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Luck/Unluck of the Draw: An Empirical Study of Examiner Allowance Rates

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ABSTRACT

The United States Patent and Trademark Office is tasked with reading and reviewing patent applications to determine those applications which qualify for patent protection. Each application is reviewed by a specific patent examiner who should apply the standards of patentability in an even, fair, unbiased and consistent manner. This task requires the examiner not only to be internally consistent with the applications she reviews, but consistent with the behavior of other examiners within the same art unit. I find this may not be the case. I find two distinct populations of examiners that may be harming the patent system. The first population may be acting as a "rubber stamp" by allowing patents with little to no review and/or amendments to the claims. In contrast, the second population may be rejecting too many "good" applications that meet the patentability standards. In this article, I argue that the incentive system may play a role in creating these two distinct populations of examiners. Additionally, I propose a holistic pre-grant prosecution history review of both low and high allowance rate examiners to ensure a more consistent application of patentability rules.

INTRODUCTION

> *The Oxford English Dictionary's first definition of "prosecute" is: "To follow up, pursue; to persevere or persist in; follow out, go on with (some action, undertaking, or purpose) with a view to completing or attaining it."…Patent lawyers sometimes confuse this term with "persecute," which is not surprising, given the great deal of discretion placed in the hands of the individual examiner.*[1]

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[1] ROBERT P. MERGES & JOHN FITZGERALD DUFFY, PATENT LAW AND POLICY: CASES AND MATERIALS 50, n.2 (5th ed. 2011).

¶1 Anecdotal evidence has shown that some patent examiners exhibit a counterproductive "Examiner versus Applicant" mentality. Some stories have described instances where patent examiners are proud of a low allowance rate. In fact, this study has resulted, in part, from the author's visit to the Patent and Trademark Office (PTO), and observing a sign extoling the examiner's pride in a "0% allowance rate." As one examiner commented, "To these examiners, allowances are an affront to their personal being."[2] As one can imagine, if a large population of examiners behave in such a manner, our patent system would be failing on several levels.

¶2 In this study, I attempted to determine the extent to which this behavior exists. This is the first study to look at individual examiners–not their characteristics, but their identities–to determine if factors that others consider "random" are actually primary drivers of patent grants. This study is one of the largest of its kind, analyzing over 1.5 million patents, in an attempt to capture every patent issued by the USPTO over the last ten years. Specifically, I analyze every patent issued in the past decade arranged by art unit (e.g., biotech or computer), examiner type (primary or secondary) and duration of prosecution (application date to issue date). I find that the "luck of the draw" of which examiner an applicant receives plays a larger role in patent allowances than previously recognized.

¶3 I focus on two distinct populations of examiners at the PTO: primary examiners and secondary examiners. Primary examiners are usually more senior examiners with at least five years of experience, and have full signatory authority.[3] Secondary examiners are usually junior examiners with less than five years of experience, and do not have signatory authority. Each secondary examiner is partnered with a primary examiner, who directly supervises and edits work product generated by the secondary examiner.

¶4 Perhaps unsurprisingly, secondary examiners issue patents at a much lower rate than primary examiners.[4] Furthermore, it takes less time for primary examiners to prosecute patents to allowance when compared with secondary examiners. This result may be unsurprising since primary examiners have more experience, and may know the art and the correct types of rejections based on the application's claims. Additionally, primary examiners are given much less time to review applications when compared to secondary examiners.

¶5 Interestingly, there is a small yet significant population of secondary examiners who have a very small number of issued patents, even though they have several years of experience at the PTO. I also observe that the population of secondary examiners with a low allowance rate takes much longer to issue patents. This population of secondary examiners may be doing damage to the patent system by rejecting applications that would otherwise be allowed by most examiners. The damage done by this population of examiners is twofold. First, these examiners are applying rules of patentability inconsistently from their peers. Second, these examiners disproportionally contribute to the backlog problem because they keep applications in prosecution for durations longer than necessary, while expending valuable PTO resources. These examiners may be rejecting applications as a default because (1) a rejection strategy can artificially increase the measurement used to assess examiner productivity ("counts") and (2) junior examiners are in a probationary period for their first year of service, thus they may be more cautious of issuing "low quality" patents within the first year of service.[5]

¶6 In contrast, a small but significant subset of primary examiners who have very high allowance rates and account for a disproportionately large number of allowances. Applicants who are lucky enough to draw these examiners have a higher likelihood of receiving a patent, most likely with little

[2] Personal communication with a PTO primary examiner (preferred to remain anonymous).

[3] In general, signatory authority allows an examiner to respond to the applicant without further review. An allowance, however, needs to be verified through quality control (QC).

[4] *See* Mark A. Lemley & Bhaven N. Sampat, *Examiner Characteristics and Patent Office Outcomes*, REV. ECON. & STAT. (forthcoming 2012) [hereinafter Lemley & Sampat 2011]. *See also* Mark A. Lemley & Bhaven N. Sampat, *Examining Patent Examination,* 2010 STAN. TECH. L. REV. 2 (2010) [hereinafter Lemley & Sampat 2010]; Mark A. Lemley & Bhaven N. Sampat, *Is the Patent Office a Rubber Stamp?*, 58 EMORY L.J. 181 (2008) [hereinafter Lemley & Sampat 2008].

[5] Personal communication with a PTO primary examiner (preferred to remain anonymous).

or no substantive changes to the claims.[6] This situation may also be damaging to the patent system because "low quality" patents will enter into the stream of commerce, blocking innovation, needlessly increasing transaction and/or litigation costs.

¶7 Many commentators have discussed examiner allowance rates and focused on the allowance of "low quality" patents.[7] Others have focused on the use of continuation practice as a mechanism by which applicants can acquire an unlimited number of tries to get a patent.[8] In an elegant set of studies, Lemley and Sampat were the first to empirically determine the allowance rates for patent applications while also correlating different allowance rates with junior (secondary) or senior (primary) examiners.[9] In this study, I build on the studies by Lemley and Sampat, and investigate the allowance rate of these two different populations of examiners.

¶8 In sum, this study finds that the likelihood of obtaining a patent will rely in large part on the examiner assigned to the application. In the examiner lottery, there is a low probability that an applicant will receive a high allowance rate primary examiner, where the applicant will most likely receive a patent in a short period of time and with few to no claim amendments. For example, in technology center 3700,[10] there is approximately a 12% chance an applicant will receive a "high volume" primary examiner who issues many patents in a short period of time (this 12% subset issued over 51% of the patents from technology center 3700). On the other hand, there is a higher probability that an applicant will receive a low allowance rate secondary examiner, where the applicant will experience a long delay before acquiring a patent, and/or will have to significantly limit the claims before issuance. For example, in 3700, there is approximately a 17% chance an applicant will receive a "low volume" secondary examiner who takes a longer period of time to issue a low volume of patents (this 17% subset issued fewer than 0.35% of the patents from technology center 3700). Although there is no ideal allowance rate, there are many examiners who work far outside the median (both on the low and high end). This observation in itself may cause concern for our patent system.

¶9 Part I describes the patent office structure and examination procedures. Part II describes the general findings regarding allowance rates. Part III discusses possible incentives and mechanisms by which examiners reject and allow patents. Part IV summarizes previous studies regarding examiner allowance rates. Part V describes our dataset and the limitations associated with the dataset. Part VI surveys the extent to which examiners could affect an applicants' ability to obtain a patent, as well as possible implications and solutions to normalize low and high grant rate examiners.

I. PATENT OFFICE STRUCTURE AND THE EXAMINATION PROCEDURE

A. Overview

¶10 The PTO currently is staffed with over 6,500 patent examiners.[11] In recent years, the examiner corps has allowed over 200,000 patents per year. Additionally, in 2010, the federal government received over $1.4 billion in revenue from fees generated in association with the PTO.[12]

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[6] Preliminary results from an analysis of patent examiners in technology center 1600 who have at least three or more years of experience and issued more than fifty patents per year on average, with an average of 1000 days or less (a total of eighty-six examiners meet this criteria).

[7] *See e.g.*, Jay P. Kesan & Andres A. Gallo, *Why "Bad" Patents Survive in the Market and How Should We Change? – The Private and Social Costs of Patents*, 55 EMORY L.J. 61 (2006); John R. Thomas, *Collusion and Collective Action in the Patent System: A Proposal for Patent Bounties*, 2001 U. ILL. L. REV. 305 (2001).

[8] *See* Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U. L. REV. 63 (2004).

[9] This study confirms many of the findings by Lemley and Sampat. *See* Lemley & Sampat 2011; Lemley & Sampat 2010; Lemley & Sampat 2008.

[10] Technology center 3700 deals with mechanical engineering, manufacturing, and products patents.

[11] U.S. PAT. & TRADEMARK OFF., PATENTS DASHBOARD (July 2011), http://www.uspto.gov/dashboards/patents/main.dashxml (last visited Aug. 19, 2011).

[12] U.S. PAT. & TRADEMARK OFF., FY 2010 USPTO PERFORMANCE AND ACCOUNTABILITY REPORT, SUMMARY OF FINANCIAL AND PERFORMANCE HIGHLIGHTS, http://www.uspto.gov/about/stratplan/ar/2010/par_01.html.

Unquestionably, the PTO commands a large workforce with a enormous pool of resources. However, even in light of the workforce and budget, the backlog of patent applications continues to grow.

¶11 The backlog problem has grown in part due to two factors: (1) the number of applications has increased and (2) poor retention of experienced examiners. Correspondingly, Jaffe and Lerner show that the number of applications that each examiner has to review has grown from approximately eighty per year in 1958 to over one hundred per year in 2002.[13] Examiner retention is a clear problem for the PTO. Once examiners develop the skills necessary to become proficient examiners, many leave to enter the private sector making two to three times as much as the PTO pays.[14] As a result, many examiners leave the PTO right when they become able to efficiently and accurately review applications.

B. Examination Procedure

¶12 When an application is sent to the PTO, it is reviewed to make sure all procedural requirements are met for a filing date. Applications are then sorted for examination by "technology center" and "art unit." Each technology center represents a broad technology type, for example, technology center 1600 represents "biochemistry and organic chemistry."[15] Within each technology center are many "art units." Each art unit represents a narrower group of technology within the technology center, for example, 1642 represents "Antibody Engineering and Cancer Immunology."[16]

¶13 Each art unit has a group of examiners who are related by similar technologies.[17] Once in the art unit, a supervisory patent examiner (SPE) will then assign applications, for the most part, randomly,[18] to a reviewing examiner. The reviewing examiner can be either a primary examiner or secondary examiner. A primary examiner is usually more experienced (usually more than five years at the patent office), has the ability send out actions to the applicant with limited review (signatory authority) and is not under constant supervision. In contrast, a secondary examiner is a junior examiner usually with less than five years at the PTO, cannot send out actions to the applicant without review, and is under the supervision of a primary examiner.

¶14 Examiners then review the specification and closely examine the claims.[19] The reviewing examiner then conducts a search for prior art that may render the application unpatentable (usually due to anticipation or obviousness). Examiners search within databases such as prior U.S. patents or applications, foreign patents and/or non-patent literature such as scientific or technical journals. The reviewing examiner then assesses the novelty and non-obviousness of the claims in light of the prior art that was found and the prior art disclosed by the applicant. Furthermore, the reviewing examiner will determine if the claims have written support, utility and if the claims are enabled.

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[13] 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 52, Figure 5.2 (Princeton University Press 2004).

[14] The average salary for an examiner is $60,000 in contrast to $150,000 for new law school graduates specializing in patent practice. Additionally, many law firms supplement salaries with generous signing bonuses. *See id.* at 135–136. *See also* Rick Weiss, Op-Ed., *The 'Patent Pending' Problem*, THE BOSTON GLOBE, Feb. 9, 2009, *available at* http://www.boston.com/bostonglobe/editorial_opinion/oped/articles/2009/02/09/the_patent_pending_problem.

[15] *See* U.S. PAT. & TRADEMARK OFF., PATENT TECHNOLOGY CENTER 1600 CONTACT INFORMATION, http://www.uspto.gov/about/contacts/phone_directory/pat_tech/1600.jsp (last visited February 3, 2012).

[16] *See id.*

[17] Each hundreds (1600, 1700, 2100, 2400, 2600, 2700, 2800, 2900, 3600 and 3700) unit is a large technology group. For example, art unit 1600 covers biotechnology and organic chemistry, while art unit 2100 covers computer architecture, software and information security. Further, each tens unit narrows the technology. For example 1610 is directed to organic compounds and 2110 is directed to computer architecture. Finally, the unit digit is the narrowest measure of technology. For example, 1611 is drug, bio-affecting and body treating compositions, while 2111 deals with electrical computers and digital data processing systems.

[18] Some SPEs will assign applications on the basis of the last digit of the application serial number. Other SPEs will assign based on docket management, giving the oldest unassigned application to the examiner who has finished examining a prior application. *See* Lemley & Sampat 2011, *supra* note 4.

[19] *See* Michael Risch, *The Failure of Public Notice in Patent Prosecution*, 21 HARV. J.L & TECH. 179, 183 (2007).

¶15 If there is no prior art and the claims are properly described and enabled, the examiner will issue a notice of allowance. However, first action allowances are a relatively rare occurrence.[20] More commonly, the examiner will reject the claims for one of the reasons listed above.[21] The applicant then has no more than six months to respond to the office action.[22] Usually, the applicant will take one of two actions: (1) amend the claims to traverse the rejections or (2) traverse the rejection based on scientific or legal arguments.

¶16 If the examiner is persuaded by the response, she can allow the case. If the examiner is not persuaded, she can reject using the same rejections as in the first office action, or reject based on new grounds. Depending on the arguments made by the applicant (and if the examiner was persuaded by the applicant's arguments), the examiner can then choose to make her next response either "final" or "non-final." The applicant has six months to choose one of several common options: (1) file an request for continued examination (RCE) to continue examination, basically continuing prosecution over where the examiner left off, (2) file a notice of appeal, appealing the rejections to the board of patent appeals and interferences (BPAI), (3) abandon the application or (4) file a continuation application (CON) or continuation in part (CIP) application. Filing a continuation or CIP application can be done in conjunction with filing an RCE, notice of appeal or abandonment. The process then repeats itself until a patent is allowed or the applicant abandons the application.[23]

C. The Backlog

¶17 The backlog of unexamined patent applications stands at 695,086.[24] The first time an examiner even looks at an application is 27.2 months after it is filed by the applicant.[25] In 1999, most patents would have issued in that time period.[26] Thus, today it takes longer to get a first action on the merits than the average time for a patent to issue just 10 years ago. To address this issue, the PTO has been increasing the number of patent examiners on staff. Examiner numbers have increased from approximately 4177 in 2005 to 6775 in June 2011.[27] However, this increase in staffing may not be enough considering that the number of patent applications filed at the PTO has increased from 409,532 in 2005 to 509,367 in 2010.[28]

¶18 Compounding the backlog problem is the use of continuation applications and requests for continued examination (RCEs). Applicants can indefinitely continue prosecution by filing RCEs and continuation applications. These applications increase the number of applications in the backlog while allowing the applicant to delay and prolong prosecution. It could be argued that RCE and continuation applications are delays caused by the applicant, thus irrelevant to the PTO backlog analysis. However, if examiners are erroneously rejecting applications, thus forcing applicants to file RCEs or continuation applications to overcome these rejections, then this delay should be attributed to the PTO.

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[20] Lemley & Sampat 2008, *supra* note 4, at 197, Table 9 (showing in their data set that first action allowances only occurred 13.46% of the time).

[21] Lemley & Sampat 2010, *supra* note 4, at 7 (finding that 86.50% of their data set had a first action non-final rejection).

[22] 37 C.F.R. § 1.134 (2000).

[23] A patent application is never really "finally" rejected if the applicant does not want it to be, simply because the applicant can continue prosecution via an RCE or filing a continuation application. Accordingly, many commentators have focused on allowance rates rather than rejection rates. *See* Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U. L. REV. 63 (2004).

[24] *See* U.S. PAT. & TRADEMARK OFF., PATENTS DASHBOARD, *supra* note 11.

[25] *See id.*

[26] Gene Quinn, *USPTO Backlog: Patent Pendency Out of Control*, IPWATCHDOG, April 22, 2009, http://ipwatchdog.com/2009/04/22/uspto-backlog-patent-pendency-out-of-control/id=2848/.

[27] U.S. PAT. & TRADEMARK OFF., 2009 PERFORMANCE AND ACCOUNTABILITY REPORT, p. 140, http://www.uspto.gov/about/stratplan/ar/2009/2009annualreport.pdf; *see also* U.S. PAT. & TRADEMARK OFF., PATENTS DASHBOARD, *supra* note 11.

[28] U.S. PAT. & TRADEMARK OFF., 2009 PERFORMANCE AND ACCOUNTABILITY REPORT, p. 112 (Table 1); and U.S. PAT. & TRADEMARK OFF., 2010 PERFORMANCE AND ACCOUNTABILITY REPORT, p. 125.

¶19 Magnifying the backlog problem is the new way the PTO treats RCEs. Before November 15, 2009, RCEs were classified as amendments and placed on the examiner's amended docket, which required the examiner to review the case within two months of the RCE filing. However, now RCEs are docketed on the examiner's "special new" application docket, which is the same docket on which continuation and divisional applications are reviewed.[29] Examiners now need only review a minimum of one item on their special new docket every month.[30] Because examiners get less "counts"[31] for multiple RCEs filed (1.0 counts for the first response to an RCE, but 0.75 counts for every response for any subsequent RCEs), there may be an incentive for examiners to delay examination of RCEs, instead of examining new applications to receive full credit (1.25 counts for the first office action in a continuation or divisional application). This RCE docking procedure could discourage prompt examination of RCEs and thus longer prosecution times.

II. ALLOWING HIGH QUALITY PATENTS

¶20 There have been anecdotal stories about examiners who take pride in a zero allowance rate. It is very unlikely that an examiner who has reviewed hundreds of patents will never encounter a patent that is allowable. Further, it is very unlikely that all applicants who work with that examiner would not be willing to compromise to obtain an allowable patent. In situations where the examiner has a zero percent allowance rate, it is more likely that the examiner is in error more often than the applicant. This is because most inventions can be narrowed sufficiently such that some claim is allowable, no matter how narrow. This study considers examiners with a consistently low allowance rate to determine those characteristics that constitute a zero-allowance rate examiner. As a matter of logic, this data set does not capture the potentially apocryphal examiners with true zero percent allowance rates, because the data set is limited to those examiners who have issued at least one patent in the past decade. Additionally, a limitation of this data set is the fact that data is not available regarding how many patent applications each individual examiner is assigned.

¶21 Lemley and Sampat argued that there is no way for the PTO to truly "finally" reject an application, because "the applicant can always come back [using RCEs and/or continuations] and argue that the examiner should change her mind."[32] However, the PTO does have the power to kill an application by simply keeping it in prosecution for over 20 years,[33] such that if the application issues, it will be dead on arrival with no patent life. Filing a continuation application or a continuation-in-part application will not remedy this situation because expiration is linked to the earliest filing date, which in these cases would be the parent application. Furthermore, many applicants may simply give up on an application for business reasons if prosecution takes more than five or six years.

¶22 Even if a patent issues from an application that has been in prosecution for a decade, much of the damage may have already been done. Specifically, applicants who prosecute patents for long periods of time may be irreparably harmed because of: (1) the inability to get funding[34] (due to a lack of a robust patent portfolio), (2) the inability to exclude competitors to enter the field (competitors may discount those applications locked in prosecution for long periods of time or have a longer time to develop design-arounds), (3) the inability to capture royalties for most of the patent life and (4) the actual cost to prosecute patents for such a long duration of time.

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[29] U.S. PAT. & TRADEMARK OFF., NOTICE OF CHANGE TO DOCKETING OF REQUESTS FOR CONTINUED EXAMINATION (Oct. 19, 2009), http://www.uspto.gov/patents/law/notices/rce_docket.pdf.

[30] *Id.*

[31] For an explanation of the "count" system, see http://www.popa.org/pdf/agreements/counts-counts-31aug2010.pdf (last visited Apr. 18, 2012). *See also infra* Part II.A.

[32] Lemley & Sampat 2008, *supra* note 4, at 188–89.

[33] This applies to those applications filed after June 8, 1995 without patent term adjustment (PTA). Applications filed before June 8, 1995 have an expiration date of either: (1) 17 years from the issue date or (2) 20 years from earliest US priority date, whichever is greater.

[34] *See* Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625 (2002).

A. Examiner Incentives

¶23 Examiner productivity is judged by "counts." Counts help determine if an examiner is promoted or is given a salary bonus. Counts can be earned in many ways, such as by first office actions or disposal of cases by allowance or applicant abandonment.[35] Although a "final rejection" is not awarded counts, issuing a response to a first RCE is given a count, with less credit given to every subsequent RCE.[36]

¶24 I argue that the current count system gives junior examiners a greater incentive to reject patents. Although it is true that a rejected patent will consume much more of an examiner's time, it is a continued source of "counts" for an examiner. Thus, one way an examiner can maximize counts is to continually reject a particular application, thereby forcing applicants to file an RCE or CON, which garners the examiner more counts. Specifically, an examiner that rejects the same application multiple times gets counts for the first office action, responses to every RCE filed, the first action in any continuation application filed, and the allowance or abandonment of the application. Furthermore, each continuation application will bring a new stream of counts for the examiner. In contrast, if an examiner issues only one non-final rejection and then allows the application, he only gets two counts, and the stream of potential counts dries up if no continuation is filed. Compounding the perverse incentives, once an examiner reviews the application, he becomes familiar with the technology and can thus spend less time generating rejections in future continuation applications and RCEs.

¶25 In contrast, Jaffe and Lerner argue that the current count system incentivizes an examiner to "go easy" on applicants and allow their patents to be allowed.[37] They posit that a rejected patent will typically consume much more of an examiner's time than one that is allowed after the initial application. Furthermore, they assert that there is an incentive for examiners to work quickly under this system, typically spending only sixteen to twenty hours with each application. [38]

¶26 The "go easy" strategy to maximize counts may be more advantageous when employed by primary examiners. Primary examiners are under less scrutiny when allowing patents. In general, they do not undergo a secondary review by another pair of eyes.[39] Accordingly, to maximize counts, this population of examiners has an incentive to give one non-final rejection and then allow a case. Furthermore, the PTO actually loses money on patent examination, and only recovers that money when the applicant pays the maintenance fees. [40] Although maintenance fees are not tied to any specific examiner, some primary examiners may feel that their jobs are generally dependent on a robust allowance rate.

¶27 Jaffe and Lerner note this dissonance for examiners. Specifically, some examiners choose an allowance strategy to maximize their counts, thereby increasing the number of patents issued. In contrast, some examiners choose a rejection strategy to maximize counts, forcing applicants to file child applications or RCEs to continue examination. For instance, Jaffe and Lerner note an examiner comment: "When I first started here, I was told 'when in doubt reject' and to try to reject. Now I am told, 'when in doubt allow' and try to find a reason to allow."[41] If true, examiners are stuck between a

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[35] *See* U.S. PAT. & TRADEMARK OFF., 1705 EXAM'R DOCKET, TIME, AND ACTIVITY RECORDATION [R–8]—1700 MISC., http://www.uspto.gov/web/offices/pac/mpep/documents/1700_1705.htm (last visited Feb. 3, 2012).

[36] U.S. PAT. & TRADEMARK OFF., NOTICE OF CHANGE TO DOCKETING OF REQUESTS FOR CONTINUED EXAMINATION (Oct. 19, 2009), http://www.uspto.gov/patents/law/notices/rce_docket.pdf.

[37] 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 136 (2004).

[38] *Id.* (citing *Patents: Improving Quality and Curing Defects, Subcommittee on Courts, the Internet and Intellectual Property of the House. Comm. on the Judiciary*, 107th Cong. 1 (statement of James F. Cottone, President, National Intellectual Property Researchers Association)).

[39] For example, Class 705 (business method patents), which used to undergo a secondary review even if allowed by a primary examiner. *See* U.S. PAT. & TRADEMARK OFF., ENHANCE CURRENT QUALITY ASSURANCE PROGRAM BY INTEGRATING REVIEWS TO COVER ALL STAGES OF EXAMINATION, http://www.uspto.gov/web/offices/com/strat21/action/q1p17.htm (last visited Feb. 3, 2012). Interestingly, the PTO recently terminated the "Second Pair of Eyes" review program for business methods. *See also* Mark Lemley, *Can the Patent Office be Fixed?*, 15 MARQ. INTELL. PROP. L. REV. 295 (2011). Also, personal communication between author and PTO official.

[40] Jon Dudas, Steve Maebius, & Sean Tu, *Let the PTO Pay Its Own Way*, NAT'L L.J. (October 26, 2009).

[41] ADAM B. JAFFE & JOSH LERNER, INNOVATION AND ITS DISCONTENTS: HOW OUR BROKEN PATENT SYSTEM IS

rock and a hard place, getting criticized for lack of quality control if they allow too many patents, and also getting criticized for low output if they allow too few patents.

B. Incentives to Reject and Maximize Counts

¶28 There are incentives and strategies by which an examiner can use rejections to garner additional counts. I analogize this strategy with drug companies. Drug companies can maximize profits by using two different strategies. The first strategy is simple: come up with a cure and then market it to as many people as possible. Thus, garner a small profit from a high volume of consumers. Take for example, a drug company in the field of diabetes. Selling the cure for diabetes allows for a one-time fee. Thus, to maximize profit the drug company would market it to as many people as possible. Examiners who have a high allowance rate may be following this strategy to maximize counts. By allowing many cases after one non-final rejection these examiners can garner the most number of counts with the least amount of effort in the shortest amount of time. The time factor may play a significant role because primary examiners are given a shorter amount of time to review an application than junior examiners.

¶29 The second strategy is more complex. This strategy does not call for a cure, but simply management of the disease symptoms. For example, a drug company that only manages diabetic symptoms can sell insulin, blood glucose strips, monitoring devices, and all other accoutrements associated with the disease. Each item will be relatively inexpensive and create a steady revenue stream for the drug company. Accordingly, each patient becomes a steady revenue stream until death. Furthermore, depending on the nature of the disease, that patient may have children and grandchildren who are also diabetic, and who must also manage their symptoms, garnering even more revenue.

¶30 Examiners who have a very high rejection rate may be following this type of steady revenue stream strategy, because an allowance will "cure the disease" and end the counts that can be generated from that family member. However, if the examiner files a continuous set of rejections, he can maximize his counts. Facing rejection after rejection, the applicant may be forced to file child applications, allowing the examiner to add further counts.

¶31 There are two factors that compound the problem, and give the examiner even more incentive to reject. First, RCE and continuation practice allows an examiner to spend less time to issue more rejections. Second, examiners face less scrutiny when issuing rejections than when they allow an application. I note that the PTO has tried to address this RCE problem by lowering the amount of counts associated with responses to second or subsequent RCEs.

1. Factor 1

¶32 The quota system decreases the amount of time examiners can spend on an application as they accumulate experience at the PTO. RCE and continuation practice allow examiners to garner more counts in a shorter amount of time. The specification of a continuation application (and RCE) is identical to the parent application. Thus, if an applicant is forced to file a continuation application or RCE, the examiner requires much less time to review and understand the claimed technology, since the review was already completed in the parent application. Thus, it requires much less work for the examiner to come up with 1) art rejections since the examiner need only complete a new search and review any new pieces of art[42] and 2) written description and enablement rejections[43], as the specification is identical to the parent application. Thus, forcing applicants to file RCEs and/or continuation applications allows the examiner to spend less time to garner more counts. One might

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ENDANGERING INNOVATION AND PROGRESS, AND WHAT TO DO ABOUT IT 137 (2004) (citing Gregory Aharonian, *A Few Patent Examiners Complain About Patent Quality*, PATNEWS (January 28, 1999)).

[42] The examiner is more efficient in understanding the prior art since he has already read some of the art in the previous rejections. Additionally, the examiner does not need to review the applicant's specification to compare it to the prior art reference, since this should have also previously been done in the parent application.

[43] If the applicant makes claim amendments, the examiner does not need to review the specification because he already should have done so in the parent application.

assume that this time pressure would force more senior examiners to reject, maximizing counts while reducing time needed to review applications. Interestingly, I do not see the majority of primary examiners pursuing this strategy.

2. Factor 2

¶33 Second, this rejection strategy may be particularly attractive to secondary examiners who are scrutinized more when allowing a case. To allow a case, first the secondary examiner needs to get approval from the primary examiner working with her, and second, the application must go for quality review before the patent issues. By contrast, a rejection is only reviewed by the primary examiner. There are no further consequences or punishments when bad rejections are issued, so secondary examiners may tend toward rejections.[44] Further, an examiner may lose privileges or suffer institutional ridicule when issuing bad patents.[45] For example, under the "second pair of eyes" review program, there has been anecdotal evidence that two "reversals" under this program could result in termination.[46]

¶34 Finally, I note that the most junior examiners have one additional reason to reject applications. Specifically, junior examiners are in a probationary period for the first year of service. After this probationary period, it becomes increasingly difficult for the PTO to terminate employment. Accordingly, junior examiners may be more willing to reject claims at a higher rate to avoid unfavorable reviews, thereby increasing their ability to avoid negative reviews within the first year of service.

¶35 It is true that applicants have the ability to appeal an examiner's decision to the Board of Patent Appeals and Interferences. However, this avenue may be expensive and unavailable to those inventors who are trying to patent their invention on a budget. Inventors who use the patent system as a signal to obtain venture capital funding hurt their chances of getting funding if they fail to obtain a patent, lose on appeal, and cannot generate a strong patent portfolio.[47]

III. ALLOWANCE RATES

¶36 Many commentators have attempted to determine the actual allowance rate at the PTO by art unit. However, this task is nearly impossible because the patent office does not publish the number of applications filed by art unit.[48] In general, the PTO states that the overall allowance rate from 1993-1999 was sixty-six percent[49] and is now approximately fifty-four percent.[50]

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[44] Under Director Kappos, there is a new program to review patents based on both allowances and rejections. Personal communication with ALJ.

[45] *See* DANIEL WRIGHT, PATENTLY SILLY: FROM THE COLLAPSIBLE WALKER TO THE INCINERATING TOILET, THE CRAZIEST INVENTIONS EVER DEVISED (2009); *see also* RICK FEINBERG, PECULIAR PATENTS: A COLLECTION OF UNUSUAL AND INTERESTING INVENTIONS FROM THE FILES OF THE U.S. PATENT OFFICE (1994).

[46] *See* Warren Woessner, *Second Pair of Eyes Review—Is the Wicked Witch Really Dead?*, PATENTS4LIFE, http://www.patents4life.com/2009/10/second-pair-of-eyes-review-is-the-wicked-witch-really-dead (last visited Feb. 3, 2012) ("One examiner told [Warren Wossner] that if he received two "reversals" from a SPOE [Second Pair of Eyes] review, he could be fired.").

[47] *See* Clarisa Long, *Patent Signals*, 69 U. CHI. L. REV. 625 (2002) (focusing on patents as a means for credibly publicizing information); *see also* Gideon Parchomovsky & R. Polk Wagner, *Patent Porfolios*, 154 U PENN. L. REV. 1 (2005) (focusing on aggregation of patents into patent portfolios as a separate function for patents).

[48] Even in the age of publication, some patents are not published if: the applicant has specifically requested confidentiality, the patent is placed under a secrecy order, a provisional application, an application for a design patent, or the application is deemed detrimental to national security if disclosed. *See* 35 U.S.C. § 122.

[49] Lemley & Sampat 2008 at 184 (citing e-mail from Robert W. Bahr, Senior Patent Attorney, Office of the Deputy Commissioner for Patent Examination Policy to Cecil D. Quillen, Jr., Senior Advisor, Cornerstone Research, (Apr. 22, 2006, 3:31 PM), http://www.uspto.gov/web/offices/pac/dapp/ opla/comments/ fpp_ continuation/quillen.pdf (stating that the uncorrected grant rate for the PTO for its fiscal years 1993-1998 is 66%).

[50] Harold Wegner, *The USPTO's 54% Allowance Rate*, IPFRONTLINE, Dec. 30, 2006, http://www.ipfrontline.com/depts/article.asp?id=13796&deptid=5 (stating that the PTO announced a 54% allowance rate).

A. Calculated Allowance Rates

¶37 Others have attempted to calculate the allowance rate controlling for continuations. Quillen and Webster have attempted to adjust for continuation application and have estimated the allowance rate to be 85%.[51] Furthermore, Clarke has taken another approach to control for continuations and have come to a different conclusion, showing allowance rates of around 75%.[52] Others yet have taken random samples to determine allowance rates as low as 47%[53] to as high as 70.5%[54]. Lemley and Sampat estimate that the patent grant rate is between 68.4% and 78.1% (corrected for continuations).[55]

B. Absolute Grant Rates Not Corrected for CONs, CIPs or DIVs

¶38 From our data set and using the PTO accountability reports, I can determine the grant percentage for patents in any given year for the past decade dependent on application date. I note that our data set only captures those patents issued between January 1, 2001-July 15, 2011. Grant rates will be slightly left-justified, in that those applications filed in 2000 and 2001 will have greater numbers that have issued since these applications have had more time to go through prosecution. In contrast, those applications filed in 2010 will not have time to actually issue to patents, and thus artificially look like they have lower issuance rates.

¶39 Additionally, I note that those applications filed in the earlier years (1998-1999) may look like they have artificially low grant rates. This is probably due to the fact that many of these applications issued before 2001 (the average pendency in 1999 was approximately 20 months), and thus were not captured in our 2001-2011 data set. Accordingly, we infer that those applications that have not issued into patents are more likely to have been abandoned than their later filed counterparts. This is because the life left on these patents will most likely be only a few years (if there are no PTA or PTE adjustments).

Year	Applications filed	Number of Issued Patents between 2001-2011 with Application Year	% Grant (not adjusted for CON, CIP, and/or DIV)
1998	256,666	15,922	6.20%
1999	278,268	54,059	19.42%
2000	311,807	137,522	44.11%
2001	344,717	184,050	53.39%
2002	353,394	191,509	54.19%
2003	355,418	182,913	51.46%
2004	378,984	170,542	44.99%
2005	409,532	156,544	38.22%
2006	445,613	139,141	31.22%
2007	468,330	110,705	23.63%

[51] Cecil D. Quillen Jr., Ogden H. Webster, & Richard Eichmann, *Continuing Patent Applications and Performance of the U.S. Patent and Trademark Office-- Extended*, 12 FED. CIR. B.J. 35, 38 (2002).

[52] 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, 335 (2003); and Lawrence B. Ebert, *How High are the Grant Rates at the USPTO?*, 86 J. PAT & TRADEMARK OFF. SOC'Y 568, 569 (2004).

[53] Dennis Crouch, *Evidence Based Prosecution: The Status of Applications Filed 4 ½ Years Ago*, PATENTLYO, June 25, 2009, http://www.patentlyo.com/patent/2009/06/evidence-based-prosecution-the-status-of-applications-filed-4-%C2%BD-years-ago.html (showing 47.8% patent rate of 462 randomly selected utility patent applications between December 2004 and January 2005).

[54] Lemley & Sampat 2008, *supra* note 4, at 189 (showing that 70.5% of applications from January 2001 were patented with 2.2% still pending and 27.3% abandoned). However, the 70.5% calculation may be slightly lower than the actual allowance rate because the 2.2% still pending still could become patents and also the 27.3% abandoned applications included applications which had been allowed, but were abandoned by applicants.

[55] *Id.* at 192. Since continuation, continuation-in-part, and divisional applications are "child" applications that are based on original "parent" applications. Of the roughly 10,000 patents analyzed, approximately 2,000 were child applications.

2008	496,886	67,452	13.57%
2009	486,499	27,472	5.64%
2010	509,367	7,964	1.56%

¶40 As expected, this data set is most robust for years between 2000 and 2005, where between 40 to 55% of the applications have issued as patents. This was expected, because earlier applications (those filed between 1998-1999) probably issued at a faster rate when the backlog was smaller, thus falling outside of our 2001-2011 issued dataset. Similarly, most later applications (those filed from 2008 to 2010) probably have not yet been examined since the backlog has grown. Thus, those later applications have a lower issuance rate. These data correspond closely to the allowance rates published by the PTO, showing an approximately allowance rate of 50% between 2001 and 2003.

¶41 These statistics are also encouraging because they suggest that relatively few applications will be granted much later in time. I infer that applications filed in 1998 most likely issued between 1998-2000, resulting in few patents in this cohort being issued between 2001 and 2011. Thus, if the data behaves similarly for all years, for example, those applications filed in 2002 will probably not result in many more issued patents past 2011.

¶42 We note that these data only show issued patents, which is different from allowance. As Lemley and Sampat noted, many abandonments could be because of business reasons and not substantive rejections.[56] In fact 30.9% of the abandonments in their data set came after non-substantive office communications, or even after notices of allowances.[57] Correspondingly, Crouch's data set shows a 0.7% abandonment rate simply for failure to pay an issue fee.[58]

C. Importance of Allowance Rates

¶43 The simple fact is that one cannot predetermine an "ideal" allowance rate. Each patent application must be adjudicated on its own merits. With that said, there are arguments for adjusting the aggregate allowance rate both up or down. Many commentators who worry about granting "low quality" patents discuss mechanisms to enhance rejection rates, strengthen post grant review, or create a two tier patent system.[59] These commentators assume that the allowance rate is too high. In contrast, other commentators worry about examiners rejecting "high quality" patents and thus develop mechanisms to enhance allowance rates like the use of continuation practice. These commentators believe that the allowance rate is too low.

1. One Side of the Coin – Weeding Out "Low Quality" Patents

¶44 In many technology groups, there is a perception that the PTO is allowing "low quality" patents that impose a higher cost on competitors. These social costs include deadweight losses created by monopoly pricing, harmful rent seeking, predatory pricing and the ability to unjustly exclude competitors from the market. Accordingly, there have been many proposals to enhance patent quality by weeding out bad patents.[60] Additionally, fears that patent thickets will prevent whole industries from innovating have prompted enormous compensation for patent portfolios.[61] Some solutions to the "bad patents" problem include use of a post-grant review to allow for administrative

[56] *Id.* at 193.

[57] *Id.*

[58] Dennis Crouch, *Evidence Based Prosecution: The Status of Applications Filed 4 ½ Years Ago*, PATENTLYO, June 25, 2009, http://www.patentlyo.com/patent/2009/06/evidence-based-prosecution-the-status-of-applications-filed-4-%C2%BD-years-ago.html

[59] *See* Doug Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity*, 60 STAN. L. REV. 45 (2007) (arguing for the creation of a two tiered system of patent validity); Mark A. Lemley, Doug Lichtman & Bhaven Sampat, *What to do with Bad Patents,* REGULATION 10, 12–13 (Winter 2005–06).

[60] *See e.g.*, Robert P. Merges, *As Many as Six Impossible Patents Before Breakfast: Property Rights for Business Concepts and Patent System Reform*, 14 BERKELEY TECH. L.J. 577 (1999); Lawrence Lessig, *The Problem with Patents*, INDUS. STANDARD, Apr.23, 1999, http://www.lessig.org/content/standard/0,1902,4296,00.html.

[61] See, for example, the sale of Nortel Network patents to an alliance made up of Apple, Microsoft, Research in Motion, Sony, Ericsson, EMC and other technology giants for $4.5 billion in cash.

challenges to bad patents or creation of a two tiered patent system[62] (similar to the Chinese utility model patent[63] versus the invention patent), where one tier would get substantial substantive review while a second tier would not undergo a rigorous substantive review.

¶45 Many commentators who are concerned about the "low quality" patents problem have come from the information technology industry and software industry. This is interesting because in the electronic industry patents are often shared among competitors through pooling or cross-licensing. This sharing is needed because any given product often contains many patented technologies. Thus, the software, computer and electronics industries benefit from a patent system that allows fewer patents.

2. Flip Side of the Coin – Allowing "High Quality" Patents

¶46 In some technology groups, such as biotechnology, there is a perception that the examiners are unjustly hindering the allowance of "good patents." Although rejection of good patents does not impose a higher cost on competitors, it imposes a higher cost on innovators. It is well known that the field of biotechnology and drug development relies heavily on patents to protect the return on investment in the development of a commercial product.[64] Some solutions to the "good patents" problem include use of continuation practice to keep applications alive and increase the likelihood of allowance. Other solutions include a stronger administrative appeals process (to the SPE or the BPAI) or a review process for bad rejections.

¶47 Pharmaceutical and biotechnology patents usually have one or a small family of patents that cover the entire product. Many commentators have discussed the importance of patents in the drug and biotechnology field.[65] An early empirical study by Edwin Mansfield argued that many products in the pharmaceuticals industry would not have been developed or introduced without patent protection. [66] Thus, in the biotechnology field one (or just a few) patents will protect an extensive investment in research, clinical testing and/or manufacture of a product. Patents in biotechnology are especially important since manufacturing processes are easily copied with only a fraction of the investment of the innovator company. Accordingly, commentators argue, the pharmaceutical industry benefits from a patent system that allows more patents.

¶48 Studies done by Richard Levin et al.[67] and Wes Cohen et al.[68] found that the computer and semiconductor industries placed stress on factors such as lead-time and first mover advantages. In contrast, both studies done by Levin and Cohen found that the pharmaceutical industry placed the highest importance on patents. Thus, it stands to reason that those in the software and computer industries focus on "weeding out bad patents" while those who work in the biotech and chemical industries focus on "allowing good patents."

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[62] The new patent reform bill of 2011, the "America Invents Act of 2011," creates stronger post-grant procedures such as special post-grant review for business methods, new post-grant opposition proceedings, ex parte reexamination and inter partes reexamination. Leahy-Smith America Invents Act (AIA), Pub. L. No. 112-29, 125 Stat. 284 (2011) (codified in scattered sections of 35 U.S.C.). *See also* Doug Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity,* 60 STAN. L. REV. 45 (2007).

[63] The Chinese utility model patents, however, are available for only physical products, and not for methods or chemical compounds. Accordingly, I would suggest a slightly modified system which would allow for a full spectrum two-tiered system in the United States.

[64] RICHARD E. CAVES, MICHAEL D. WHINSTON & MARK A. HURWITZ, PATENT EXPIRATION, ENTRY, AND COMPETITION IN THE U.S. PHARMACEUTICAL INDUSTRY, BROOKINGS PAPERS ON ECONOMIC ACTIVITY: MICROECONOMICS 1 (1991).

[65] *See e.g.*, Henry Grabowski, *Patents, Innovation and Access to New Pharmaceuticals*, 5 J. OF INT'L ECON L. 849 (2002).

[66] Edwin Mansfield, *Patents and Innovation*, 32 MGMT. SCI. 173 (1986).

[67] RICHARD D. LEVIN ET AL., APPROPRIATING THE RETURNS FROM INDUSTRIAL RESEARCH AND DEVELOPMENT, BROOKINGS PAPERS ON ECONOMIC ACTIVITY 783–820 (1987).

[68] Wesley M. Cohen et al., *Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (Or Not)* (Nat'l Bureau of Econ. Research Working Paper No. 7552, 2000).

IV. LEMLEY AND SAMPAT 2011 STUDIES

¶49 In a set of three elegant studies, Lemley and Sampat reviewed examiner characteristics and patent outcomes.[69] They found that the ability for an applicant to obtain a patent is in part based on the random draw of the examiner.[70] Their data showed that more experienced examiners are more willing to issue patents and make rejections with fewer prior art citations.[71] Additionally, they revealed that the likelihood of obtaining a patent varies significantly by industry.[72]

¶50 Lemley and Sampat reviewed approximately 10,000 patents filed in January 2001 from the "cradle to the grave."[73] Considering the prosecution histories for these applications, they determined that: (1) senior examiners allowed patents at a higher rate than junior examiners, (2) junior examiners made more art rejections than senior examiners, (3) there was no statistically significant difference between senior and junior examiners' probability of approving applications that were also approved by the EPO (as a measure of quality). Furthermore, they found that senior examiners systematically cite less prior art and have a higher rate of issuing first action allowances. Additionally, they argued that senior examiners are simply doing less work rather than getting it right more often than junior examiners. [74]

¶51 Additionally, they examined several possible selection factors such as: (1) application selection bias,[75] (2) selective retention effects,[76] and (3) tenure effects[77]. First, Lemley and Sampat analyzed possible selection bias through a combination of interviews, pages in the application, patent family size, and by comparison to corresponding granted EPO patents. Their data and survey results showed that there is no selection bias. When reviewing examiners who would leave within 5 years, they found that this subpopulation of examiners have a higher likelihood of granting without rejections (the opposite of what would have been expected if selective retention were in play). Unfortunately, they could not rule out tenure effects because (1) they lacked data regarding examiners who were tenured or untenured and (2) it is difficult to separate the tenure effects and experience effects because of the strong relationship between tenure and experience.

¶52 Lemley admits that his study could not conclude who has the "correct" allowance rate: (1) senior examiners who allow more patents with fewer art rejections or (2) junior examiners who allow less patents and reject more based on prior art rejection. For example, a grant rate of 85% may still be too low if every application is meritorious. Lemley and Sampat's study suggests that "examiners are doing more work, and rejecting applications with more rigor, at early stages in their career, and both doing less work and allowing more patents as their tenure increases."[78]

¶53 It is worthy to note that in a corresponding study using this same data, Lemley and Sampat show that many applications that get issued have at least one amendment (85.45%).[79] This statistic demonstrates that most applicants are willing to narrow the scope of their initial claims to obtain a patent. It could also acknowledge that applicants start off with unrealistically broad claims so that

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[69] *See* Lemley & Sampat 2011, *supra* note 4; Lemley & Sampat 2010, *supra* note 4; Lemley & Sampat 2008, *supra* note 4.

[70] Lemley & Sampat 2011, *supra* note 4.

[71] *Id.*

[72] Lemley & Sampat 2008, *supra* note 4.

[73] Lemley argues that there is no actual way for the PTO to finally reject a patent. Mark A. Lemley & Kimberly A. Moore, *Ending Abuse of Patent Continuations*, 84 B.U. L. REV. 63 (2004). Thus, they consider a patent application to have been finally abandoned if the applicant: (1) filed an express abandonment or (2) failed to respond a PTO rejection within six months (the time limit for doing so before a default abandonment). I note that the PTO can de facto reject a patent by keeping the patent in prosecution for more than 20 years, in which case there would be little to no patent term left on issuance.

[74] Lemley & Sampat 2011, *supra* note 4, at 22.

[75] Application selection bias exists if "easier" or "harder" applications go to specific examiners, resulting in a cherry-picking type effect. *Id.* at 14-16.

[76] Selective retention effects: more technical or highly educated examiners are more likely to leave the PTO earlier in their careers. *Id.* at 19-21.

[77] Tenure effect--: after promotion, primary examiners with full signatory authority are not subject to the same level of scrutiny. Specifically, they can sign off on their own applications without review. *Id.* at 21-22.

[78] *Id.* at 13.

[79] Lemley & Sampat 2010, *supra* note 4.

they have some room to negotiate with the examiner.[80] Applicants may also start off with very broad claims to stake a claim to a technology area and signal to competitors to stay away from a certain type of technology. These broad claims will serve a notice function when the application publishes to those competitors who wish to enter the area (and complete a freedom to operate search). Thus, by claiming unrealistically broadly, applicants can add an element of uncertainty for possible competitors, thereby gaining a competitive advantage by increasing competitor costs to enter the market with a product that may infringe the applicant's broadest claims.[81]

V. OUR DATA SET AND DESCRIPTIVE STATISTICS

¶54 Our data set is simply all patents allowed between 2001 and 2011 (approximately 1.7 million patents) in every active art unit sorted by art unit, application filing date, issue date, primary examiner and/or secondary examiner. These data include only utility patents and is unfiltered for continuations, CIPs, divisional applications, and applications directed at foreign filings. Plant, design, reexamination and reissue patents are not included in this data set. This database permits us to determine the type of examiner (primary or secondary) and rate at which each examiner type issues patents. Furthermore, this database allows us to determine the average amount of time it takes an examiner to issue a patent. Finally, I can filter the examiner types, and determine how long it takes low volume examiners to issue patents compared to high volume examiners.[82]

¶55 Each art unit may not contain information from every year. For example, technology center 2400 seems to have been created in 2009, so the data only includes 2009-2011. Similarly, technology center 2100 does not have data past 2007, leaving data for 2001-2007.[83]

¶56 Allison and Lemley previously argued that the PTO classification system is rife with error.[84] Allison and Lemley found that many applications were either erroneously or arbitrarily placed into technology groups.[85] However, since I focus on the examiners associated with each art unit, and not the specific technology associated with the art unit, I did not reclassify the examiners. Additionally, I note that examiners can be associated with multiple art units (usually within the larger technology group).[86]

¶57 One major limitation of this data set is based on the unavailability of application data categorized by art unit. Thus, these data suffer from a "denominator" limitation since I do not know how many applications were filed in each art unit per year. Accordingly, I cannot determine the percentage of allowed patents per year per art unit. Additionally, I cannot compare allowance percentages across technologies. I can only make inferences based on the total number of applications filed by year.

¶58 Many of the same issues that Lemley and Sampat faced are present in this data set.[87] Accordingly, I have employed many of these same strategies to traverse those problems when applicable. For example, official PTO examiner data is reported with many formatting and spelling errors.[88] I have

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[80] Other commentators such as Michael Risch have proposed that applicants start out with broad claims because inventors will narrow claims based on prior art found by the examiner. *See* Michael Risch, *Failure of Public Notice in Patent Prosecution*, 21 HARV. J.L. & TECH. 179 (2007).

[81] *See* ALEXANDER STACK, INTERNATIONAL PATENT LAW: COOPERATION, HARMONIZATION AND AN INSTITUTIONAL ANALYSIS OF WIPO AND WTO 60–61 (Edward Elgar Pub. 2011) (showing how absolute undertraining may deter a competitor from entering a new market).

[82] I define low volume examiners as examiners (secondary or primary examiners) that issue fewer than 5 patents per year. I define high volume examiners as examiners (secondary or primary examiners) that issue more than 50 patents per year.

[83] PTO librarian confirmed that these art units are currently in existance, but the art unit data has not been entered yet for these years.

[84] John R. Allison & Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 53 VAND. L. REV. 2099, 2114 (2000).

[85] *Id.*

[86] For example, an examiner can be associated with both 1611 and 1614, but usually not two completely unrelated technology groups. For example, an examiner is usually not associated with both technology centers 1600 and 1700.

[87] Lemley & Sampat 2011, *supra* note 4.

[88] Lemley & Sampat found that one examiner name (Ponnathapura Achutamurthy) was spelled no less than 20 different ways on the front page of issued patents. I have also corrected names of those examiners who were married between 2001-2011.

used a combination of programming and hand-editing to clean the examiner names. Additionally, similar to Lemley and Sampat, in my data set I treat the "working examiner" as the examiner who did the most direct work on that application: the secondary examiner (if present) or the primary examiner if there was no secondary examiner. Furthermore, I rely on Lemley and Sampat's previous results showing that there is no selection bias when applications are distributed among examiners.[89]

¶59 I note that there is a significant population of primary examiners who do not issue patents, but act in a supervisory role. These examiners work with multiple secondary examiners, reviewing their substantive actions. Reviewing rejections written by junior examiners may be a more efficient use of an experienced primary examiner's expertise. However, in our data set, these primary examiners are in a null set because I count the allowances toward the junior examiners, because the junior examiners are the ones who are doing most of the substantive work. These experienced primary examiners are in a null set because (1) I do not want to "double count" these patents under both a primary and secondary examiner count and (2) I believe this more accurately reflects PTO procedure.

¶60 In order to "stack the deck" in the PTO's favor, I have not counted those years in which an examiner issues one and only one patent. Accordingly the data set is right censored, in that I have removed many of the examiners with the lowest allowance rates. Accordingly, I have removed examiners that could fall within these categories: (1) those examiners who were only briefly at the PTO, but left before issuing more than one patent, (2) those examiners who are primary examiners who mainly review the work of secondary examiners but issued one patent by themselves, (3) those examiners who have issued one patent, but have not issued any since, (4) those examiners hired in December who may have issued only one patent because of the ramp up time, and (5) examiners who came back to the PTO and needed time to ramp up during their return year. Additionally, these data do not capture those examiners who truly have a zero allowance rate, since this data set only records those examiners who have issued at least one patent.

¶61 Certain aspects of the data set used by Lemley and Sampat are different than our data set. For example, Lemley and Sampat track approximately 10,000 patents filed in January 2001, which allows them to determine the fate of each application (allowance, abandonment, or still pending). Additionally, Lemley and Sampat's data set was filtered to remove "non-original" patents, such as PCT applications directed at foreign filings and filings based on earlier applications such as: (1) continuation, (2) continuations-in-part (CIPs), and (3) divisionals. In contrast, this data set contains a much larger number of events (over 1.5 million issued patents), which has not been filtered for "non-original" patents. Additionally, our data are tracked over time, and not simply a snapshot of one month. Accordingly, this data set can be used to evaluate rate data such as allowance rates per year per art unit.

¶62 Finally, our data set includes any patents and their corresponding allowed family members, such as continuations, continuations-in-part, divisional applications and PCT international priority applications. Because our data set is unfiltered, there is a two-fold limitation. First, some applications that have already been presented to the PTO (such as a continuation, CIP or divisional applications) are counted in the denominator, thus understating the chance of at least one patent being granted on one original application. Second, more than one patent may issue based on continuations and related applications. Thus, including these issued family members in the numerator overstates the grant rate.

¶63 Therefore, because this dataset is unfiltered for continuations, continuation in parts, and divisional applications, the problem is twofold. First, the denominator problem will be more pronounced in the later filed applications where several family members may still be in prosecution without an allowance. Second, the numerator problem will be more pronounced in the earlier filed applications where many family members may have completed prosecution through to issuance.

[89] See *infra* Part IV.

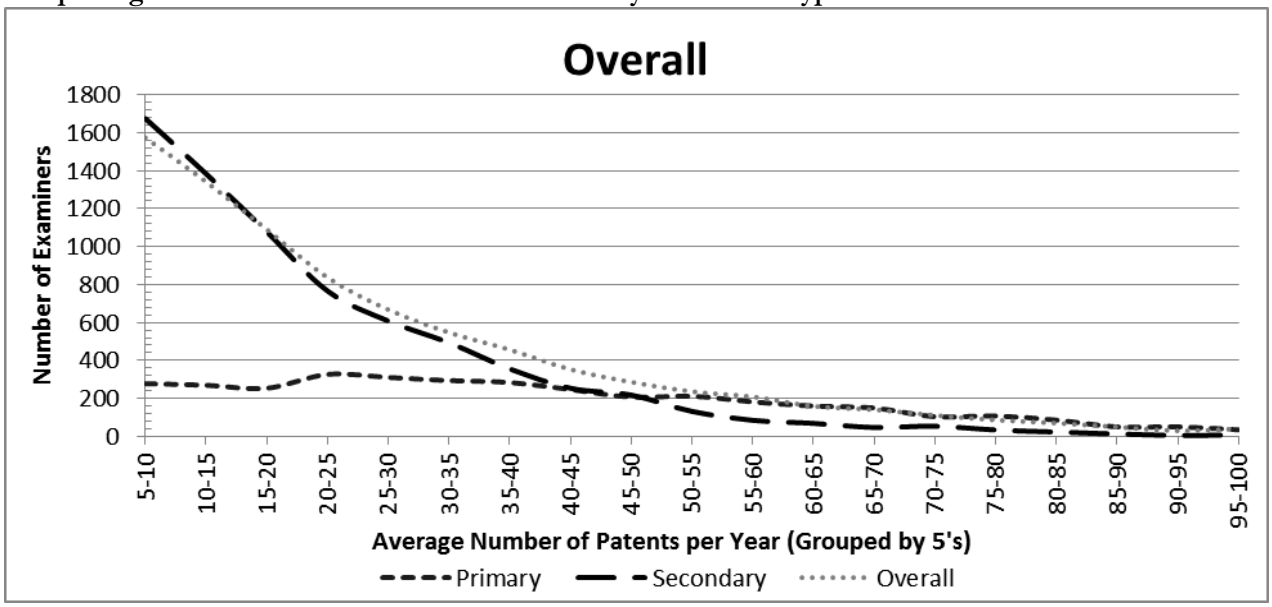
VI. RESULTS

A. Allowance Rates – General Issuance Trends

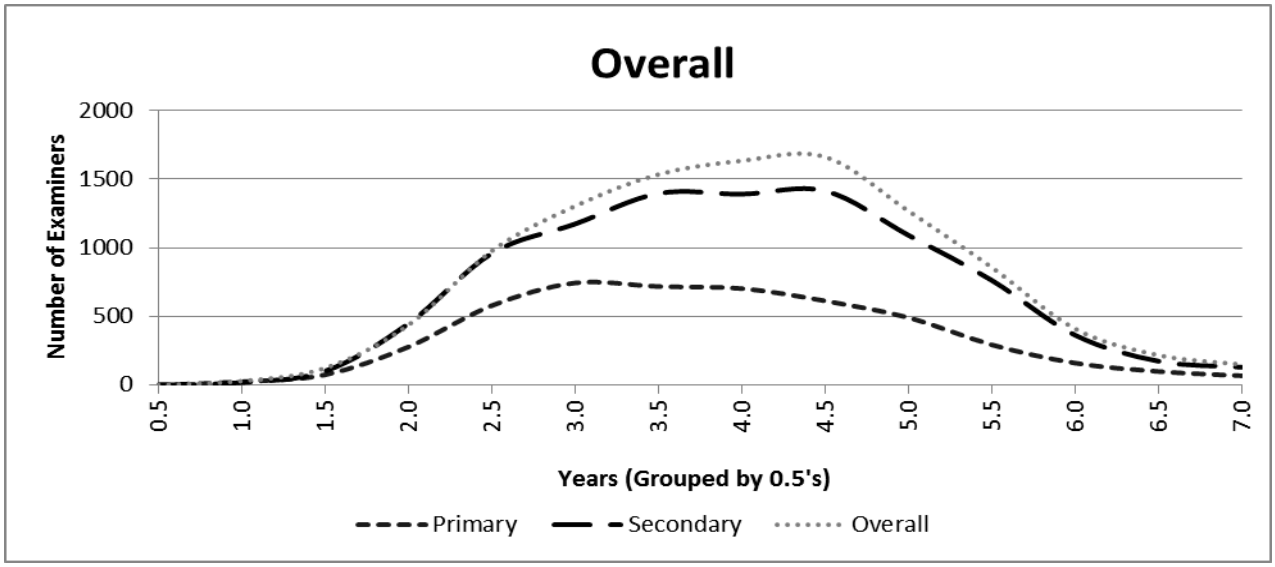
¶64 We begin by confirming some results found in the Lemley and Sampat studies. First, I confirm that secondary examiners issue patents at a much lower rate than primary examiners. Uniformly across all art units, primary examiners issue patents at higher rates than secondary examiners. Furthermore, the higher ends of the spectrum (those examiners that issue the highest number of patents per year) are only populated by primary examiners. I characterize low volume examiners as those secondary examiners who, on average, issue less than five (5) patents per year. I characterize high volume examiners as those primary examiners who, on average, issue more than fifty (50) patents per year.

¶65 Technology types vary dramatically, for example, biotechnology patents may take longer to review and issue compared to mechanical inventions. Interestingly, the trends for primary and secondary examiner behavior were independent of art unit (see Figure 1). No matter what the art unit, secondary examiners on average issued fewer patents than primary examiners. Furthermore, the examiners issuing the highest number of patents were populated mostly by primary examiners. Finally, independent of art unit, the lowest volume examiners took a longer amount of time to issue patents (see Figures 2 and 3). The dotted line that represents "Both" are those examiners who were listed as both a primary and a secondary examiner (most likely those examiners who were transitioning between an advancement from secondary examiner to primary examiner). In the appendix below, Figures 1, 2 and 3 have been broken down by specific technology centers. As seen in these figures, the trends are nearly identical.

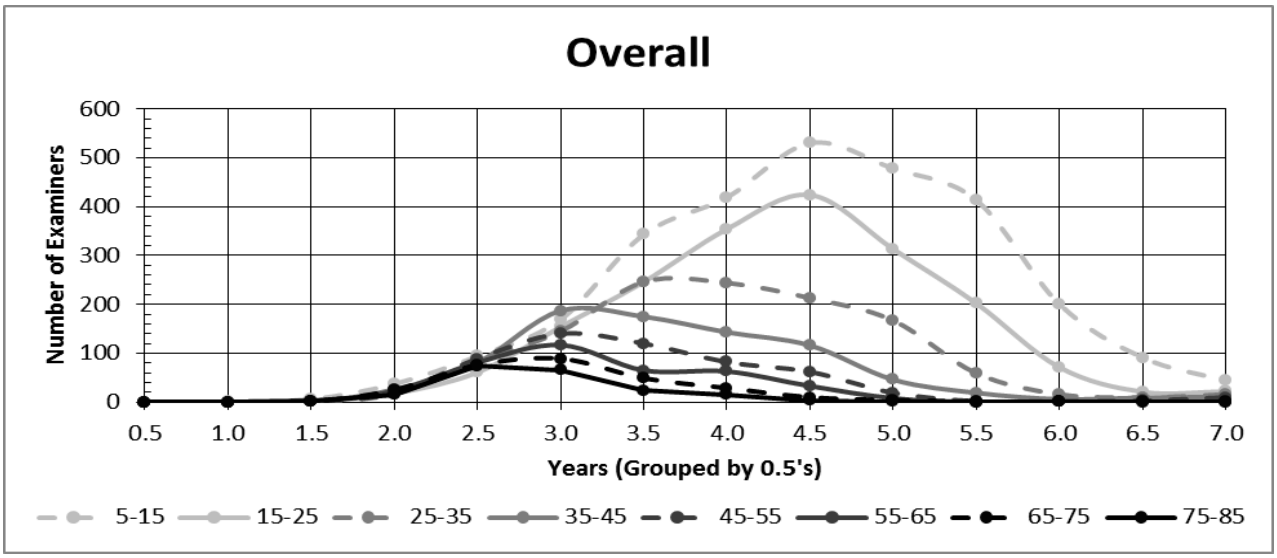
Sample Figure 1 - Overall Patent Allowance Rate by Examiner Type



Sample Figure 2 - Overall Average Patent Prosecution Duration by Examiner Type



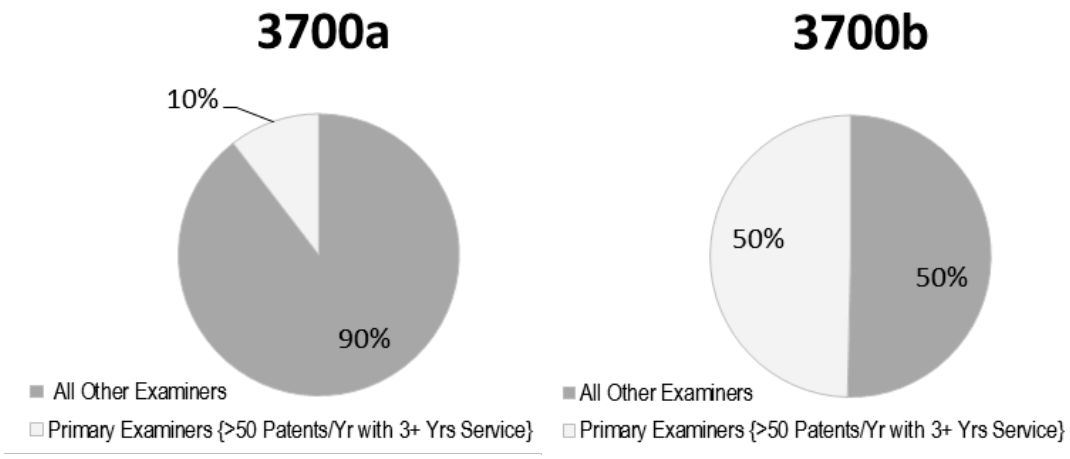
Sample Figure 3 - Overall Prosecution Duration by Examiner Allowance Rate



¶66 On the high end of the spectrum, there is a significant population of primary examiners who have 3 or more years of experience and allow an average of more than 50 patents per year, which may also create problems for the patent system.[90] This population of primary examiners accounts for a disproportionate number of issued patents (see Figures 4a and 4b). For example, in technology center 3700, primary examiners who issue on average over 50 patents per year (for at least 3 years) account for 12% (approximately 200 high volume examiners) of the examiners (there are approximately 1800 total examiners in technology center 3700). However, this population of high volume examiners issue approximately 51% of the patents from this technology center (120,822 out of 235,686 patents).

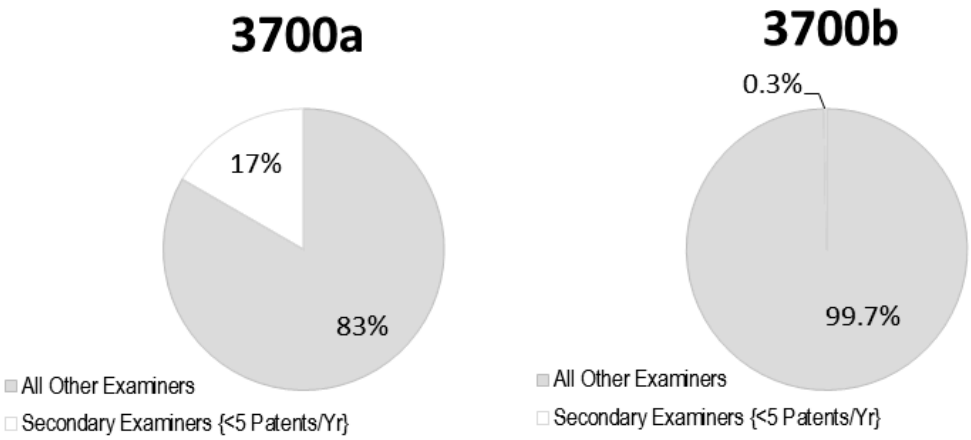
[90] An applicant who encounters one of these primary examiners may have an easier time getting his patent allowed. *See infra* Part II.C

Sample Figures 4a and 4b



¶67 On the low end of the spectrum, there is a significant population of secondary examiners who do not allow more than 5 patents per year (see Figures 5a and 5b). This population of secondary examiners accounts for a significant portion of the art unit examination core, but issue very few patents. For example, in technology center 3700, secondary examiners who issue on average fewer than 5 patents per year account for approximately 17% (more than 300 examiners) of the examination core for 3700, but issue approximately only 0.35% of the total patents coming from that technology center (823 out of 235,686 patents).

Sample Figures 5a and 5b

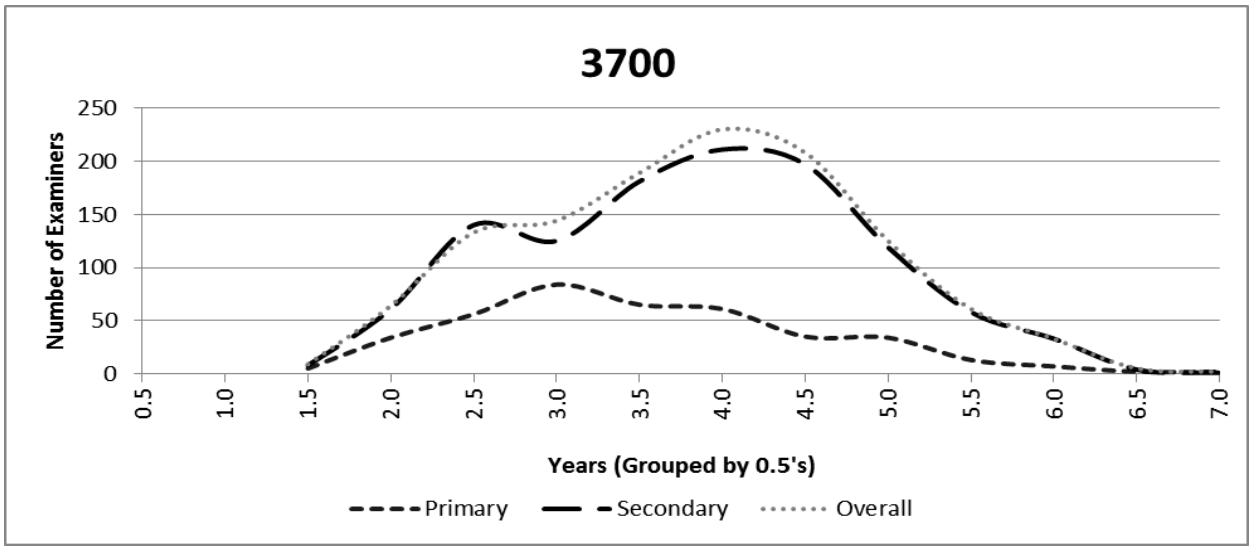


B. Allowance Rates – General TimingTrends

¶68 Unsurprisingly, duration in prosecution varies dramatically by art unit. The data demonstrates that the lower volume examiners (those who issue less than 5 patents per year) take much longer to issue a patent than those examiners who issue a higher volume of patents. These effects are also dependent on art unit. However, the trends are fairly consistent. Primary examiners, in general, issue patents in a shorter amount of time when compared to secondary examiners (Figure 2). This trend makes sense because primary examiners are given a shorter amount of time to review applications when compared to secondary examiners. For example, in technology center 3700, primary examiners

take approximately 3 years to issue a patent. In contrast, secondary examiners in 3700 take approximately 4 years to issue a patent.

Sample Figure 2

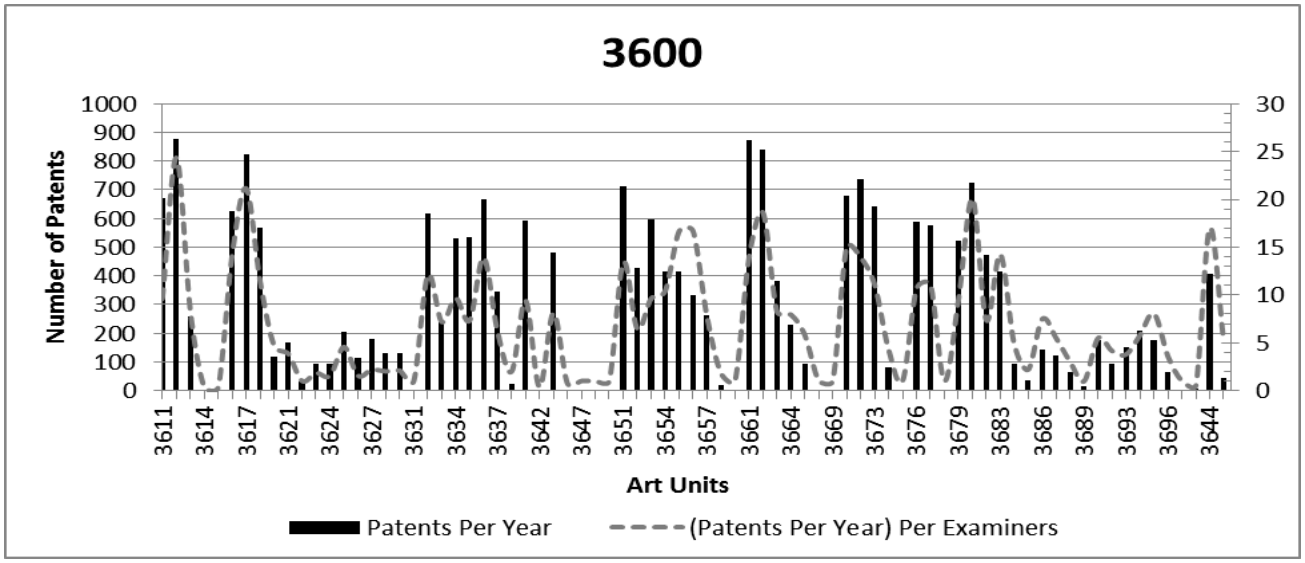


¶69 In this data set, earlier filed applications (pre-1995 applications) will, of course, experience a longer period of prosecution. Similarly, applications filed recently (between 2010 and 2011), will necessarily experience a shorter time in prosecution. However, because this data set focuses only on issued patents, each year contains an assortment of patents that issue with both early filing dates and recently filed applications. Thus, this dataset accurately reflects the general length of prosecution, because each decade has short and long duration patents at the margins.

¶70 Finally, I analyzed the patent allowance rates by art unit, and compared this to the normalized examiner output in each art unit (average number of patents per year per examiner in each art unit). These data help determine if any one art unit is disproportionately represented, and if any one group of examiners has an unexpectedly high output, thereby skewing the data. The trend is fairly consistent that art units with a high number of issued patents also have a higher output per examiner. See Figure 6. This suggests that art units that issue more patents do not do so by simply adding more examiners that issue patents at the same rate, but have examiners that issue patents at a higher rate. One explanation could be that examiners in art units with high application volumes feel institutional pressure to allow more patents. However, without data on the number of applications filed in each art unit, it is impossible to verify this hypothesis.

¶71 For example, as shown in the figure below for technology center 3600, art unit 3617 issued approximately 876 patents between 2001 and 2011. This corresponds to an average of approximately 23.6 patents allowed per examiner in 3617. In contrast, art unit 3619 issued approximately 94 patents between 2001 and 2011. This corresponds to an average of approximately 3.75 patents allowed per examiner in 3619. Thus, examiners in each art unit behave differently. If examiners behaved identically between art units (which they do not), the dotted line would have been a straight line, which would have suggested that adding more examiners would alleviate the backlog problem. However, these data show that examiners between art units are issuing patents at different rates, and so adding examiners may not be the best way to alleviate the patent backlog problem. I note that these are results are generally consistent between all technology centers.

Sample Figure 6



¶72 In sum, these data suggest that there are two very different populations of examiners. In the first group, there is a significant population of secondary examiners who, on average, issue very few patents per year, compared to the rest of examiners in the same technology center. In the second group, there is a significant population of primary examiners who, on average, issue a disproportionately high number of patents per year. These two populations of examiners exist in every technology center, which suggests that this phenomena occurs independent of technology type.

¶73 The first group that allows few patents may create problems for the patent system because they are not allowing "good patents." The second group that allows many patents may create problems for the patent system because they are not filtering out "bad patents." Most likely, these differences are due to experience, tenure effects and different incentives created by the count system.

C. Possible Interpretations

¶74 Lemley and Sampat show that secondary examiners cite more prior art than their primary examiner counterparts.[91] There may be several reasons for this observation. First, as Lemley and Sampat suggest, secondary examiners may be citing more prior art because they are doing a more complete search. An alternative rationale may be because these secondary examiners are citing more prior art in successive office actions to garner more counts. These accounts are not mutually exclusive.

¶75 The count system provides an explanation for both primary examiners who issue many patents and secondary examiner who issue very few patents. As Jaffe and Lerner suggest, some examiners have an incentive to "go easy" on inventors and allow the application. Primary examiners should fall into this category more than secondary examiners, since they are under less scrutiny when they allow a case. Additionally, primary examiners may know how to efficiently conduct a search and also know what claim language is narrow enough to avoid existing prior art. Furthermore, due to the time pressures, primary examiners may focus on internal patentability issues within the application without doing a through prior art search.[92] Lemley and Sampat have recently shown that U.S. examiners are

[91] Lemley & Sampat 2011, *supra* note 4, at 22.

[92] Primary examiners seem to reject based on 35 U.S.C. § 112, first and second paragraph (written description, enablement, and definiteness rejections) more than secondary examiners, especially with respect to art rejections based on 35 U.S.C. § 102 (novelty) or 35 U.S.C. § 103 (obviousness).

most adept at citing to U.S. patents, rather than non-patent literature such as journal articles.[93] It may be that these experienced primary examiner are able to allow cases faster because they already know the U.S. patent landscape, and thus know what may be patentable over U.S. patent prior art. Thus, primary examiners are better suited to maximize their counts by allowing a high number of patents. Accordingly, our data show that secondary examiners do not issue more than 120 patents per year.

¶76 In contrast, as described above, secondary examiners may have an incentive to maximize their counts by rejecting applications. Because secondary examiners are under more scrutiny when they allow a case, they may be more careful and issue rejections as a default. Careful analysis by an examiner *ex ante* can lead to better and narrower patents, resulting in decreased litigation. However, bad rejections and prolonged prosecution can stifle innovation and increase costs for innovators. Additionally, there are a host of mechanisms by which secondary examiners can obfuscate bad rejections and still garner counts. Our data show that a much higher percentage of secondary examiners than primary examiners issue fewer than 5 patents per year.[94]

D. Implications and Possible Solutions

¶77 One underlying theme in the studies done by Lemley and Sampat is that more rejections results in "better" patents, and that more prior art rejections result in stronger patents. It is true that more rejections may narrow the scope of the patent such that more information disclosed in the application remains unclaimed. However, it may also be true that the applicant did not need to narrow the claims in the first place, if the full scope of the original claims were novel, non-obvious, useful, enabled and fully described. As shown above, there could be a population of applications that may be valid but are rejected simply because of poor or inconsistent examination.

¶78 This study finds that there is significant population of examiners who have a surprisingly low allowance rate. As discussed above, it would be unlikely that selection factors cause these examiners to get "harder" patents. Thus, I suggest that the rejections from these examiners should be carefully scrutinized. Perhaps a quality control group should be established by which applicants could submit particularly egregious rejections. This is especially important if the examiner is a primary examiner who is subject to less scrutiny for "bad" rejections. Alternatively, another strategy to avoid bad rejections would be to punish examiners who engage in this behavior by removing their counts. In particular, if the BPAI or a quality control group reverses an examiner rejection, counts for those actions could not be credited to the examiner. While applicants may bring appeals based on uncertainty in the law, judgments that are clearly one sided for the applicant should result, at a minimum, in the loss of counts. Punishment for bad rejections would dampen their effects by removing some of the incentives for issuing them.

¶79 Alternatively, the PTO could *sua sponte* review rejections from this population of examiners at a higher rate. When rejections are reviewed in isolation and out of context, they may look like valid rejections when in fact they are erroneous. Accordingly, rejections should be looked at from the full prosecution history and not in isolation. The PTO can also employ this to review examiners with a high issue rate. Lemley and Sampat suggest that a "second pair" of eyes seems correlated with a significant increase in actual rejections.[95] I believe, however, that this system is useful not only for those examiners that have a high volume of issued patents, but also for examiners with a very low volume of issued patents.[96]

¶80 Additionally, this study shows that there is a small but significant population of primary examiners who have a surprisingly high allowance rate. This population of examiners may be acting

[93] Mark A. Lemley & Bhaven Sampat, *Examining Patent Examination*, 2010 STAN. TECH. L. REV. 2 (2010).

[94] This, of course, could also be explained by the fact that primary examiners have more experience and thus will be able to issue more allowances in a shorter period of time. Similarly, secondary examiners may need more time to issue their first few patents due to their lack of experience.

[95] Lemley & Sampat 2008, *supra* note 4, at 201–02.

[96] This extra pair of eyes strategy may be less effective for low volume secondary examiners simply because they already have an "extra pair of eyes" in the review process, namely the primary examiner. However, this strategy may be more effective for primary examiners who have a very low allowance rate.

as a "rubber stamp." I suggest that the allowances from these examiners should also be carefully scrutinized, especially for patents that were allowed without rejections or claim amendments.

¶81 Finally, like Lemley and Sampat's data,[97] ours suggests that examiner assignment plays a significant role in whether the patent is allowed. If patents are rewards for disclosing innovation, then our current system may be failing in two distinct ways. First, our patent system may not reward some true inventors by issuing too many rejections. Second, our current system may unjustifiably reward others who are able to quickly obtain a patent with broad claims, based entirely on the examiners they draw. If the characteristics of the specific patent examiners indeed play a large role in an applicant's ability to obtain a patent, as this study concludes, we must seriously reconsider patent law's presumption of validity.[98]

Table 1 - Percent of Examiners with Low / High Allowance Rates

Technology Center 1600	Amount	% Chance (from subgroup)	% Chance (from all Examiners)	%Total Patents Issued
Total Secondary Examiners	**943**	**100%**	**61%**	**37%**
Fewer than 5 issued patents/yr	320	33.9%	20.7%	0.8%
Fewer than 5 issued patents/yr with at least 3 years at PTO	28	1.8%	1.8%	0.3%
Total Primary Examiners	**601**	**100%**	**39%**	**63%**
More than 50 issued patents/yr	93	15.5%	6%	31%
More than 50 issued patents/yr with at least 3 years at PTO	86	14.3%	6%	30%

Technology Center 1700	Amount	% Chance (from subgroup)	% Chance (from all Examiners)	%Total Patents Issued
Total Secondary Examiners	**858**	**100%**	**60.5%**	**31.9%**
Fewer than 5 issued patents/yr	201	23.4%	14.2%	0.4%
Fewer than 5 issued patents/yr with at least 3 years at PTO	20	2.3%	1.4%	0.2%
Total Primary Examiners	**561**	**100%**	**39.5%**	**68.1%**
More than 50 issued patents/yr	136	24.2%	9.6%	41.9%
More than 50 issued patents/yr with at least 3 years at PTO	128	22.8%	9%	41.5%

[97] Lemley & Sampat 2011, *supra* note 4, at 24.

[98] Douglas Lichtman & Mark Lemley, *Rethinking Patent Law's Presumption of Validity*, 60 STAN. L. REV. 45 (2007); *see also* Douglas Lichtman, *Rethinking Prosecution History Estoppel*, 71 U. CHI. L. REV. 151 (2004).

Technology Center 2100	Amount	% Chance (from subgroup)	% Chance (from all Examiners)	%Total Patents Issued
Total Secondary Examiners	**1325**	**100%**	**69%**	**49.6%**
Fewer than 5 issued patents/yr	435	32.8%	22.6%	1.4%
Fewer than 5 issued patents/yr with at least 3 years at PTO	43	3.2%	2.2%	0.5%
Total Primary Examiners	**596**	**100%**	**31%**	**50.4%**
More than 50 issued patents/yr	47	7.9%	2.4%	15.7%
More than 50 issued patents/yr with at least 3 years at PTO	41	6.9%	2.1%	15.3%

Technology Center 2400	Amount	% Chance (from subgroup)	% Chance (from all Examiners)	%Total Patents Issued
Total Secondary Examiners	**670**	**100%**	**72%**	**53%**
Fewer than 5 issued patents/yr	191	29%	21%	2%
Fewer than 5 issued patents/yr with at least 3 years at PTO	79	12%	9%	1%
Total Primary Examiners	**258**	**100%**	**28%**	**47%**
More than 50 issued patents/yr	93	36%	10%	23%
More than 50 issued patents/yr with at least 3 years at PTO	64	25%	7%	10%

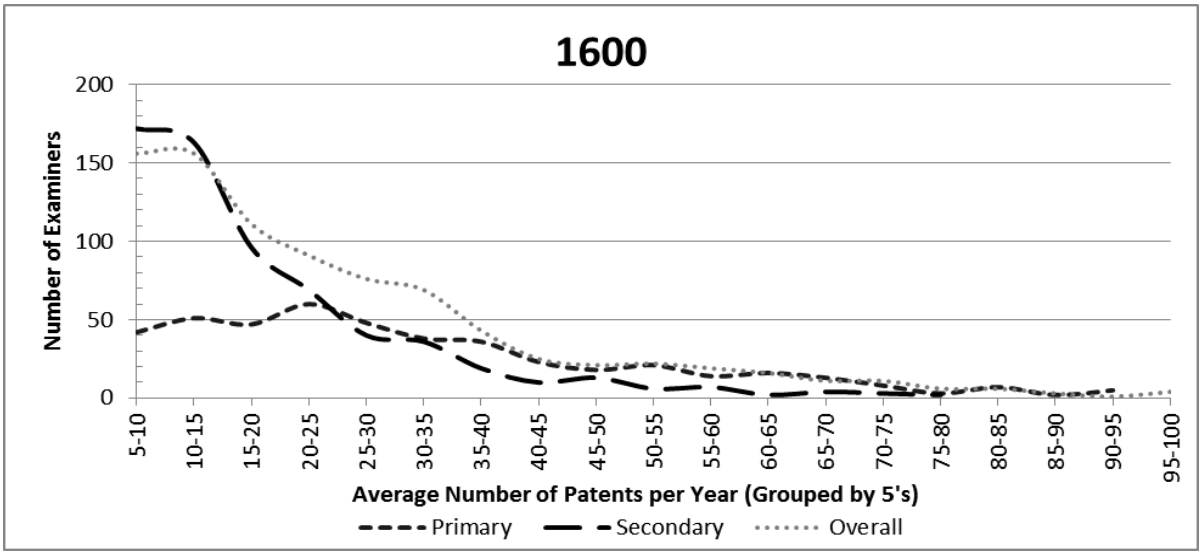
Technology Center 2600	Amount	% Chance (from subgroup)	% Chance (from all Examiners)	%Total Patents Issued
Total Secondary Examiners	**1434**	**100%**	**69%**	**44%**
Fewer than 5 issued patents/yr	405	28%	19%	1%
Fewer than 5 issued patents/yr with at least 3 years at PTO	15	1%	1%	0.13%
Total Primary Examiners	**653**	**100%**	**31%**	**56%**
More than 50 issued patents/yr	145	22%	7%	33%
More than 50 issued patents/yr with at least 3 years at PTO	131	20%	6%	32%

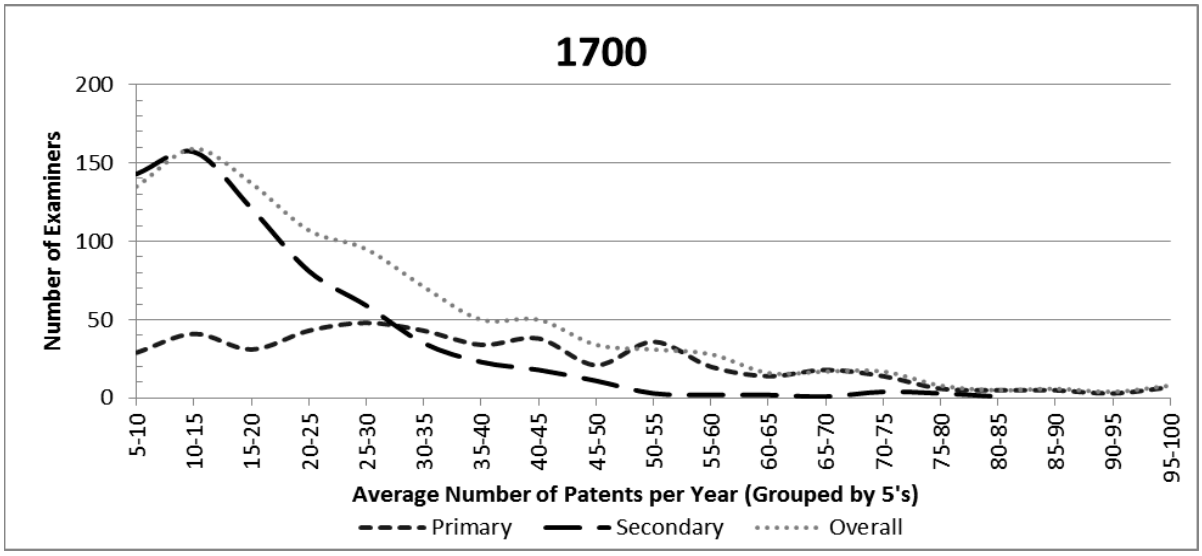
Technology Center 2800	**Amount**	**% Chance (from subgroup)**	**% Chance (from all Examiners)**	**%Total Patents Issued**
Total Secondary Examiners	**2102**	**100%**	**64%**	**51%**
Fewer than 5 issued patents/yr	515	25%	16%	0.17%
Fewer than 5 issued patents/yr with at least 3 years at PTO	11	1%	0.33%	0.02%
Total Primary Examiners	**1161**	**100%**	**36%**	**49%**
More than 50 issued patents/yr	468	40%	14%	43%
More than 50 issued patents/yr with at least 3 years at PTO	425	37%	13%	43%

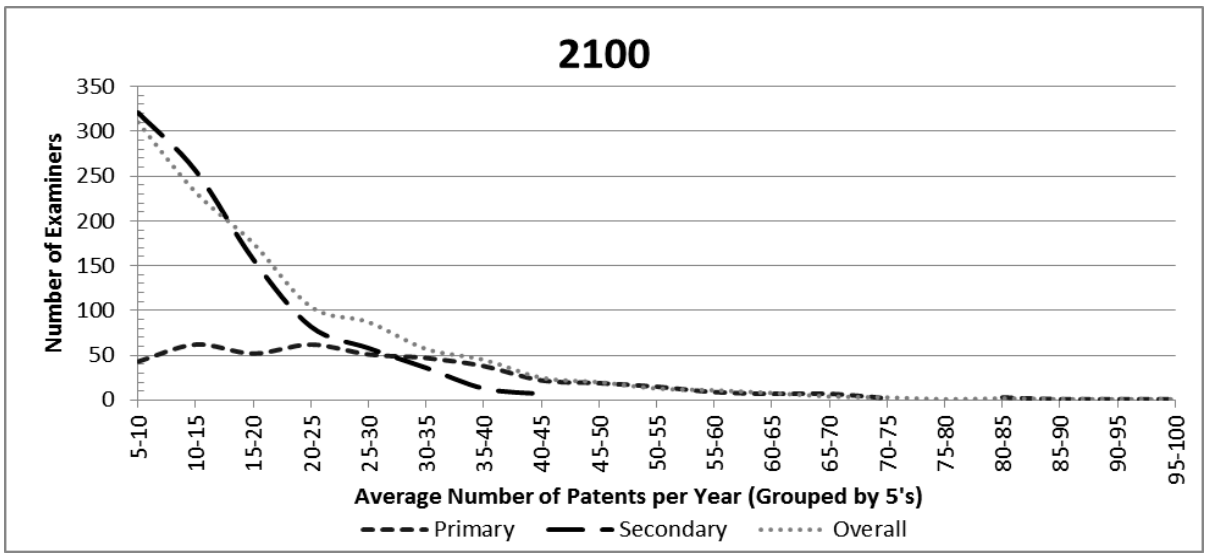
Technology Center 3600	**Amount**	**% Chance (from subgroup)**	**% Chance (from all Examiners)**	**%Total Patents Issued**
Total Secondary Examiners	**1218**	**100%**	**62%**	**39%**
Fewer than 5 issued patents/yr	366	30%	19%	1%
Fewer than 5 issued patents/yr with at least 3 years at PTO	40	3.3%	2%	0.24%
Total Primary Examiners	**760**	**100%**	**38%**	**61%**
More than 50 issued patents/yr	177	23.3%	9%	44%
More than 50 issued patents/yr with at least 3 years at PTO	156	20.5%	8%	44%

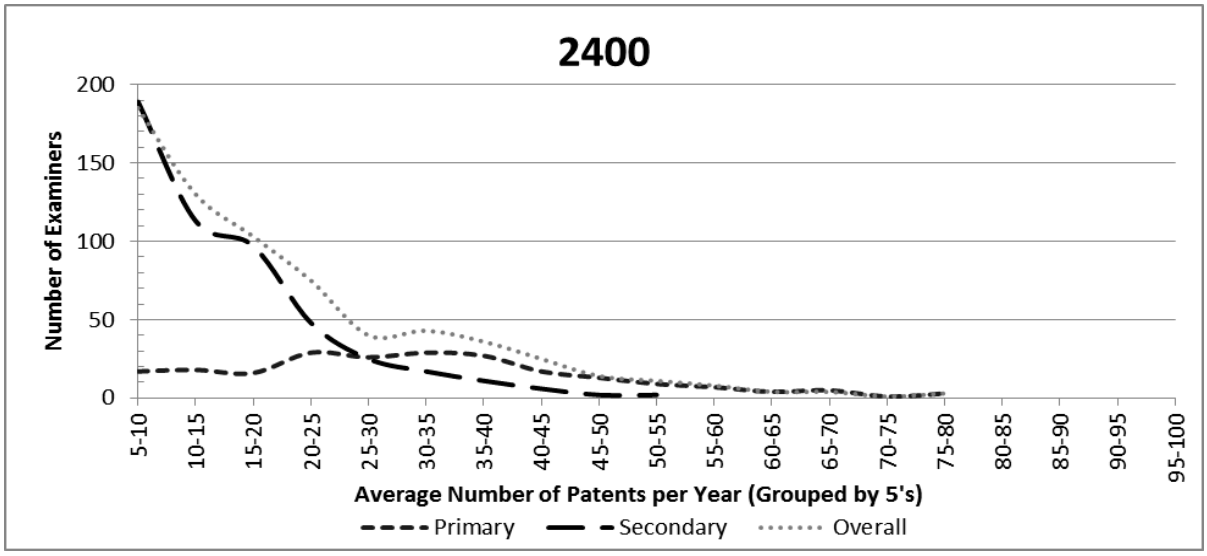
Technology Center 3700	**Amount**	**% Chance (from subgroup)**	**% Chance (from all Examiners)**	**%Total Patents Issued**
Total Secondary Examiners	**1341**	**100%**	**66%**	**37%**
Fewer than 5 issued patents/yr	337	25%	17%	0.34%
Fewer than 5 issued patents/yr with at least 3 years at PTO	6	0.4%		0.03%
Total Primary Examiners	**680**	**100%**	**34%**	**63%**
More than 50 issued patents/yr	223	32.8%	11%	0.07%
More than 50 issued patents/yr with at least 3 years at PTO	211	31%	10%	49.66%

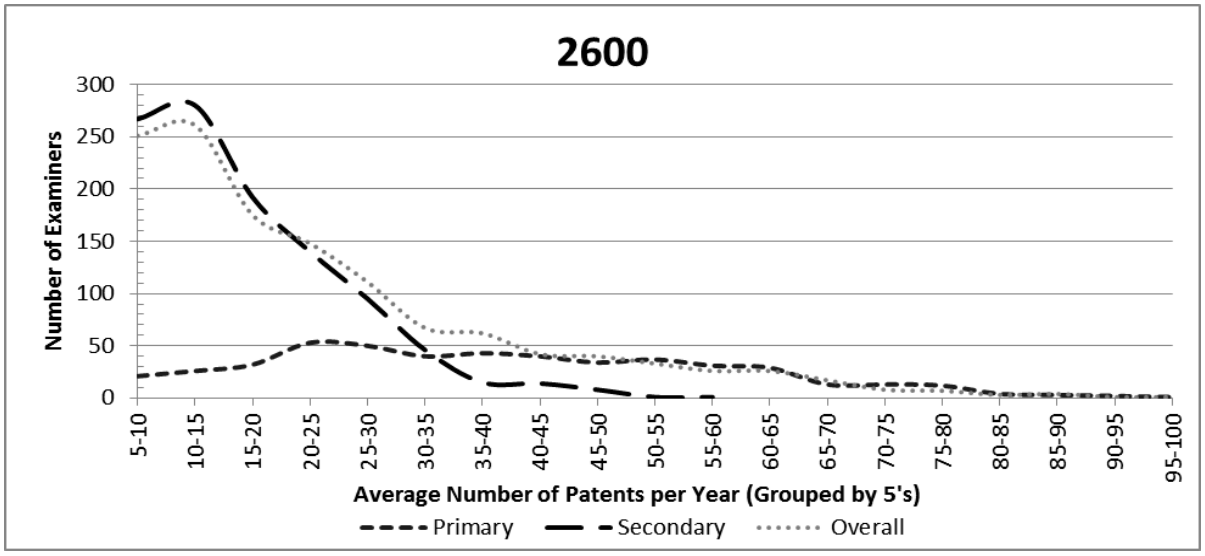
Figure 1 - Patent Allowance Rate by Examiner Type

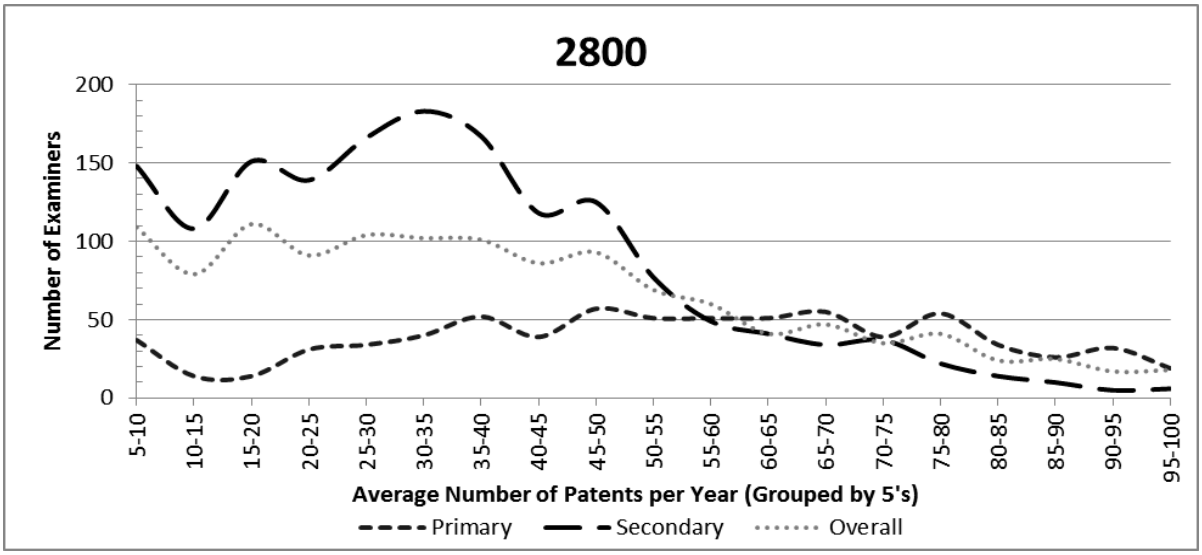


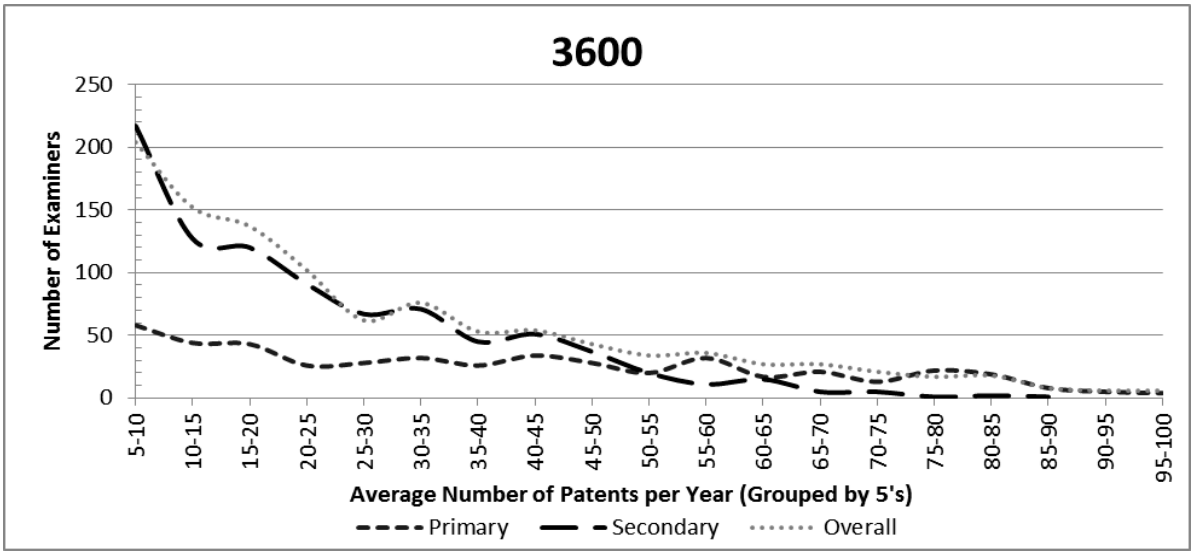


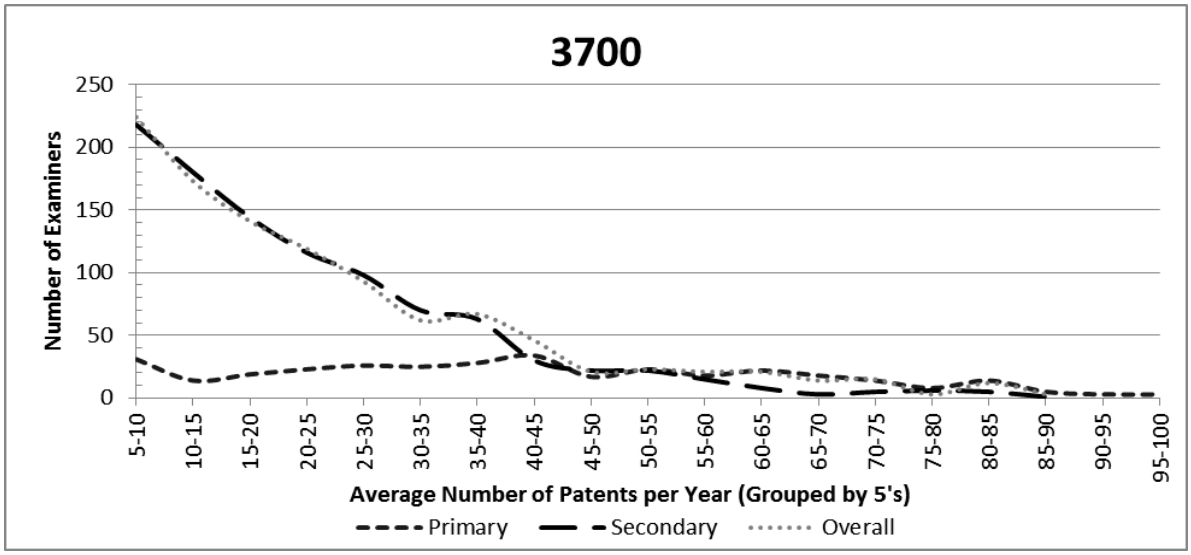












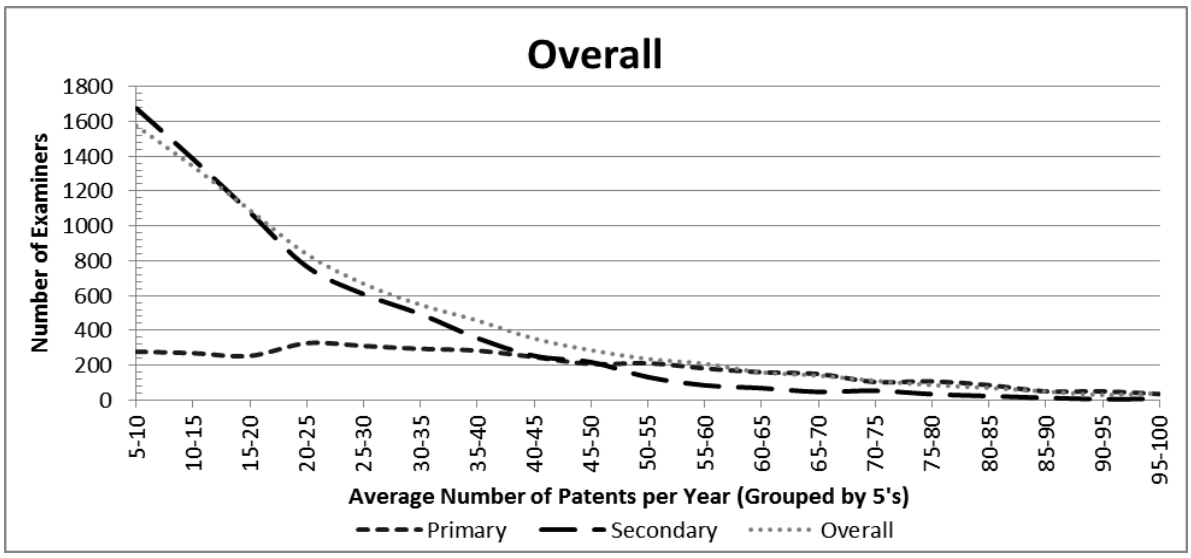
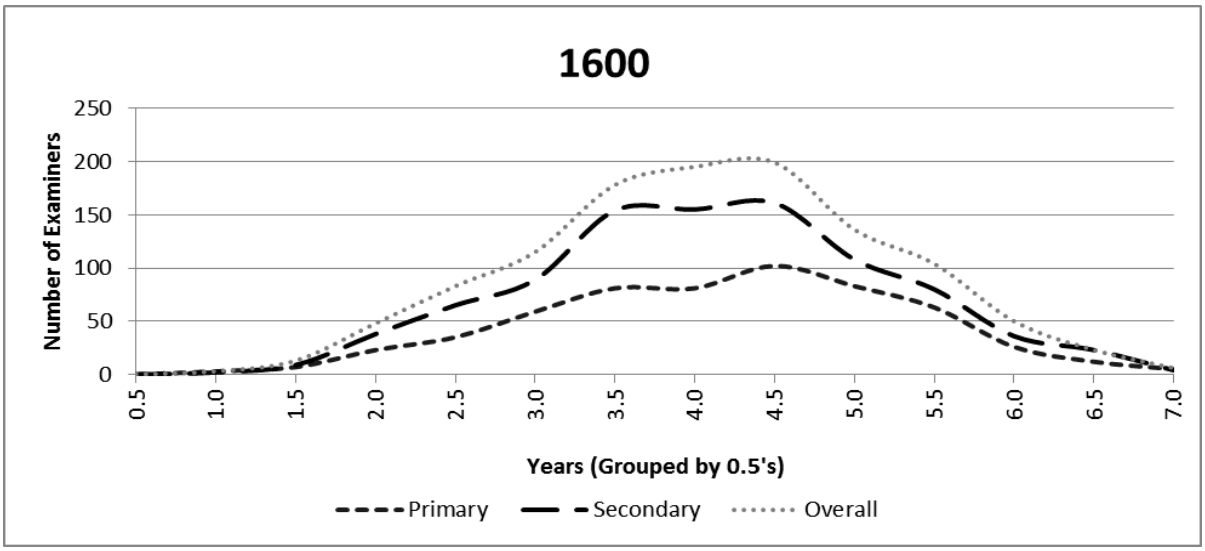
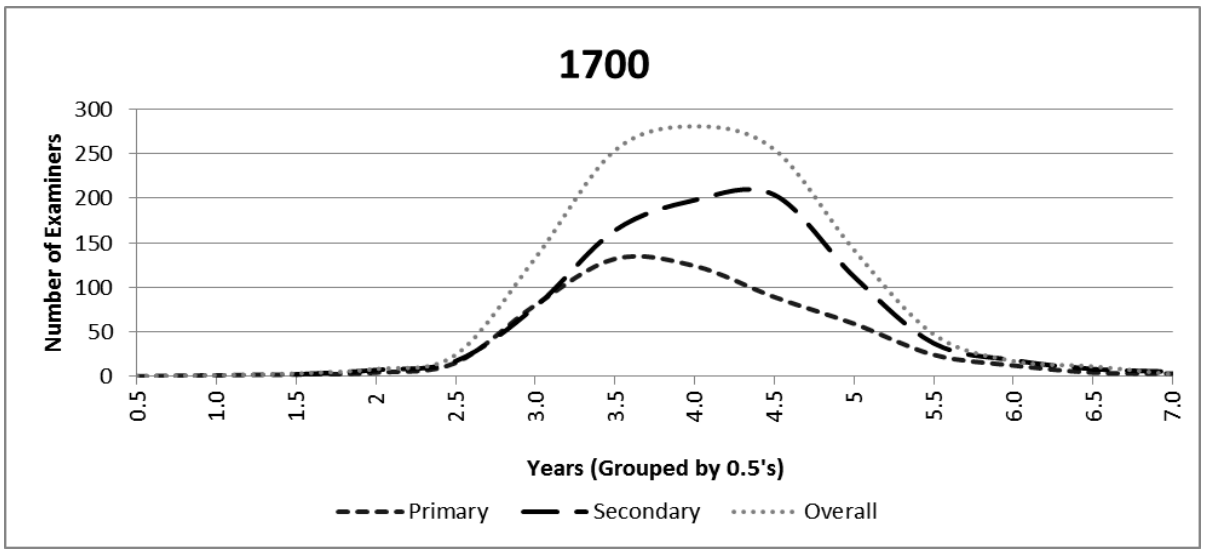
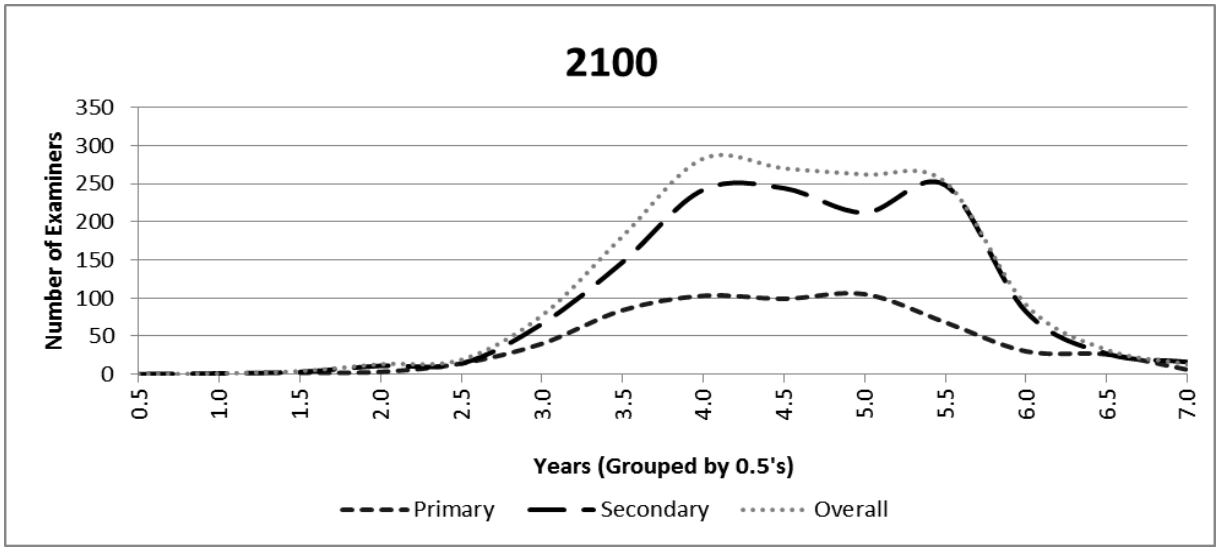
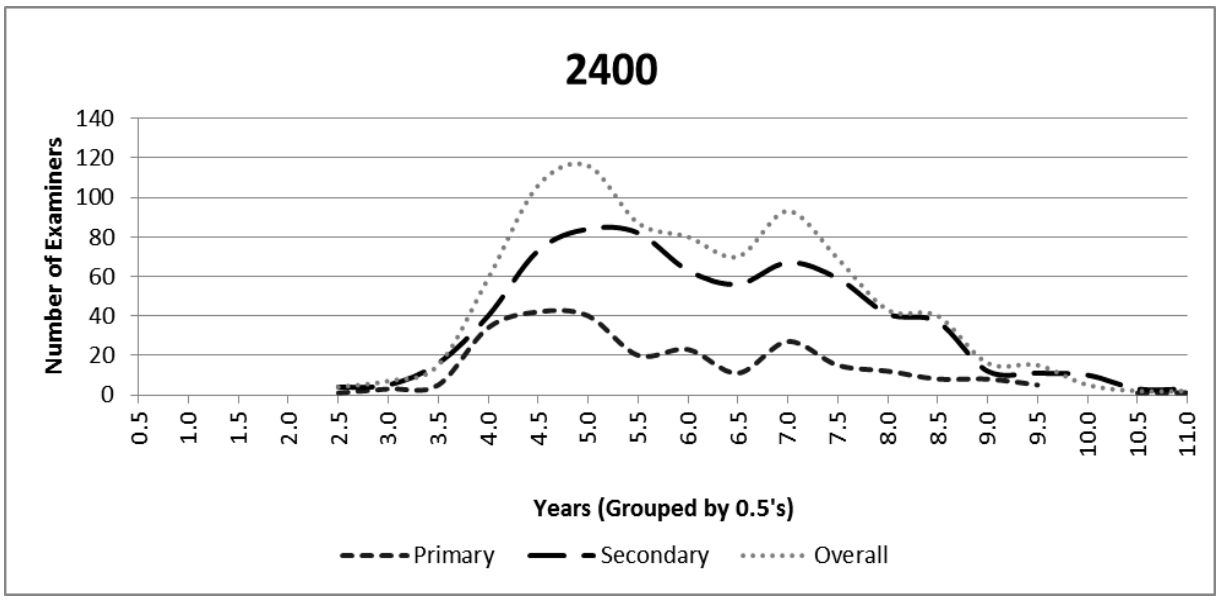


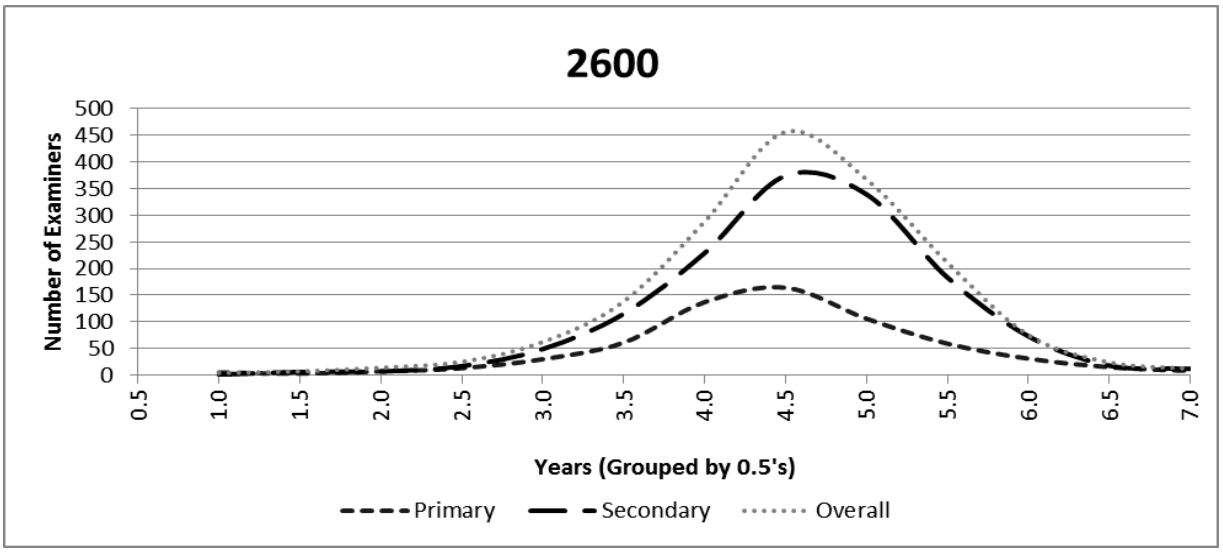
Figure 2 - Average Patent Prosecution Duration by Examiner Type

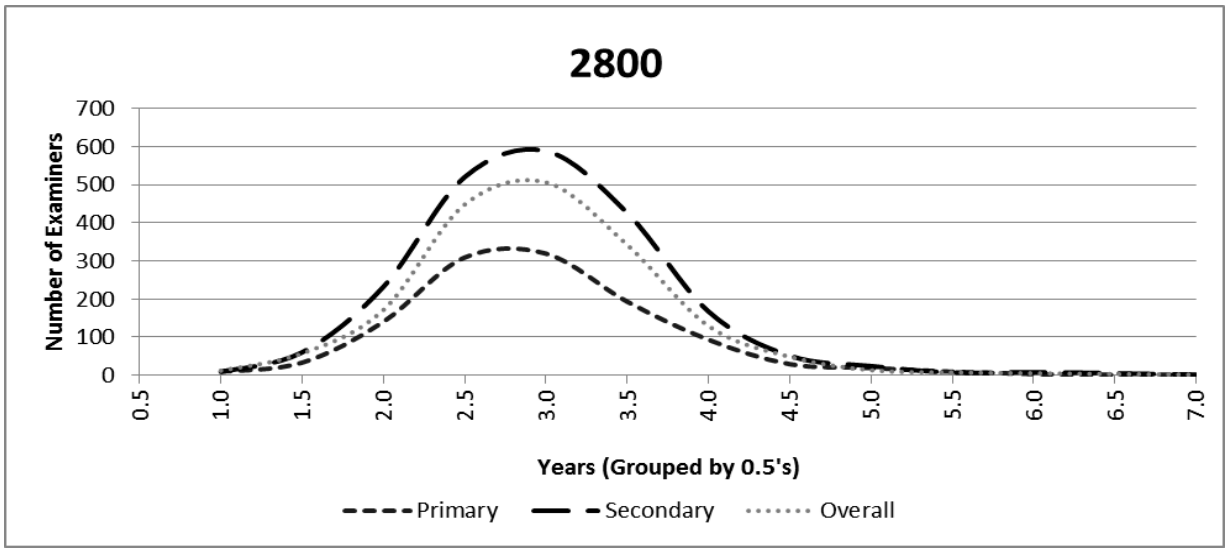


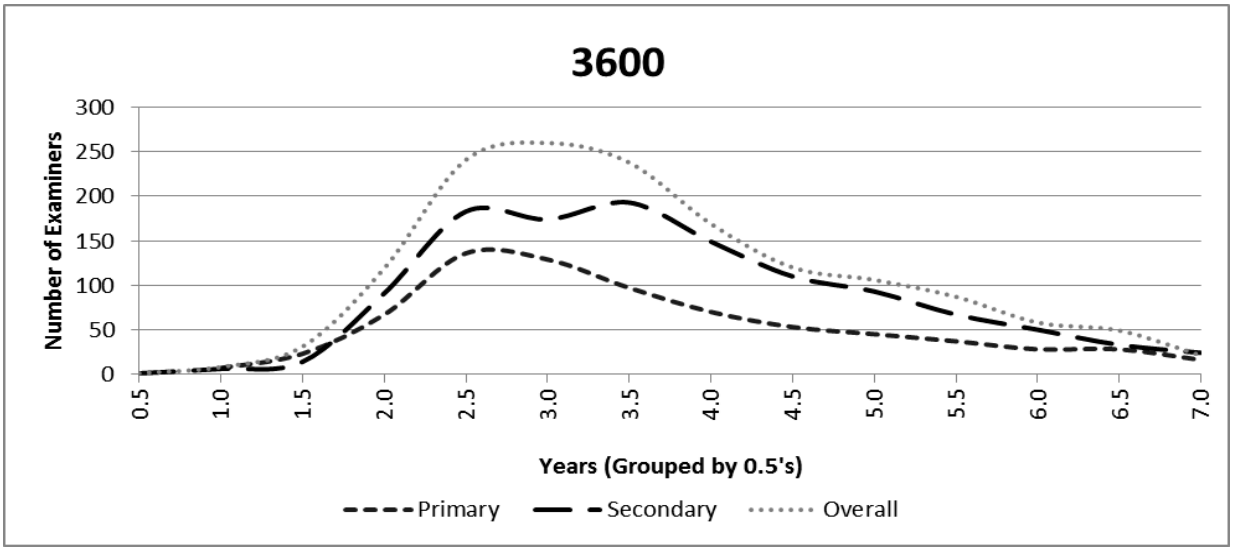


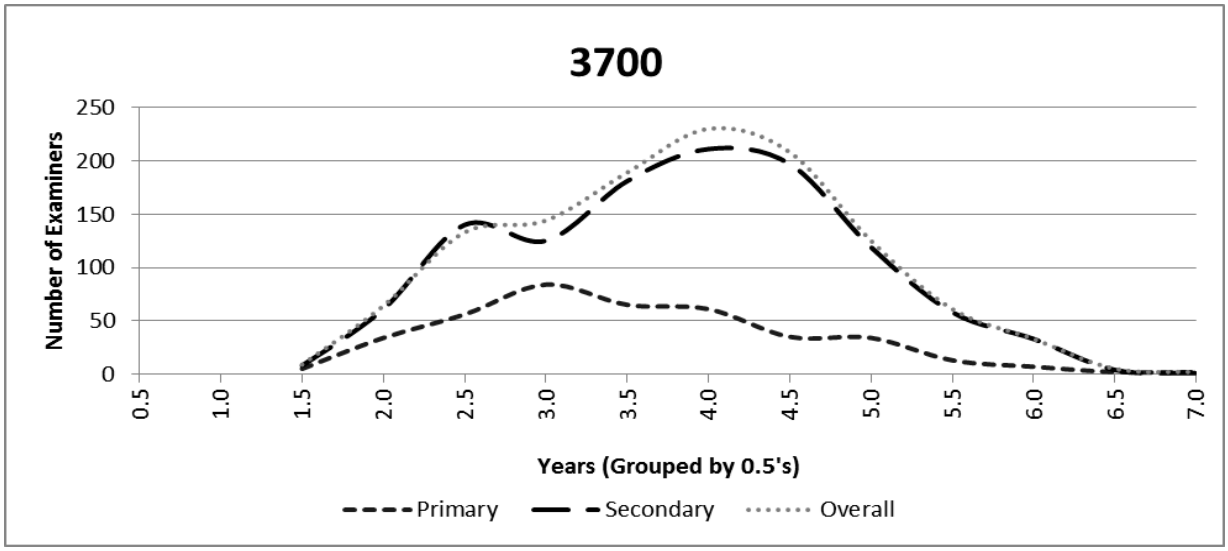












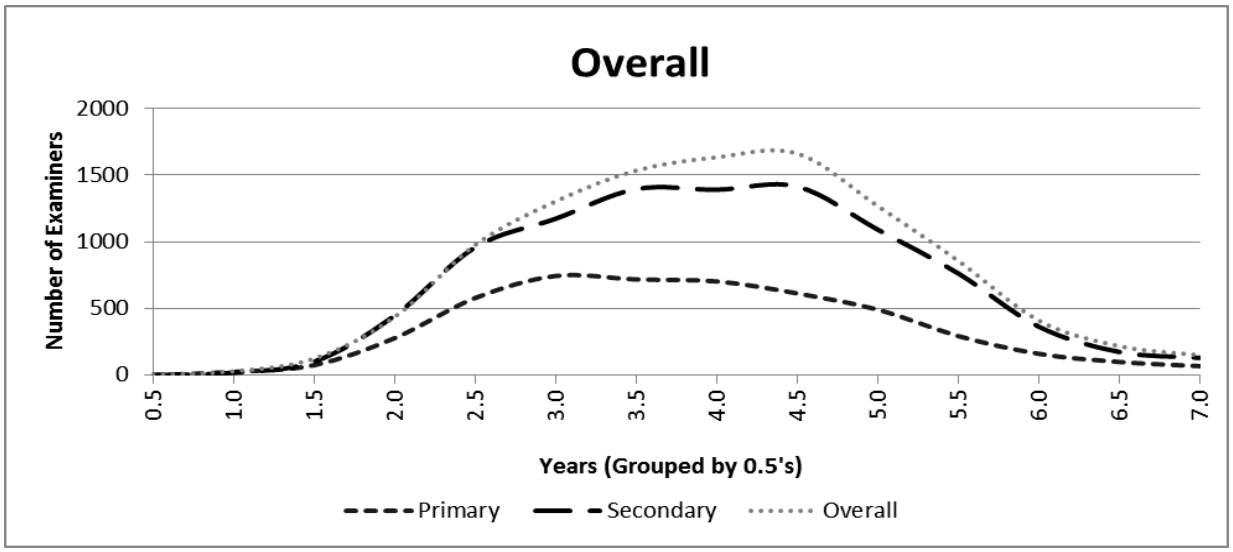
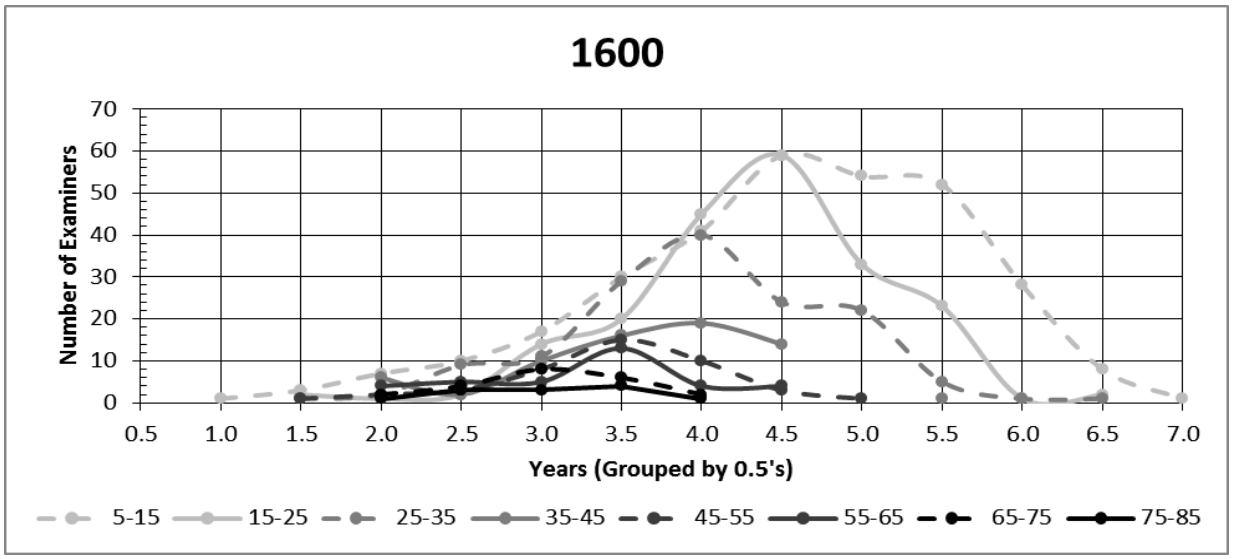
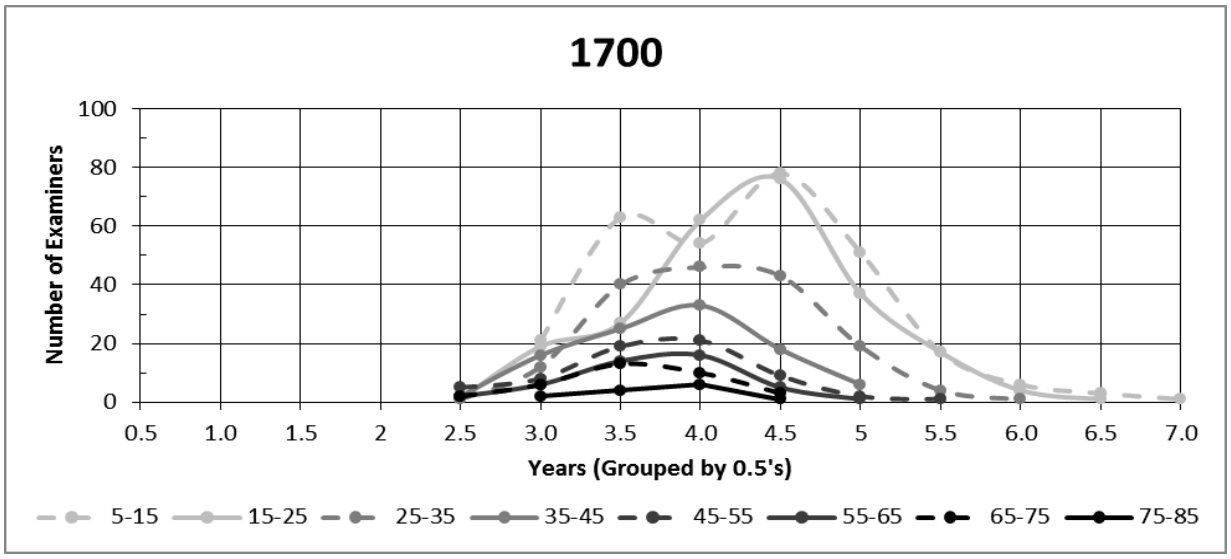
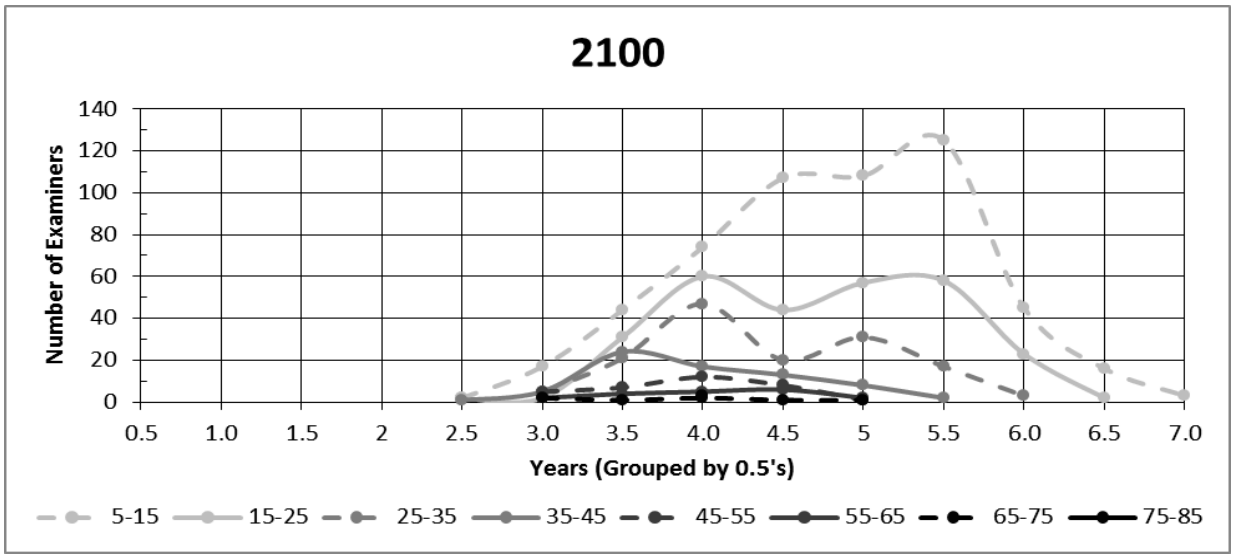
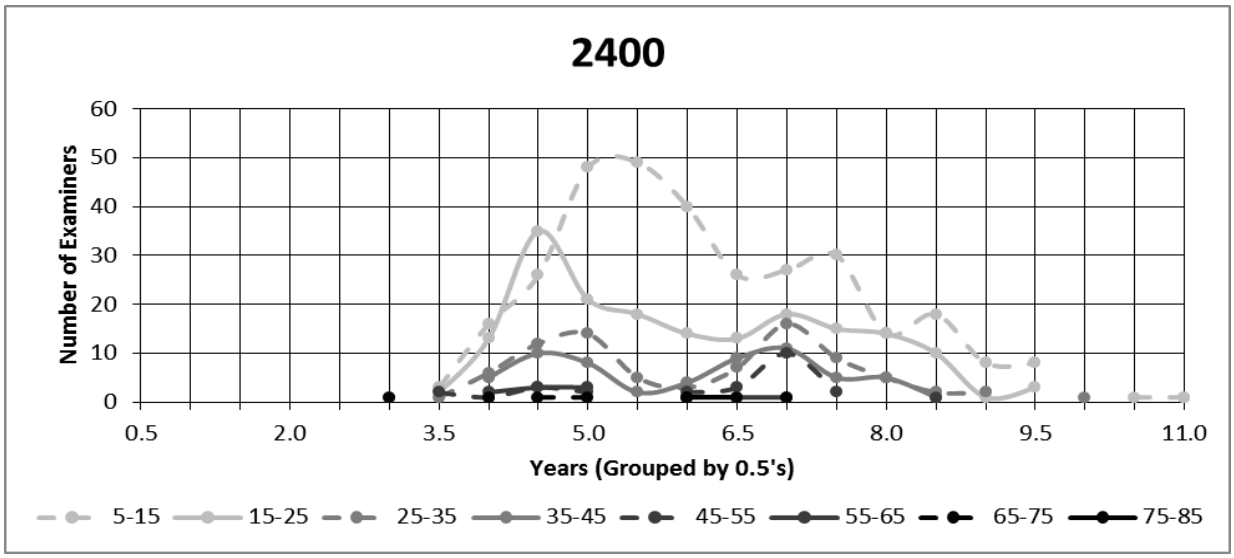


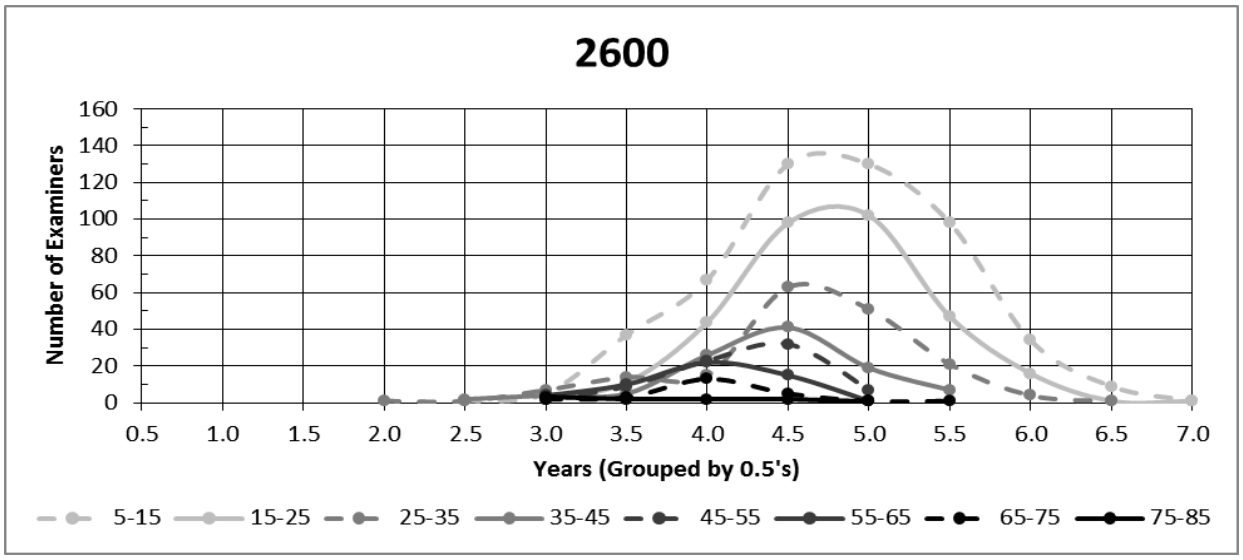
Figure 3 - Prosecution Duration by Examiner Allowance Rate

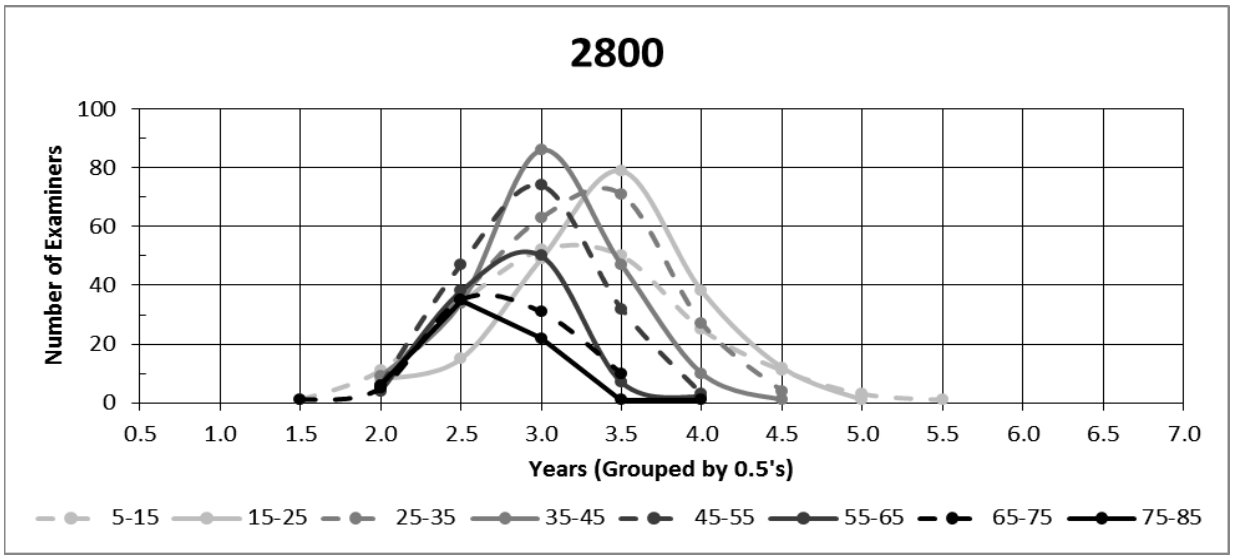


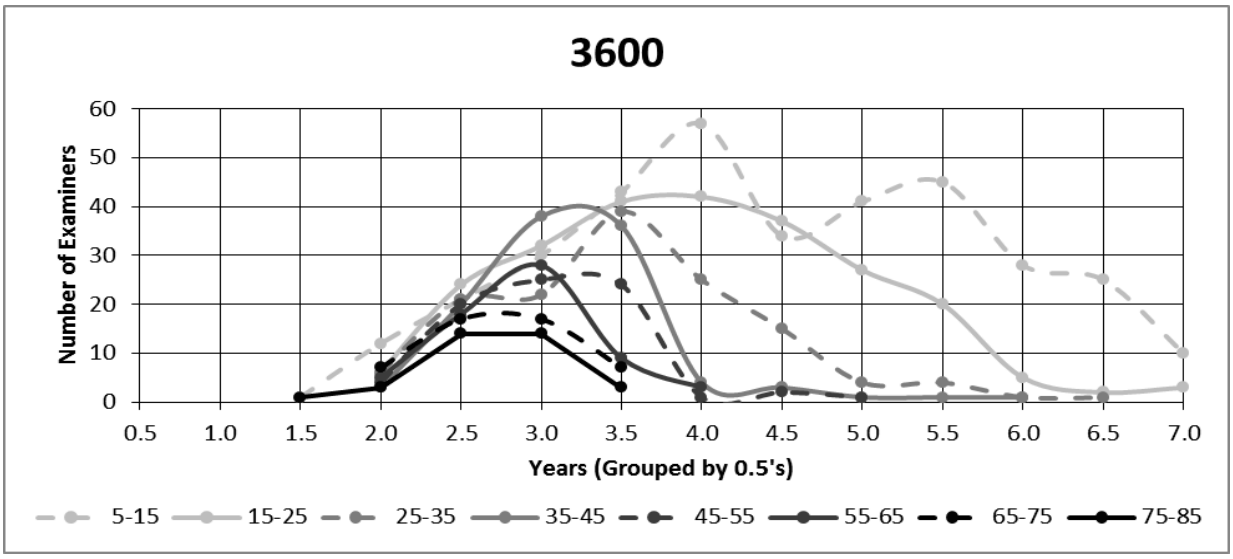


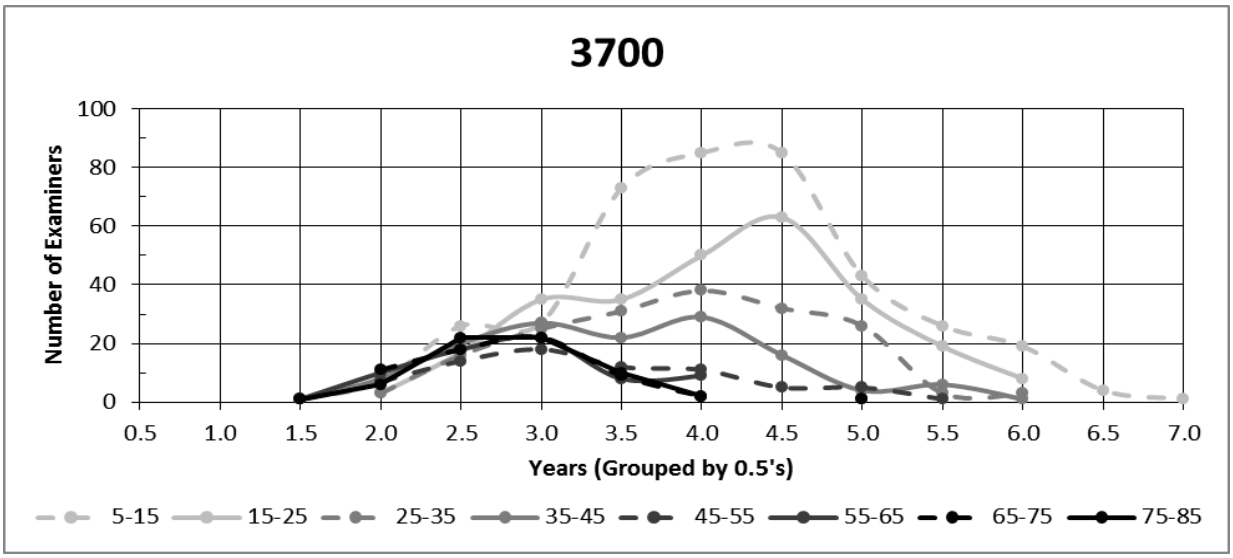












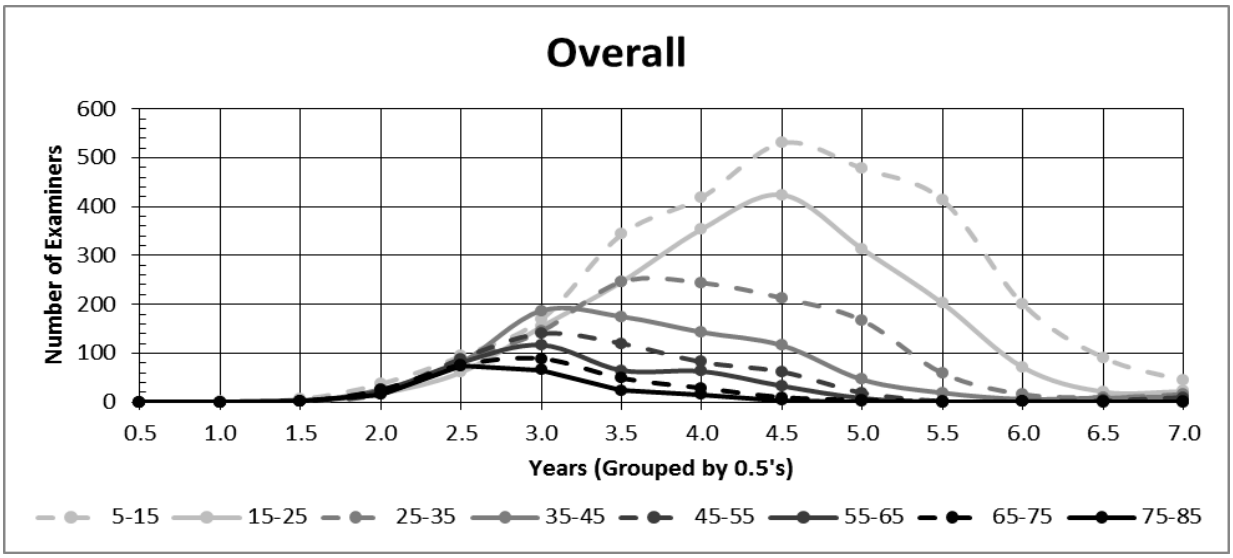
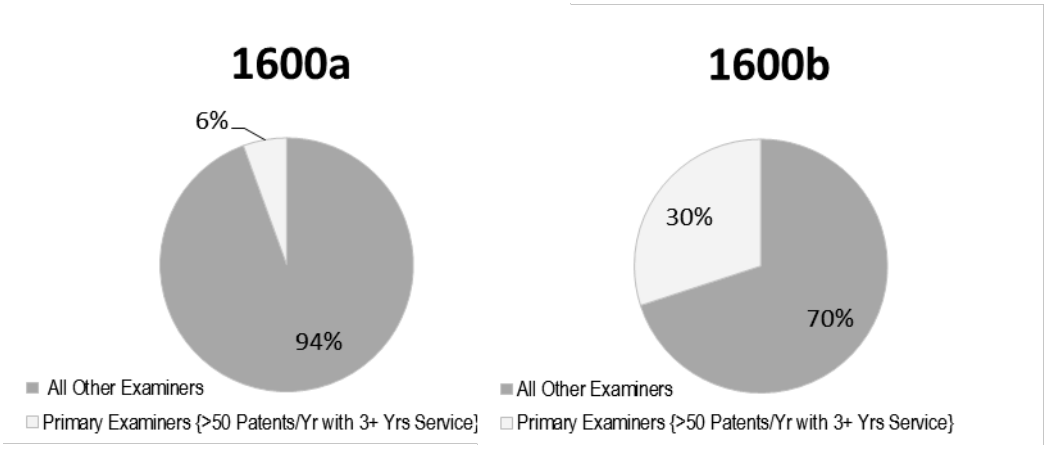
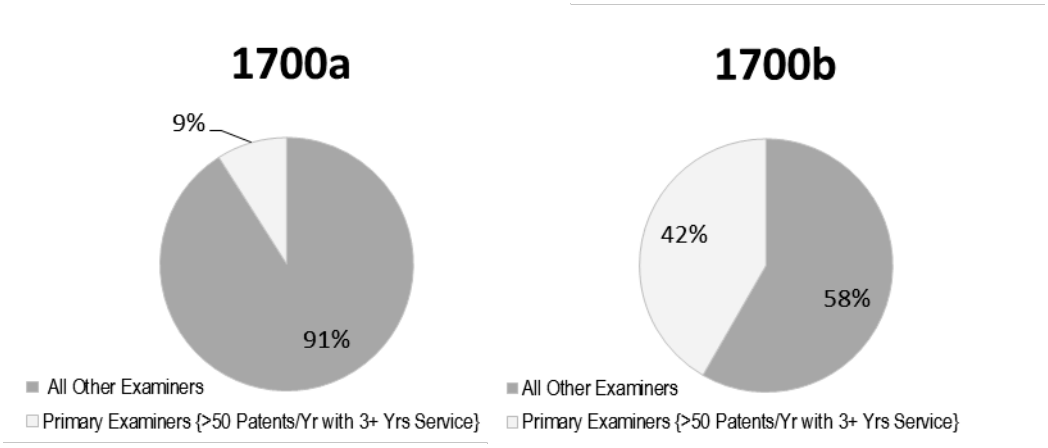
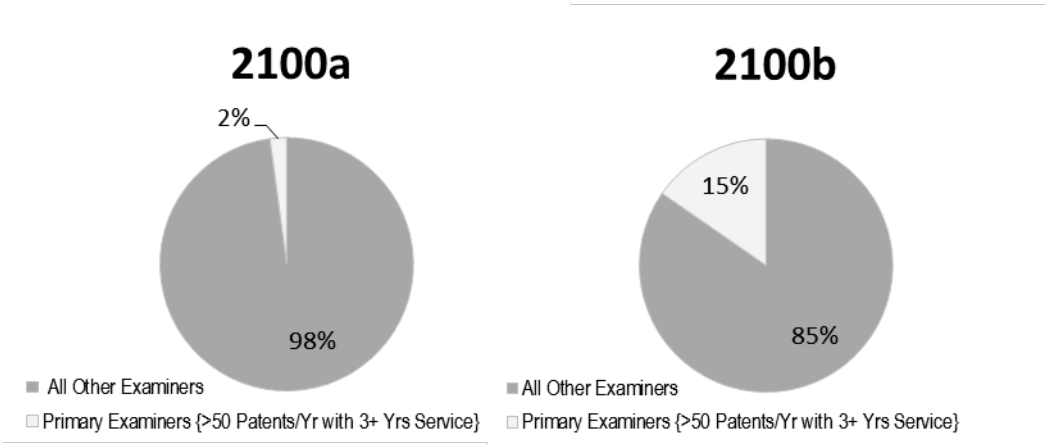


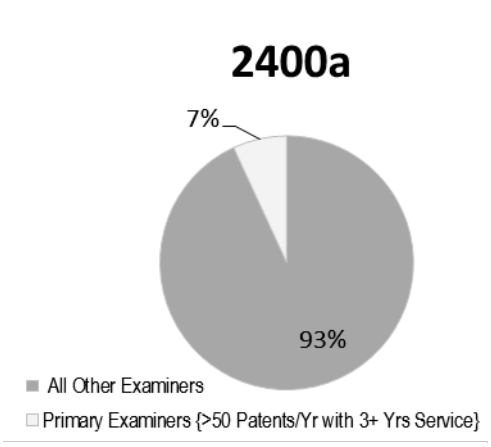
Figure 4a -
Percentage of High Allowance Rate Primary Examiners Per Technology Center (Average of More than 50 Patents Per Year)

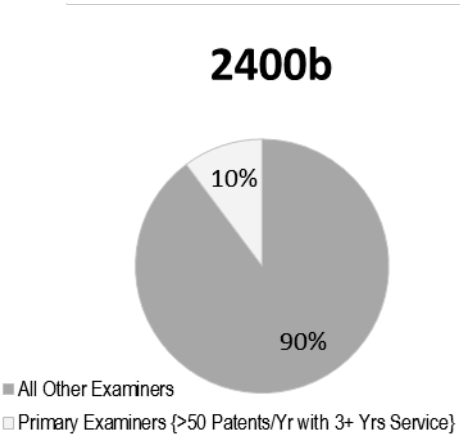
Figure 4b -
Number of Patents Allowed by High Allowance Rate Primary Examiners as a Percentage of All Patents Allowed in that Technology Center

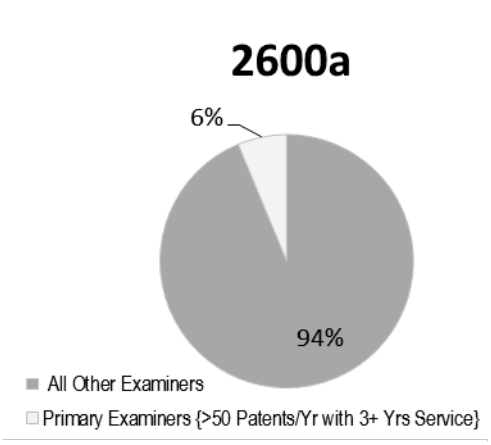


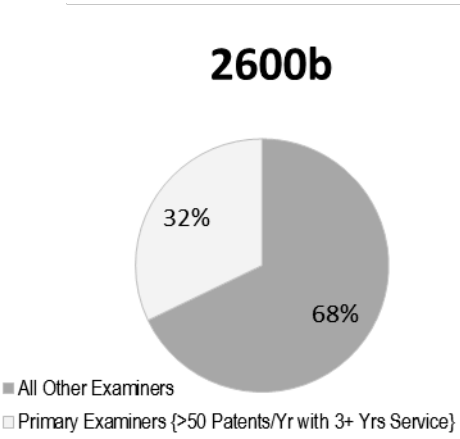


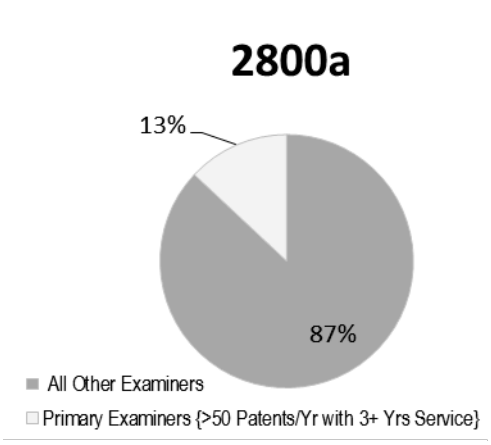


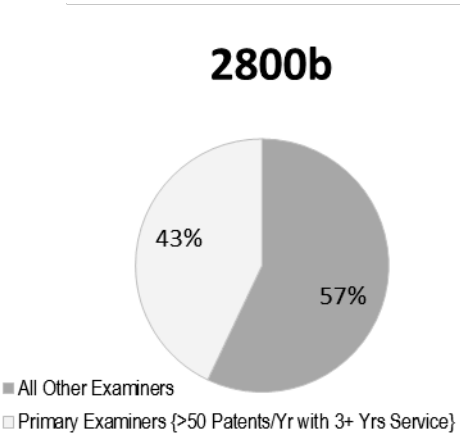


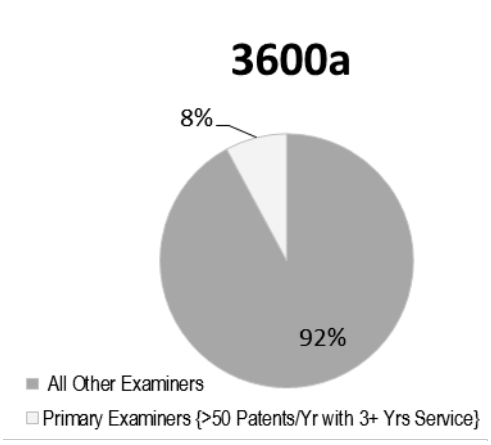


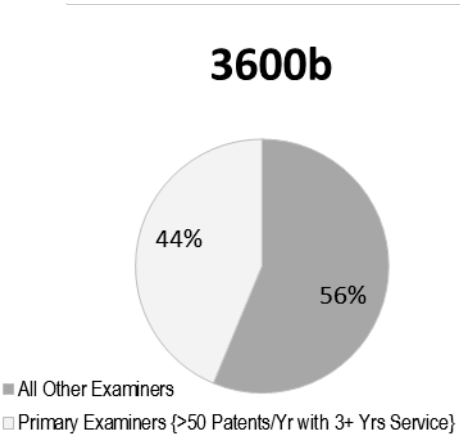


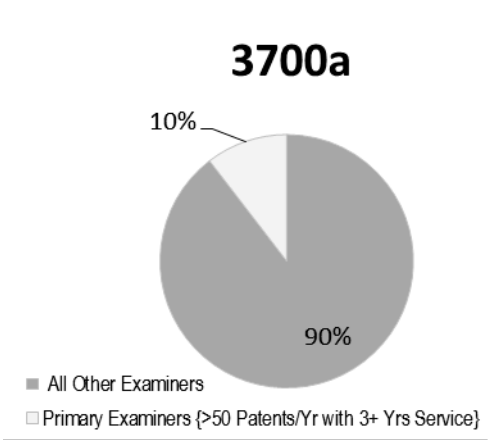


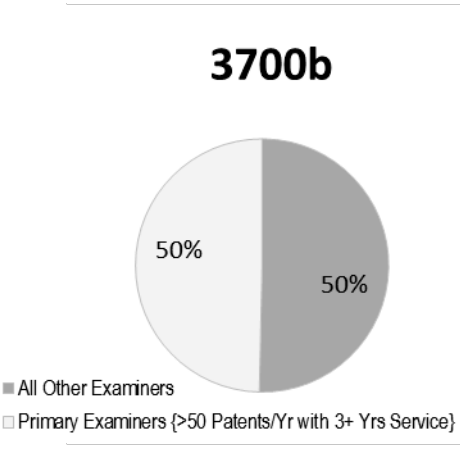


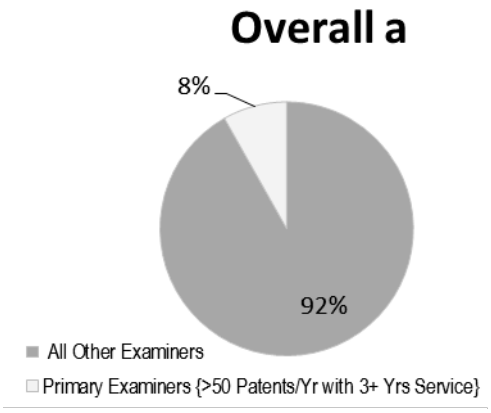












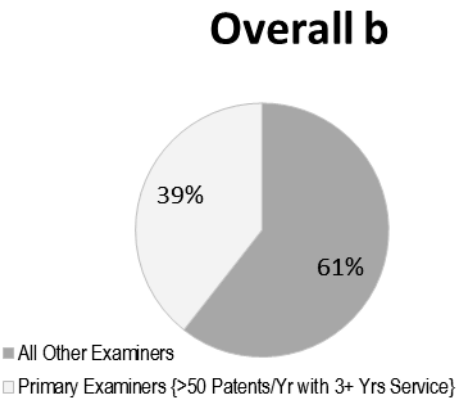
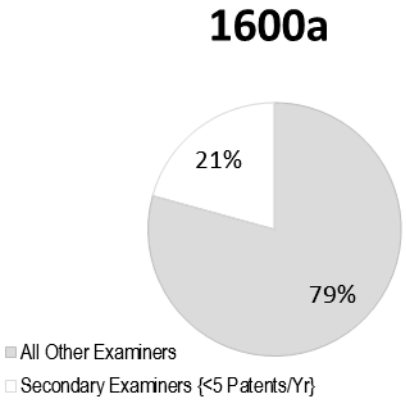
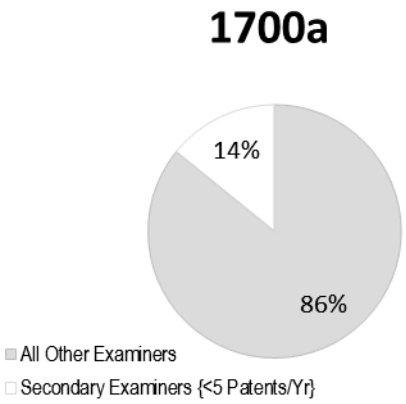


Figure 5a -
Percentage of Low Allowance Rate Secondary Examiners Per Technology Center (Average of Fewer than 5 Patents Per Year)





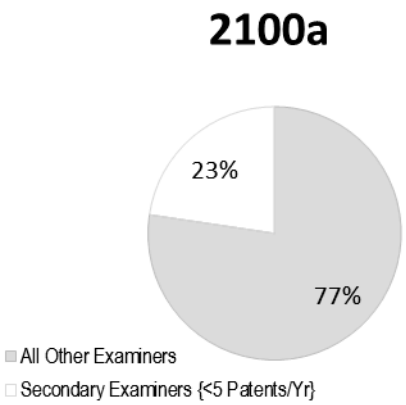
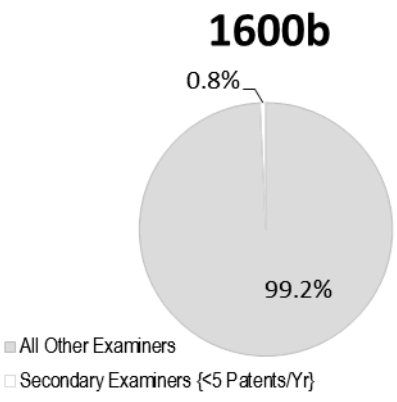
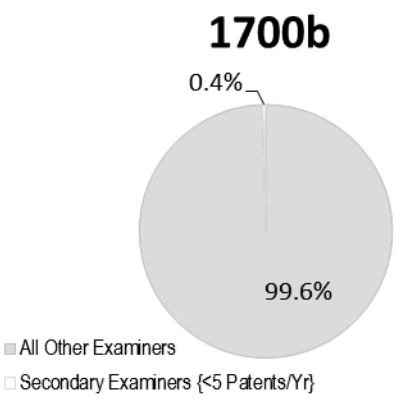
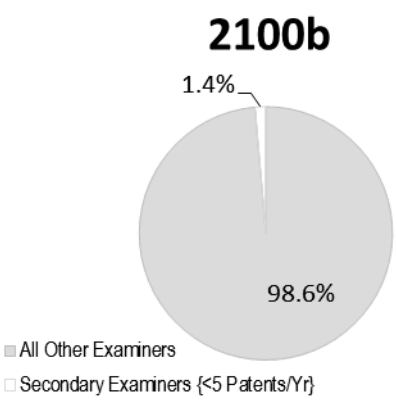
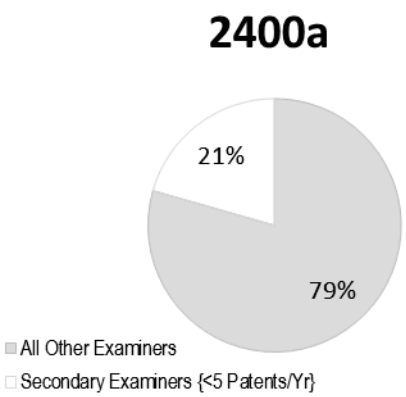


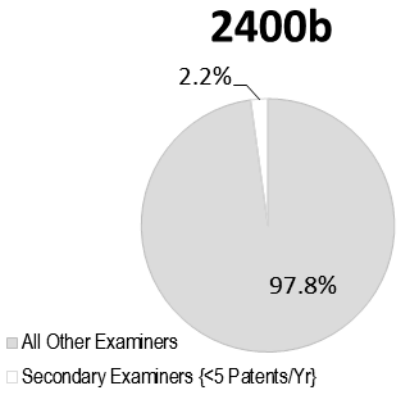
Figure 5b -
Number of Patents Allowed by Low Allowance Rate Secondary Examiners as a Percentage of All Patents Allowed in that Technology Center

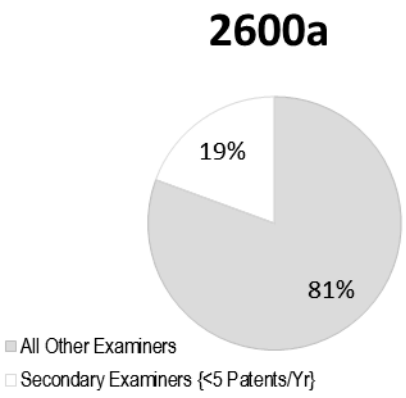


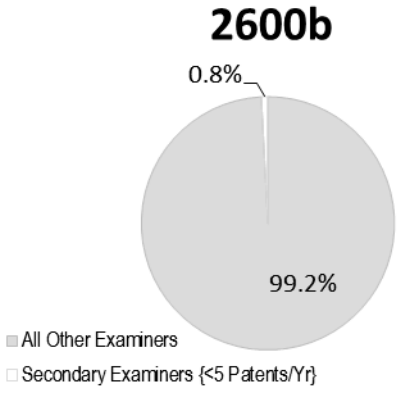


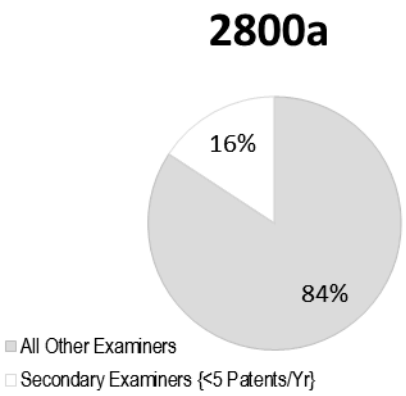


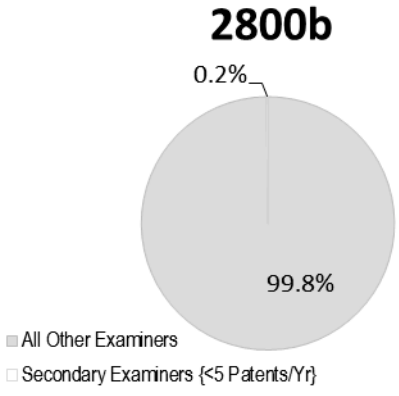


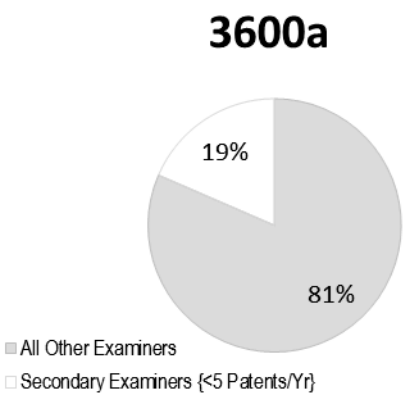


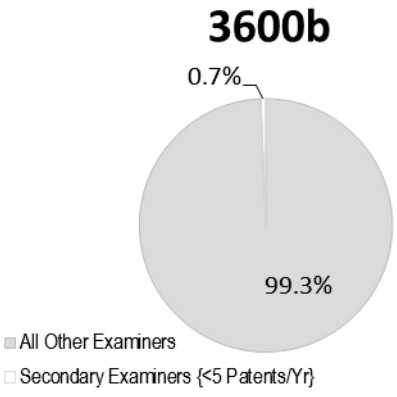


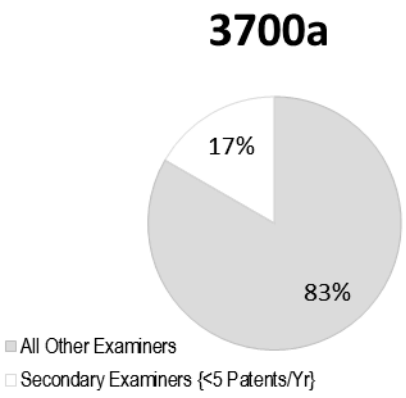


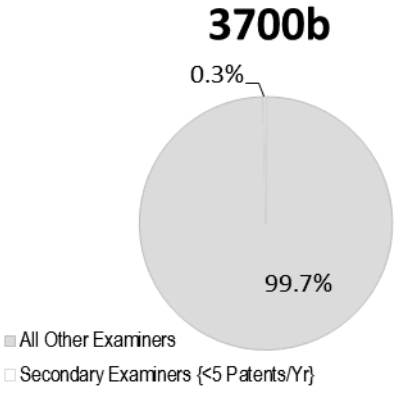


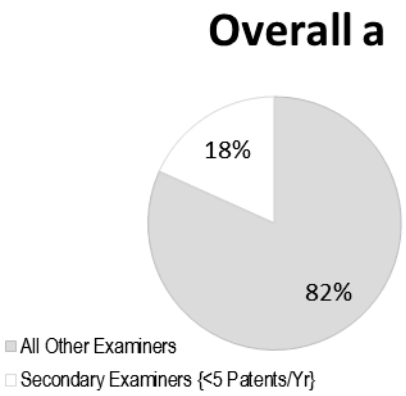












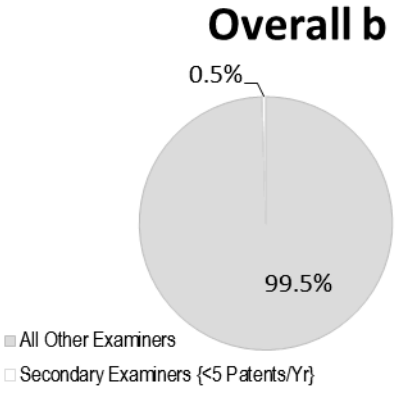


Figure 6 - Allowance Rates Based on Technology Centers