Claim 1 allowed and Claim 2 rejected; (iii) Claim 2 allowed and Claim 1 rejected; and (iv) both Claim 1 and Claim 2 rejected. In all but the last outcome, the USPTO would grant a patent with at least one claim. Therefore, the USPTO patent grant rate would be 75% as opposed to the 50% grant rate of the JPO. This example shows that claims submitted to different national patent offices with examination practices having *identical* claim allowance probability will result in a higher patent grant rate at the national patent office that receives more claims per patent application. The more claims submitted in an application, the higher the likelihood that at least one claim would be allowed, leading to a patent grant.

[55] Effective January 1, 1988, Article 36, Paragraph 5, and Article 37 of the Japanese Patent Act provided that multiple claims may be present in a single patent application subject to the unity of invention requirement. Prior to this change, multiple claims were allowed in rare exceptions that appeared mostly in chemical and pharmaceutical patents. *See* Tokkyohô [Japanese Patent Act], Law No. 121 of 1959, art. 36, no. 5, art. 37. *See also* Sonoda & Koyayashi, *supra* note 34, at 1–2.

Figure 3. The average number of claims filed in patent applications by filing year at the USPTO, EPO and JPO.



Sources: USPTO data for 1998-2002 was taken from its IG report[56] and the 1990 data is at slide 13 of the USPTO presentation, note 45. All EPO data and the JPO data for 1995-2003 were reported in an EPO report.[57] Data for additional years in the JPO were obtained from the Tokyo Institute of Intellectual Property.[58]

The events of each claim's allowance in the example above are assumed statistically independent and thus the *effective* number of *statistically* independent claims is equal to the number of patently independent claims. In general, the allowance of claims in an application may constitute statistically correlated outcomes, wherein the prior art of record may impact in similar ways the allowance or rejection of several independent claims as a group. Therefore the *effective* number of *statistically* independent claims may be less than the number of patently independent claims over a large subset of patent applications. There is evidence, however, that the above example of

[56] U.S. Dep't of Commerce, *supra* note 49, at 17 fig.12.

[57] President of the European Patent Office, The Increased Voluminosity of Patent Applications Received by the EPO and its Impact on the European Patent System 2–3 (2005), *available at* http://ac.european-patent-office.org/strategy_debate/documentation/pdf/ec05073.pdf.

[58] Akira Goto & Kazuyuki Motohashi, *Construction of Japanese Patent Database for Research on Japanese Patenting Activities*, 18–19 (2006), http://www.iip.or.jp/e/patentdb/paper.pdf (Based on these authors' results, the grand average can be estimated by using the technology sector data of Figure 5 weighted by the number of applications for each technology sector shown in Figure 2).

combining claims from several applications filed in one national office into a single application filed in another is not atypical.[59] Another factor affecting the effective number of independent claims is the claim amendment process in prosecution, which changes the meaning and scope of the claims.

In addition to the differences in the total number of claims, national patent offices differ in the number of independent claims they permit applicants to file in a single patent application. For example, the USPTO rules do not limit the number of independent method claims or independent apparatus claims that may be filed in an application. The patent law in the U.S. recognizes that there may be several independent ways of claiming the same invention. In contrast, EPO rules generally permit only one independent claim per category.[60] Consequently, most European patents have no more than one independent method claim and one independent apparatus claim. It is therefore difficult to assess the meaning of an application grant in any patent office without taking into account information on the number of independent claims, their content and scope, and the total number of claims in the respective applications.

Beyond the differing number of claims and the relative mix of independent claims, there are other significant differences in the way inventions are claimed in various national patent offices which further render a comparison of patent grant rates largely irrelevant as a relative indicator. For example, the United States has a continuing patent application system that is unique among the major intellectual property granting nations.[61] Legislators in other nations provided that only divisional applications may be filed subsequent to an original application and those must be directed towards distinct inventions. Such rules foreclose on any opportunity to obtain continuation or CIP claims abroad. In contrast, the U.S. continuation and CIP processes enables applicants to submit additional claims on a previously disclosed invention, claiming the parent application's priority date, any time during the pendency of a parent application. Therefore, the U.S. patent system generally produces

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[59] Hélène Dernis et al., *Using Patent Counts for Cross-Country Comparisons of Technology Output*, Sci. Tech. Indus. Review No. 27, Jan. 2002, at 144 ("Applications citing multiple priority applications are particularly common for Japanese [applicants, who] often cite between five and 30 priority [Japanese] applications for a *single* European or U.S. patent") (emphasis added). This means that claims from several such Japanese applications may be combined and filed in one EPO or USPTO application.

[60] Convention on the Grant of European Patents, Rule 29(2), Oct. 5, 1973, 1065 U.N.T.S. 199 (defining the principle of "one independent claim per category" with only a few admissible exceptions, in which an applicant bears the burden of convincingly demonstrating that any additional independent claims come under one of the exceptions given in the Rule).

[61] *See generally* Katznelson, *supra* note 38 (describing the U.S. continuing patent examination process).

more patents per original priority application than in foreign countries. Statistically, the resulting patents have claims with different scope characteristics than those of their foreign counterparts. There is evidence that due to the U.S. continuation and CIP processes, issued U.S. claims for inventions in a given U.S. priority application are distributed over more patents and extend over a wider grant date range than those issued in foreign countries.[62] In some cases, certain claims that issue later in U.S continuations or CIPs cannot be presented abroad because opportunities to file such follow-up applications are unavailable outside the U.S. The result is that claim portfolios for the same invention disclosures can differ widely within an international family of patent counterparts. In higher likelihood, U.S. patents contain claims that more closely match actual products and innovations in the market. Therefore, the naïve assumption that a priority application in one national patent office defines the claim protection sought or obtained in another is generally incorrect. For the reasons explained above, without inspecting the claims in each case individually, patent scholars and policy makers would be well advised not to use grant rate comparisons across statistical pools of patent applications in different national patent offices as indicators of relative examination performance of such patent offices.

Conclusion

This paper examines two studies that compared the patent grant rate among national patent offices. It exposes their fundamental analysis flaws that resulted in false indications of excessive patent grant rates at the USPTO. It is shown that in these inquiries, the authors set themselves up in a false paradigm that, by definition, can only produce results in which the USPTO's grant rate is higher than that of foreign patent offices. A troubling aspect of the deficient methods in these studies is that their results are widely cited as indicators for national patent office comparative performance. Citation of the results of these studies has created misinformation and a misguided folklore in the

[62] Hélène Dernis & Mosahid Khan, *Triadic Patent Families Methodology* 15 (Org. Econ. Co-operation and Dev. Directorate for Sci., Tech., and Indus. Working Paper Series, Paper No. 2004/2, 2004), *available* in two formats at http://www.olis.oecd.org/olis/2004doc.nsf/linkto/dsti-doc(2004)2 (showing in Figure 5 that for the 1997 priority year, 14% of U.S. patent priorities lead to 2 or more patents while that share is only 5% and 1% for European and Japanese patents respectively. These lower percentages in Europe and Japan are only due to divisional applications). *Cf.* John R. Allison and Mark A. Lemley, *The Growing Complexity of the United States Patent System*, 82 B.U. L. Rev. 77, 98–99 (2002) (finding that the average total number of U.S. applications in a priority chain, including the one that ultimately resulted in a patent, increased from 1.32 in a 1976-8 patent sample to 1.50 in a 1996–8 sample).

intellectual property community that the patent grant rate in the USPTO is the highest among national patent offices. Unfortunately, this lead to a baseless inference that the USPTO's patent grant performance is more lax compared to other patent offices. Although this paper draws no conclusions on USPTO patent examination quality, it derives the correct USPTO patent grant rates, shown to be lower by tens of percents compared to estimates obtained by the studies reviewed in this paper. The distinction between the grant rate and the output allowance rate and possible bias sources are also explained. Finally, it is shown that the scope and average number of claims in patent applications differ substantially among national patent offices. Therefore, even accurate patent grant rate comparisons among national patent offices are of little probative value and should not be used as indicators of examination rigor or patentability standards.

Appendix A: USPTO Historical Utility Patents Data

Source Item	1 A	2 B	2 C	calc. D	1 E	1 F	1 G	1 H	calc. J	3 K	calc. L
Fiscal Year	Total Applications Filed (excluding design patent applications)	Applications Allowed by Allowance Year	Applications Abandoned by Abandonment Year	Output Allowance Rate = B/(B+C)	Continuation Applications Filed	Continued Prosecution Applications (CPAs) Filed	Requests for Continued Examination (RCEs) Filed	Rule 129 Continuations Filed	Total Applications For Distinct Inventions = A-F-G-H	Total Granted Patents by Application Year	Grant Rate = K / J
1980	93,800				6,022					66,855	
1981	107,513	58,187	30,358	0.66	6,764				107,513	64,542	0.60
1982	116,731	54,484	29,099	0.65	9,097				116,731	69,016	0.59
1983	97,448	64,376	35,555	0.64	6,764				97,448	57,773	0.59
1984	109,539	69,987	43,313	0.62	9,509				109,539	65,264	0.60
1985	116,427	75,405	45,083	0.63	11,882				116,427	70,726	0.61
1986	121,611	80,921	49,151	0.62	14,036				121,611	74,130	0.61
1987	126,407	79,755	46,190	0.63	15,466				126,407	79,303	0.63
1988	137,069	87,870	46,351	0.65	16,923				137,069	88,143	0.64
1989	151,331	98,472	47,218	0.68	19,184				151,331	95,074	0.63
1990	163,561	96,672	45,750	0.68	19,962				163,571	98,615	0.60
1991	167,715	102,014	53,703	0.66	22,346				167,715	99,893	0.60
1992	172,539	103,093	59,199	0.64	26,086				172,539	102,983	0.60
1993	174,553	104,351	60,763	0.63	28,067				174,553	106,561	0.61
1994	186,123	107,221	64,932	0.62	31,750				186,123	118,468	0.64
1995	221,304	106,566	66,460	0.62	37,563			1,612	219,692	146,362	0.67
1996	191,016	121,694	58,358	0.68	23,735			5,016	186,100	136,204	0.73
1997	220,773	135,240	61,367	0.69	28,673			3,737	217,036	164,796	0.76
1998	240,090	143,045	60,102	0.70	14,016	17,461		2,356	220,273	167,664	0.76
1999	261,013	155,380	64,062	0.71	13,239	25,258		949	234,834	174,709	0.74
2000	293,244	166,200	68,056	0.71	17,613	30,888	1,033	444	260,879	186,511	0.71
2001	326,081	166,868	72,566	0.70	21,436	22,406	12,438	206	291,031	191,692	0.66
2002	333,688	171,814	88,417	0.66	25,601	8,978	25,677	118	298,915	180,433	0.60
2003	333,452	188,283	96,176	0.66	26,135	2,333	39,562	87	291,470	145,374	0.50
2004	355,527	179,349	107,824	0.62	27,989		45,945	40	309,542	89,114	0.29
2005	384,228	164,093	115,232	0.59	30,754		54,332	8	326,615	33,506	0.10

Sources:

1. Response to FOIA Request, note 43.
2. USPTO Annual Reports, note 39.
3. USPTO website patent database as of March 12, 2007. See details in note 46.