PATENT EXAMINERS AND LITIGATION OUTCOMES

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ABSTRACT

Conventional wisdom argues that unnecessary litigation of low quality patents hinders innovation, and that the PTO could play a role with its high grant rates. Accordingly, it is important to answer these questions: (1) which patent examiners are issuing litigated patents, (2) are examiners who are "rubber stamping" patents issuing litigated patents at a disproportionately higher rate, and (3) are examiners with less experience issuing more litigated patents? In sum, do patent examiners who issue litigated patents have common characteristics? Intuition would argue that those examiners who issue the most patents (approximately one patent every three business days) would exhibit a higher litigation rate. Surprisingly, this study suggests that this is wrong.

This study uses two new patent databases that code for nearly 1.7 million patents and approximately 12,000 patents that were litigated between 2010 and 2011. This study determined that (1) litigated patents mainly come from primary examiners (those examiners with more experience), and (2) primary examiners with between three to five years of experience and who grant between forty-five and sixty patents per year are contributing to the litigated patent pool at a higher rate than expected. Interestingly, the highest volume primary examiners (examiners who on average grant more than eighty patents per year and have more than eight years of experience) do better than expected.

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INTRODUCTION

Conventional wisdom argues that unnecessary litigation of low quality patents is a tax on innovation, and the Patent and Trademark Office (PTO) could play a role due to high grant rates.[1] Intuition suggests that those

1. *See, e.g.*, John R. Allison, Mark A. Lemley, Kimberly A. Moore & R. Derek Trunkey, *Valuable Patents*, 92 GEO. L.J. 435 (2004); John R. Allison, Mark A. Lemley & Joshua Walker, *Extreme Value or Trolls on Top? The Characteristics of the Most-Litigated Patents*, 158 U. PA. L. REV. 1 (2009); John R. Allison & Mark A. Lemley, *Empirical Evidence on the Validity of Litigated Patents*, 26 AIPLA Q.J. 185 (1998); Colleen V. Chien, *Predicting Patent Litigation*, 90 TEX. L. REV. 283 (2011); Jean O. Lanjouw & Mark Schankerman, *Characteristics of Patent Litigation: A Window on Competition*, 32 RAND J. ECON. 129 (2001) [hereinafter Lanjouw & Schankerman, *Characteristics*]; Jean O. Lanjouw & Mark Schankerman, *Patent Quality and Research Productivity: Measuring Innovation with Multiple Indicators*, 114 ECON. J. 441 (2004) [hereinafter Lanjouw & Schankerman, *Patent Quality*]; Jean O. Lanjouw & Mark Schankerman, *Protecting Intellectual Property Rights: Are Small Firms Handicapped?*, 47 J.L. & ECON. 45 (2004) [hereinafter Lanjouw & Schankerman, *Protecting IP*]; Kimberly A. Moore, *Worthless Patents*, 20 BERKELEY TECH. L.J. 1521 (2005); *see also* U.S. DEPT. OF COMMERCE, PATENT REFORM: UNLEASHING INNOVATION, PROMOTING ECONOMIC GROWTH & PRODUCING HIGH-PAYING JOBS (2010), *available at* http://www.commerce.gov/sites/default/files/documents/migrated/Patent_Reform-paper.pdf; JAMES BESSEN & MICHAEL MEURER, PATENT FAILURE: HOW JUDGES, BUREAUCRATS, AND LAWYERS PUT INNOVATORS AT RISK (2008); Joseph Farrell & Robert P. Merges, *Incentives to Challenge and Defend Patents: Why Litigation Won't Reliably Fix Patent Office Errors and Why Administrative Patent Review Might Help*, 19 BERKELEY

examiners who issue a high number of patents (average of eighty or more patents per year) will issue a disproportionately high number of litigated patents. However, this study argues that this is not the case.

Previous studies have shown that the majority of patents go unenforced,[2] and many may be worthless.[3] However, those patents that are valuable have the ability to demand large royalty rates and keep competitors out of the market. This Article focuses on the "valuable" patents by using litigated patents as a proxy for the valuable patent population. Specifically, this Article attempts to tie examiner characteristics to more objective measures of the performance of the examination process. These objective measures of performance include experience level of the examiner, average time it takes the examiner to issue a patent, and primary signatory authority. This Article then examines judicial decisions to determine if there are common characteristics between those examiners who issue patents that are subsequently litigated.

Only around 1.5% of patents are ever litigated in court.[4] However, when patents do get litigated, the process is expensive, disruptive, and somewhat inconsistent. In a 2011 study, the American Intellectual Property Law Association (AIPLA) found that for a claim that is less than $1 million, the median legal costs are $700,000.[5] When $10 million to $25 million is considered "at risk," median litigation costs can hit $3.3 million.[6] For a claim over $25 million, median legal costs are $5.5 million.[7] Academics and practitioners alike have attempted to quantify characteristics for those patents

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TECH. L.J. 943 (2004); Paul M. Janicke, *On the Causes of Unpredictability of Federal Circuit Decisions in Patent Cases*, 3 NW. J. TECH. & INTELL. PROP. 93, 93-94 (2005); Jay P. Kesan, David L. Schwartz & Ted Sichelman, *Paving the Path to Accurately Predicting Legal Outcomes: A Comment on Professor Chien's* Predicting Patent Litigation, 90 TEX. L. REV. 97 (2012); Gerald Mossinghoff & Donald R. Dunner, *Increasing the Certainty in Patent Litigation: The Need for Federal Circuit Approved Pattern Jury Instructions,* 83 J. PAT. & TRADEMARK OFF. SOC'Y 431, 432-33 (2001); Lee Petherbridge, *On Predicting Patent Litigation*, 90 TEX. L. REV. 75 (2012); Shine S. Tu, *Unluck/Luck of the Draw: An Empirical Analysis of Examiner Allowance Rates*, 20 STAN. TECH. L. REV. 10 (2012). *But see* Ted Sichelman, *Myths of (Un)certainty at the Federal Circuit*, 43 LOY. L.A. L. REV. 1161, 1188-89 (2010).

2. Moore, *supra* note 1, at 1521-22 (arguing that in 2005 there were approximately 180,000 patents issued per year, in contrast to approximately 4,500 patents enforced against infringers in patent lawsuits).

3. *Id*. at 1525-26 (finding that most patentees fail to pay maintenance fees of only a few thousand dollars). Maintenance fees are due at 3.5 years ($1600), 7.5 years ($3,600) and 11.5 years ($7,400), set in 37 CFR 1.20(e), (f) and (g), respectively. These fees are cut by 50% for small entities and cut by 75% for micro entities. *Fee Schedule*, U.S. PAT. & TRADEMARK OFF. (Mar. 13, 2014), http://www.uspto.gov/web/offices/ac/qs/ope/fee010114.htm (under heading "Patent Maintenance Fees").

4. Mark A. Lemley, *Rational Ignorance at the Patent Office*, 95 NW. U. L. REV. 1495, 1507 (2001).

5. AM. INTELLECTUAL PROP. LAW ASS'N, REPORT OF THE ECONOMIC SURVEY (2013) at I-129.

6. *Id*. at I-130.

7. *Id*. at I-131.

that are most litigated to better determine those characteristics of patents that are more frequently litigated.[8]

Patent quality is important because a higher quality patent system is likely to be taken more seriously at the litigation stage. Some commentators argue that the initial process of patent review is unreliable and thus produces an inaccurate signal.[9] All parties would prefer only valid patents be asserted; however, this is impossible. Thus, understanding facts about the patents can help us determine their validity before litigation is the next best option. While others have studied characteristics such as number of claims,[10] references,[11] family size,[12] assignments,[13] post-issuance events,[14] and forward citations,[15] this study attempts to measure patent quality by determining if there are any common characteristics between those examiners who issue litigated patents.

We previously collected and coded for every patent issued in the past decade (from 2001 to 2011, approximately 1.7 million patents).[16] Additionally, we determined that there are two distinct populations of examiners who may be harming the patent system: (1) those examiners who grant patent applications at a disproportionately high rate, and (2) those examiners who grant patent applications at a disproportionately low rate.[17] However, this previous study does not answer the normative question: which population is harming innovation more?

To address this question, we have collected and analyzed a new dataset linking patent litigation filings with our previously generated database on patent examiners. This current dataset comprises patent litigations that terminated between 2010 and 2011. The dataset includes 12,923 litigations that corresponded to 15,161 patents matched to 11,748 patent examiners.[18] For each patent, we identified the primary and/or secondary examiner and collected historical information regarding that examiner's entire examination history

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8. Chien, *supra* note 1.

9. Doug Lichtman & Mark A. Lemley, *Rethinking Patent Law's Presumption of Validity,* 60 STAN. L. REV. 45, 68 (2007).

10. Lanjouw & Schankerman, *Characteristics*, *supra* note 1, at 140-41.

11. Allison, Lemley, Moore & Trunkey, *supra* note 1, at 436-37.

12. Katrin Cremers, *Determinants of Patent Litigation in Germany* 13 (Ctr. for European Econ. Research, Discussion Paper No. 04-72, 2004), *available at* ftp://ftp.zew.de/pub/zew-docs/dp/dp0472.pdf (reporting that "the average family size of litigated patents differs significantly from that of unlitigated patents (5.6 and 4.7)").

13. Chien, *supra* note 1, at 298-99.

14. *Id*.

15. *Id*.

16. Tu, *supra* note 1.

17. *Id*.

18. We coded for 12,923 litigations that corresponded to 15,161 patents. However, we were only able to match 11,748 patents to the examiner database described in Tu, *supra* note 1. Accordingly, 3,413 patents fell outside of our examiner database. The examiner database included only those patents that issued between January 1, 2001 and July 15, 2011. Thus, many of the patents that were not included were issued before the January 1, 2001 date.

(including art unit, average examination duration, and average number of patents granted per year). We then determined if there were patterns between prior examination experience and patent litigations.

Several scholars have quantified specific characteristics that are common among litigated and/or valuable patents.[19] Additionally, some scholars have attempted to link examiner characteristics to litigation outcomes.[20] However, many of these studies have looked only at the results from litigations that reached a "final" decision.[21] In contrast, this study includes not only those patents appealed to the Court of Appeals for the Federal Circuit (CAFC), but also litigation terminated in the district court system. Accordingly, this study is more inclusive because it reviews all litigation, not just litigation that has reached a final decision.

This study examines three possible hypotheses: (1) patent examiners who issue patents at the highest rate (more than eighty patents per year) will issue more litigated patents than expected; (2) patent examiners who issue at a very low rate (fewer than ten patents per year) will issue fewer litigated patents than expected; and (3) patent examiners with the least amount of experience will issue more litigated patents than expected. The first hypothesis is born from the intuition that higher-volume examiners who may not be examining patents closely will issue patents that more frequently end up in litigation. The second hypothesis is the corollary to the first hypothesis. Specifically, intuition suggests that examiners who spend more time examining a patent will issue fewer patents that end up in litigation because the examiner spends more time on prior art searches and/or drafting well-crafted rejections. Finally, the third hypothesis comes from the intuition that more experience at the PTO may lead to less litigation, while less experience may lead to more litigation.

Many of these intuitive hypotheses are wrong. Specifically, this study finds that: (1) patent examiners who issue the most patents actually issue relatively fewer litigated patents, (2) patent examiners who issue at a very low rate issue litigated patents at an expected rate, and (3) primary patent examiners who are relatively early in their careers issue litigated patents at a disproportionally high rate. These data suggest that continued scrutiny of primary examiners who recently obtained full signatory authority might reduce the granting of litigated patents.

Additionally, because the highest-volume primary examiners grant fewer

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19. Iain M. Cockburn, Samuel Kortum & Scott Stern, *Are All Patent Examiners Equal? The Impact of Characteristics on Patent Statistics and Litigation Outcomes*, *in* PATENTS IN THE KNOWLEDGE-BASED ECONOMY 19 (Wesley M. Cohen & Stephen A. Merrill eds., 2003); Allison, Lemley, Moore & Trunkey, *supra* note 1; Allison, Lemley & Walker, *supra* note 1; Allison & Lemley, *supra* note 1; Chien, *supra* note 1; Lanjouw & Schankerman, *Characteristics*, *supra* note 1; Lanjouw & Schankerman, *Patent Quality*, *supra* note 1; Lanjouw & Schankerman, *Protecting IP*, *supra* note 1; *see also* Kesan, Schwartz & Sichelman, *supra* note 1, at 97; Petherbridge, *supra* note 1, at 75.

20. Cockburn et al., *supra* note 19.

21. *Id.*; Allison & Lemley, *supra* note 1, at 187.

than expected litigated patents, it may be efficient to create mechanisms to generate more high volume primary examiners. One possible way to emulate these high volume examiners who issue fewer litigated patents is to create a two-track specialization system for patent examiners. If one group of examiners specializes in prior-art searching, while another group of examiners specializes in drafting office actions, this division of labor could mimic the specialization of one senior examiner in a much shorter timeframe. This may allow the PTO to emulate the experience of one 10+ year examiner in a much shorter amount of time. This solution would help not only the backlog of request for continued examination applications (RCEs), but the general backlog of unexamined patent applications while increasing patent quality.

Part I of this article briefly summarizes the patent examination process. Part II summarizes some of the previous empirical literature in the field. Part III details the dataset, its compilation, and the methodology used to analyze the data, and then identifies the intrinsic limitations in this dataset. Part IV interprets and explains the results. Finally, Part V draws some general conclusions based on the patent litigation data and suggests further avenues for research.

I. BACKGROUND

It is uncontested that the PTO wields an enormous budget and oversees a large number of employees. The PTO employs some 7,800 patent examiners[22] and manages a budget of approximately $3 billion dollars.[23] The PTO planned to hire an additional 3,000 patent examiners in 2012-2013 to help reduce the backlog from 619,204 unexamined patent applications to 329,500 by 2015 and achieve a first action pendency of 10.1 months.[24]

A. *Patenting Procedure*

Patent work flow is streamlined and fairly well defined.[25] Applications first arrive at the central receiving office to determine if all of the procedural requirements are met to qualify for a filing date. Patent applications are then

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22. As of May 2014, there were 8,108 patent examiners. *Data Visualization Center*, U.S. PATENT & TRADEMARK OFF., http://www.uspto.gov/dashboards/patents/main.dashxml (last visited May 11, 2014). (The PTO dashboard changes every week but gives the most up to date information about the PTO statistics.)

23. For fiscal year 2013 the PTO projected fee collections to 2.953 billion, which will fund the required $2.822 billion in 12,212 full-time equivalent (FTE). U.S. PATENT & TRADEMARK OFFICE, FISCAL YEAR 2013, PRESIDENT'S BUDGET 6 (2013), *available at* http://www.uspto.gov/about/stratplan/budget/fy13pbr.pdf.

24. *Id*.; *Data Visualization Center*, *supra* note 22 (listing current backlog as 619,204). Currently the first action pendency is 18.9 months. *Data Visualization Center*, *supra* note 22.

25. *See* Cockburn et al., *supra* note 19. For a review of the patent work flow procedure, see generally Tu, *supra* note 1, at 10-20.

sorted into the appropriate "Technology Center" in the Patent Office for examination. Currently, the Patent Office has seven active technology centers (grouped by 100s).[26] For example, Technology Center 1600 deals with biotechnology and organic chemistry patent applications. Each technology center is further divided into "workgroups." Workgroups (grouped by 10s) further narrow the broad technology center into specific fields. For example, 1640 is a workgroup that deals with immunology, receptor/ligands, cytokines recombinant hormones, and molecular biology. Finally, each workgroup is divided into "art units." An art unit (grouped by 1s) is a working group that is responsible for reviewing a cluster of related patent art. For example, Art Unit 1648 deals with viral immunology.

Each art unit is staffed by one supervisory patent examiner (SPE) and a number of patent examiners. Once the patent application is assigned to an art unit, the SPE assigns the application to a specific working examiner.[27] Assignment to the working examiner, for the most part, is done randomly.[28] The working examiner will usually have responsibility for examination of the application until it is (1) allowed, (2) rejected, or (3) abandoned.

Patent examiners are given great discretion to reject claims based on the legal formalities and requirements. For simplicity, this study groups rejections based on issues: (1) internal to the application and (2) external to the application (prior art type rejections). Internal issues are flaws within the four corners of the application. Examples of internal issues include enablement, written description, indefiniteness, and best mode type rejections. External issues are usually third-party references (patent or non-patent literature) that render the application non-novel or obvious over the prior art.[29]

There are requirements that are internal to the application. Typically, these include written description, enablement, definiteness, and/or utility type rejections.[30] To overcome the written description bar, an applicant must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed

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26. *See generally Patent Technology Centers*, U.S. PAT. & TRADEMARK OFF. (Feb. 17, 2010, 12:34 PM), http://www.uspto.gov/about/contacts/phone_directory/pat_tech (defining the structure of the PTO technology centers).

27. This assignment is usually done in a random fashion. Mark A. Lemley & Bhaven Sampat, *Examiner Characteristics and Patent Office Outcomes*, 94 REV. ECON. & STAT. 817, 822 (2012) (finding that "[w]ithin subclasses, SPEs for the most part assigned applications randomly, assigning applications to particular examiners on the basis of the last digit of the application serial number").

28. 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. *Id*.

29. Prior art is defined generally as references such as a patent, printed publication, public use, on sale or something otherwise available to the public before the effective filing date of the claimed invention. 35 U.S.C. § 102(a)(1) (2011).

30. *See* §§ 112(a), 112(a), 112(b), and 101 respectively.

invention.[31] Second, the specification must enable the invention.[32] Specifically, the specification must describe how to make and how to use the invention. Third, the application claims must meet a threshold level of clarity and precision. The claims should define the patentable subject matter with a reasonable degree of particularity and distinctness in light of the specification, prior art, and knowledge of the person of ordinary skill in the art at the time the invention was made.[33] Finally, the claimed invention must be useful. Specifically, an applicant must identify a specific, substantial, and credible utility for the invention.[34]

Additionally, there are requirements that affect patentability that are outside the four corners of the patent application. These issues are typically based on "prior art." In general, prior art references disclose the claimed invention (or parts of the claimed invention) prior to a critical date.[35] An examiner then searches multiple databases for both patent and non-patent references to determine if any references anticipate or render the claimed invention obvious.[36] Typically, searches for prior art include prior U.S. patents and patent applications in relevant technology classes and subclasses, foreign patent documents, scientific and technical journals, and/or other databases and indexes. Efficient and effective keyword searches of these databases require significant technical knowledge and time.

After reviewing the application specification, claims, and prior art the examiner then issues a "first action" letter to the applicant. The examiner has two choices: (1) allow all or some of the claims in application, and/or (2) reject all or some of the claims, based typically on the aforementioned rejections. The applicant then has no more than six months to respond by amending the claims and/or arguing against the examiner's rejections. After reviewing the applicant's response, the examiner can then (1) allow some or all of the claims in the application if the arguments/amendments traverse the rejection, and/or (2) maintain some or all of the initial rejections, and/or (3) issue new grounds for rejections based on the amendments/arguments made by the applicant. If the examiner rejects claims for a second time, the examiner typically responds in a "final" office action. The applicant can then respond to a final office action by

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31. § 112(a); *see also* Vas-Cath, Inc. v. Mahurkar, 935 F.2d 1555, 1563 (Fed. Cir. 1991); MPEP § 2163 (9th ed. Mar. 2014), *available at* http://mpep.uspto.gov/RDMS/detail/manual/MPEP/e8r9/d0e18.xml.

32. § 112(a); *see also* Ariad Pharm., Inc. v. Eli Lilly & Co., 598 F.3d 1336, 1344 (Fed. Cir. 2010) (en banc); *Vas-Cath*, 935 F.2d at 1563; MPEP, *supra* note 31, § 2164.

33. § 112(b); *see also* MPEP, *supra* note 31, § 2173.02.

34. § 101; *see also In re* Fisher, 421 F.3d 1365, 1372 (Fed. Cir. 2005); MPEP, *supra* note 31, § 2107.01.

35. *See* MPEP, *supra* note 31, § 901 (describing what qualifies as prior art); *see also* § 102. The author notes that the critical date for prior art will change slightly based on passage of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (to be codified at scattered sections of 35 U.S.C.). However, that discussion is beyond the scope of this Article.

36. *See* §§ 102-103; *see also* MPEP, *supra* note 31, §§ 2131, 2164.

(1) filing a request for continued examination (RCE), which effectively allows the applicant one more round of review/responses with the examiner; (2) filing a continuation or a continuation in part application; (3) appealing the examiner's decision; or (4) abandoning the application (simply by either not responding within the six-month time period or expressly abandoning the application via a letter to the PTO).

B. *Patent Examiners*

Patent examiners vary in many respects. The most important differences among examiners are (1) experience at the PTO, (2) technical backgrounds, (3) art units, (4) workload and production goals, and (5) supervision and review.

Experience at the PTO varies dramatically. Primary examiners are usually more senior examiners with at least five years of experience, and usually have partial or full signatory authority.[37] Junior examiners are usually classified as "secondary examiners." Secondary examiners usually have less than five years of experience and do not have signatory authority. Each secondary examiner is paired with a primary examiner who directly supervises and edits the work product generated by the secondary examiner. Over time, the secondary examiner takes greater control over his docket and may graduate to a primary examiner with "partial" signatory authority.

Technical backgrounds between examiners also vary radically. Certain art units may require an advanced degree or more specialized training. For example, because of the technical nature required to examine applications dealing with antibody engineering and cancer immunology many examiners in Art Unit 1642 (biotechnology applications) have Ph.D.'s. In contrast, examiners in Art Unit 3636, which deals with chairs and seats, may not require an advanced degree to understand the technology.

Variations in art unit practices also greatly affect examiner behavior. Some art units promote specialization by individual examiners. For example, in mechanical art units, a small group of examiners may be responsible for all patent applications within a specific class or subclass. Accordingly, in these art units, there is less supervision and fewer checks and balances on the examiner. In contrast, some art units rely on group organization. In these art units there is less technical specialization but an increased amount of group discussion, knowledge sharing, and collective thought between examiners. Accordingly, there are greater opportunities for monitoring and supervision as well as greater knowledge transfer between examiners.[38]

Workload and production goals are one of the most significant differences among examiners, even within the same art unit. Examiners are allotted fixed

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37. In general, signatory authority allows an examiner to respond to the applicant without further review. An allowance, however, still could be verified through quality control (QC) regardless of whether the allowance was by a secondary or primary examiner.

38. Cockburn, et al., *supra* note 19.

amounts of time to initially examine an application and for disposal of the application. As an examiner becomes promoted, the amount of time allotted for examining an individual application is reduced. Regardless of technology center, the 100% benchmark is at the General Schedule (GS) GS-12 pay scale.[39] For example, a junior examiner who is a GS-10 (two levels under GS-12) may have to reach only 85% of the disposals required by a similar examiner in the same art unit who is a GS-12. Similarly, a senior examiner who is a GS-14 (two levels over GS-12) may have to reach 110% of the disposals required by a similarly situated GS-12 in the same art unit. Accordingly, primary examiners may have significantly less time to review an application compared to a secondary examiner. This shorted time period may play an important role, especially for a detailed search for prior art. Differences in these time allocations and percentages vary across technology centers, but are always relative to the GS-12 level in that art unit.[40]

Oversight and review is another significant difference among examiners. Examiners can be sorted into four groups: (1) secondary examiners with no signatory authority, (2) secondary examiners with partial signatory authority, (3) primary examiners with temporary full signatory authority, and (4) primary examiners with full signatory authority. Secondary examiners, by definition, have no signatory authority, which means that all substantive office actions are reviewed by their supervisor before going out to the applicant. Secondary examiners with partial signatory authority can sign off most office actions without supervision, but are specifically reviewed by a primary examiner when they issue a final office action or an allowance.[41] Primary examiners with temporary full signatory authority can sign off on all actions,[42] but are scrutinized for at least approximately six months (thirteen consecutive pay periods).[43] Finally, primary examiners with full signatory authority can sign off on all actions without supervision.

An examiner must complete the Signatory Authority Review Program to achieve the position of primary examiner. The examiner's work is evaluated during two separate periods (partial signatory authority period and full

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39. Telephone Interview with Senior Patent Examiner, U.S. Patent & Trademark Office (June 2013). The GS salaries and wages scale are determined by the U.S Office of Personnel Management.

40. Ron D. Katnelson, My 2010 Wishes for the U.S. Patent Examiner 5 (Jan. 8, 2010) (unpublished manuscript) (suggesting that the average production goal is set at 19.5 GS-12 equivalent hours, based on the 1976 PTO annual report), *available at* http://works.bepress.com/rkatznelson/60; *see also id*. at 8 fig.5 (showing PTO examination hours per patent production unit by technology workgroup).

41. *See* MPEP, *supra* note 31, § 1005 (listing actions which cannot be delegated to an examiner with partial signatory authority, thus requiring the signature of a primary examiner).

42. *See id*. § 1004 (listing actions which require the attention of a primary examiner.).

43. Letter to All Patent Examiners from Edward E. Kubasiewicz, Assistant Commissioner for Patents, regarding the Signatory Authority Program (Dec. 1, 1992) (on file with author).

signatory authority period) to determine if the examiner is qualified to permanently represent the Director and sign all actions independently. The length of each trial period is at least thirteen consecutive pay periods (approximately six months), but can go longer. Additionally, for each step, the examiner must perform at least 700 hours of actual examination time. Upon completion of the first review period, the examiner can progress from GS-13 to GS-13 Partial Signatory Authority (PSA). Subsequently, when the second review period is completed, the examiner can move from GS-13 PSA to GS-14 Full Signatory Authority (FSA) if the examiner performs at the "fully successful" level in the PSA for at least ten consecutive weeks.[44]

Interestingly, U.S. patent examiners seem to issue patents at the same rate as their European and Japanese counterparts. According to the PTO, during 2010 and 2011 the percentage of patents granted was approximately 44%.[45] In the European Patent Office (EPO), the percentages of patents granted in 2010 and 2011 were 38% and 43%, respectively. The Japanese Patent office (JPO) grant rates during the 2010 and 2011 years were 64% and 76%, respectively. Therefore, US patent examiners issue patents at a rate comparable to their EPO and JPO counterparts, even though US examiners examine more than twice the number of claims,[46] while receiving a compensation package that is only about 58% of EPO examiners and less than 50% of JPO examiners.[47] Unsurprisingly, the annual staff turnover rate at the PTO was about 30% in 2008.[48] In contrast, the turnover rate at the EPO was between 3-5%, and the turnover rate at the JPO was 0-3%.[49]

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44. Design examiners undergo a slightly different review process. They start the partial signatory authority program six months after receiving their promotion to GS-12. Examiners must be at 95% fully successful for the eleven weeks prior to starting the program. The PSA program lasts thirteen consecutive bi-weeks, each of which is fourteen days long, and requires that the PSA candidate finish the program at fully successful and with no less than 700 examining hours during the trial period. The FSA program for design examiners begins automatically after thirty-five consecutive pay periods after promotion to GS-13, as long as the examiner is performing at the fully successful level or higher. The FSA lasts thirteen consecutive pay periods, and must include 700 examining hours. Successful completion of the FSA grants the examiner full signatory authority and promotion to GS-14. Telephone Interview with Senior Patent Examiner, *supra* note 39; *see also* Letter from Edward E. Kubasiewicz, Assistant Commissioner For Patents to All Patent Examiners (Dec. 1, 1992) (explaining the process for promotion to full signatory authority).

45. *U.S. Patent Statistics Chart Calendar Years 1963-2013*, U.S. PAT. & TRADEMARK OFF. (Mar. 26, 2014), http://www.uspto.gov/web/offices/ac/ido/oeip/taf/us_stat.htm.

46. Pierre Picard & Bruno van Pottelsberghe de la Potterie, *Patent Office Governance and Patent System Quality* 8 tbl.1 (Ctr. for Research & Econ. Analysis, Discussion Paper 2011-06, 2011).

47. *Id*. at 12 tbl.4.

48. *Id*. at 13.

49. *Id*. at 13-14 & tbl.5 (showing that job satisfaction could be tied to different compensation packages, types governance structures, tenured contracts, unionization rates, and severance clauses).

II. EXISTING LITERATURE

Intellectual property rights have become a crucial part of our nation's economy. However, as noted above, many patents fail to attain economic success. Accordingly, many scholars have attempted to quantify those characteristics that are common among litigated and/or valuable patents.[50] However, many scholars come to the conclusion that patent litigation is uncertain and unpredictable.[51] As noted above, it is uncontested that the PTO wields an enormous budget and oversees a large number of employees. However, the unanswered question is whether the PTO is issuing good patents or not.

Many scholars have attempted to find common characteristics between litigated patents. However, only a few focus on the examiners who issue litigated patents,[52] and those rare studies focus mainly on the patents that have been litigated to a CAFC-issued final decision. In contrast, this study focuses on examiners who issue litigated patents from all district courts and segments the examiners by experience at the PTO as well as volume of patents issued. Below is a summary of some of the literature dealing with examiner characteristics and litigation outcomes, as well as some of the literature that details those characteristics in common with "valuable" patents.

Cockburn, Kortum, and Stern previously linked examiner characteristics to litigation outcomes.[53] This study was based on 182 patents from the Court of Appeals for the Federal Circuit between 1997 and 2000. Cockburn et al. found that some examiners have a higher litigation rate at the CAFC than other examiners. Specifically, they discovered that there is substantial variation in examiner experience, tenure, and the degree of forward citations (i.e. referenced more often by subsequent patents).[54] Additionally, they explained that examiner experience and workload do not affect the probability that the CAFC will find a patent invalid. Finally, they found that patents which are frequently cited have an increased probability of being found invalid by the CAFC.

Allison, Lemley, Moore and Trunkey (ALMT) examined characteristics of valuable patents by reviewing characteristics of patents litigated between 1999 and 2000 (6,861 patents).[55] In sum, ALMT found that valuable patents (1) are litigated soon after obtained, (2) are owned by domestic companies, (3) are issued to individuals or small companies, (4) cite to more prior art, (5) are

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50. *See, e.g.*, Chien, *supra* note 1; Allison & Lemley, *supra* note 1; Allison, Lemley & Walker, *supra* note 1.

51. *See, e.g.*, Janicke, *supra* note 1, at 93-94; Mossinghoff & Dunner, *supra* note 1, at 432-33. For a competing opinion, see Sichelman, *supra* note 1, at 1188-89.

52. Cockburn et al., *supra* note 19.

53. *Id*.

54. *Id*. at 28-30.

55. Allison, Lemley, Moore & Trunkey, *supra* note 1, at 437.

referenced more often by subsequent patents ("forward citations"), (6) include more claims, and (7) are disproportionately represented from certain industries.[56] Furthermore, in a follow-up study, Allison, Lemley and Walker (ALW) found that the "most-litigated" patents also have interesting characteristics. In sum, ALW found that the most litigated patents (1) had more patent continuations, (2) are cited more than twice as often,[57] (3) include more than 50% more claims,[58] (4) cite to more prior art (including nearly three times as many U.S. and foreign patents, and almost ten times as many non-patent prior art references),[59] (5) are cited more than twice as often by subsequent patents,[60] (6) are disproportionately represented from certain industries,[61] and (7) are more likely to be owned by non-practicing entities.[62]

The Allison and Lemely (AL) study[63] reviewed 299 patents litigated in 239 different cases between 1989 and 1996 resulting in a final decision and a written opinion.[64] Of the patents reviewed, 54% (162 patents) were found valid, while 46% (138 patents) were found invalid.[65] AL further segmented the invalid patents and found that of the 138 patents that were found invalid, 26.8% were held invalid by § 102 prior art, 31% were held invalid by § 102 non-prior art, and 42% were held invalid by § 103 obviousness.[66] Juries held valid more than two-thirds of the patents tried before them.[67] In contrast, only one quarter of the cases decided on pre-trial motion were decided in favor of the patentee.[68] Interestingly, the AL study found that the majority of patents litigated came from "run-of-the-mill mechanical inventions" and not chemical or electrical inventions.[69] Additionally, the AL study found that even though approximately 42-48% of the patents issued in 1995 were of foreign origin, only 14% of the litigated patents were of foreign ownership.[70] Uncited prior art is more likely to

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56. *Id*. at 438.

57. Allison, Lemley, & Walker, *supra* note 1, at 14.

58. *Id*. at 15 (finding that the most-litigated patents contain 39.3 claims on average compared to 24.5 claims for once-litigated patents).

59. *Id*.

60. *Id*. at 14.

61. *Id*. at 18 (showing that the most-litigated patents are mostly software patents); *see also* Allison, Lemley, Moore & Trunkey, *supra* note 1, at 438.

62. Allison, Lemley, & Walker, *supra* note 1, at 26; *see also* Michael Risch, *Patent Troll Myths*, 42 SETON HALL L. REV. (2012) (arguing that patents enforced by non-practicing entities are similar to many other litigated patents).

63. I note that the AL study covers many other issues that I do not review in this summary. I have only summarized those issues germane to this paper. A complete summary of their findings can be found at Allison & Lemley, *supra* note 1, at 251-52.

64. *Id*. at 194.

65. *Id*. at 205.

66. *Id*. at 208.

67. *Id*. at 212.

68. *Id*.

69. *Id*. at 217.

70. *Id*. at 226.

invalidate a patent than previously cited art.[71] Finally, patent litigation involved patents that were fairly old and patented for several years before enforcement.[72]

Lanjouw and Schankerman also published several studies linking information on patent suits from the U.S. court system to the detailed information about inventions and their owners.[73] Lanjouw coded for characteristics such as number of claims, IPC assignments, citations, ownership (nationality and type of ownership: corporate or individual), and case types (patent owner as plaintiff or defendant).[74] Generally, the authors found that there is an increased probability of patent litigation if the patent is core to a set of follow-on innovations for a corporation (as opposed to an individual). Additionally, the authors found that litigated patents are much more frequently cited[75] and have far more claims[76] than the control group.

Colleen Chien also published a study analyzing some of the characteristics of litigated patents versus non-litigated patents.[77] In this study, Chien generates a model for predicting the patents that are most likely to be litigated based on a combination of intrinsic and acquired patent file characteristics. Intrinsic traits include characteristics such as number of claims, issuance to small entity or large entity, number of foreign counterparts, number of family members,[78] and time spent in prosecution.[79] Acquired traits include characteristics such as ownership (including whether the patent has been subsequently assigned/transferred and changes in owner size[80]), investment (including maintenance fee payment, reexamination, and/or reissue), collateralized (security interest in the patent), financing, forward citations, and enforcement (including licensing and/or litigation).[81] Focusing on acquired traits, Chien's study found that litigated patents are more likely to (1) be transferred, (2) experience a change in owner size, (3) undergo ex parte reexamination, (4) have maintenance fees paid, (5) be collateralized, and (6) be cited.[82]

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71. *Id*. at 233.

72. *Id*. at 237.

73. Lanjouw & Schankerman, *Characteristics*, *supra* note 1; Lanjouw & Schankerman, *Patent Quality*, *supra* note 1; Lanjouw & Schankerman, *Protecting IP*, *supra* note 1.

74. Lanjouw & Schankerman, *Characteristics*, *supra* note 1, at 133-34.

75. *Id*. at 137.

76. *Id*. at 141.

77. Chien, *supra* note 1; *see also* Kesan,. Schwartz & Sichelman, *supra* note 1; Petherbridge, *supra* note 1.

78. Chien, *supra* note 1, at 299. (Professor Chien also analyzed "ancestor" patents from which the patent claimed priority and "descendant" patents that claimed the benefit of priority.)

79. *Id*. at 298-99.

80. *See* 37 C.F.R. § 1.27 (2013) (defining small entity status, as well as change in owner size from small entity to large entity or vice versa).

81. Chien, *supra* note 1, at 299-301.

82. *Id*. at 317.

III. DESCRIPTION OF STUDY

This study examines the "overall population" (OP) of litigated patents. The dataset includes all patents that were litigated in 2010 and 2011 that we could key to their corresponding patent examiner. The dataset is not segmented by those patents held invalid or valid, or infringed or non-infringed. It is also important to note that this study analyzes the incidence and characteristics of case filings. Because the vast majority of patent cases do not reach final judgment, we focus on all patent case filings in this study.

Additionally, the datasets are defined in terms of patents, not cases. Many cases reviewed had more than one patent in question. Accordingly, we review each of those patents as an independent unit for analysis.[83]

A. *Overall Population (OP) Dataset*

This study coded for every litigation that "terminated" in 2010 to 2011. Thus, any case that ended in either district court or the Federal Circuit was coded. The dataset includes 12,923 litigations that corresponded to 15,161 patents matched to 11,748 patent examiners.[84] This Article focuses only on validity decisions based on United States issued patents. Because we focus on issued patents, the dataset does not include appeals from the rejection of a patent application by the PTO Board of Patent Appeals and Interferences (BPAI).[85] Additionally, we do not include decisions of foreign courts or decisions or appeals from the United States International Trade Commission (ITC). Finally, it is important to note that this data set is a highly selective sample, and not representative of the majority of patents granted.

This dataset significantly differs from that described in Cockburn et al. because Cockburn et al. included only "CAFC-tested" patents that reached a final appellate decision.[86] In contrast, this dataset includes not only those patents appealed to the Federal Circuit, but also those patents whose litigation

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83. When necessary, this analysis was bifurcated even further by independent claims in each patent. For example, if in one patent, a set of claims were held valid while another set of claims were held invalid, we broke this down into two different patents for purposes of our analysis.

84. *See supra* note 18. Accordingly, 3,413 patents fell outside of our examiner database. The examiner database included only those patents that issued between January 1, 2001 and July 15, 2011. Thus, many of the patents that were not included were issued before January 1, 2001.

85. BPAI appeals were not included because the standard of review for appeals from the BPAI introduces data that are not completely comparable with the data derived from infringement actions in the district courts or the Federal Circuit. For example, the burdens of proof and the nature of the parties are dissimilar. Additionally, as noted by Allison et al., other problems include (1) the ex parte nature of the BPAI proceedings, (2) the absence of juries, and (3) the absence of the presumption of validity. *See* Allison & Lemley, *supra* note 1, at 195 n.23.

86. Cockburn et al., *supra* note 19.

terminated in the district court system. However, Cockburn et al. were able to link overall examiner experiences (in terms of years as well as total number of issued patents) with the litigated patents. In contrast, this study is limited to examiner information gleaned from the last ten years of issued patents.[87]

One might argue that a more accurate determination may be to use the average number of patents issued by a specific examiner during the year the litigated patent was issued. However, the average number of patents issued per year gives a more accurate view of the examiner's allowance profile because it is not a snapshot, but a moving average of the examiner's allowance rate over the examiner's career at the PTO between 2001 and 2012.

B. *Examiner Dataset*

In a previous study, we created a database of every patent issued between 2001 and 2012.[88] The collection, limitations, and interpretation of this database have also previously been described.[89] Briefly, we coded for every patent issued between January 2001 and June 2012 (approximately 1.7 million patents). Each patent was matched with a specific "working" examiner.[90] An average number of patents issued per year could be calculated for each examiner by simply summing the "number of patents issued"[91] divided by the "years of service" as an examiner.[92] The examiner database includes 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 dataset.

Each patent that was litigated in the OP database was matched with the examiner database that was previously created. Accordingly, the OP database contains a profile of examiners who issued patents that later underwent litigation.

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87. Our examiner dataset includes only data starting from January 2001, which is the earliest timeframe for which electronic records regarding specific examiners were kept.

88. Tu, *supra* note 1.

89. *See id*. at 54-63.

90. The "working examiner" is 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.

91. The "number of patents" issued includes all patents issued by the specific examiner between January 2001 and July 2012.

92. The "years of service" does not include those years where the examiner issues only one patent. This was done to remove 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 at the end of the year, who may have issued only one patent due to the ramp up time, and (5) examiners who came back to the PTO and needed time to ramp up during their return year.

C. *Data Collected*

For each patent in the OP dataset, we collected the following data points, to the extent that it could be determined from the court's opinion:

case name and citation;
patent number and art unit;
secondary and/or primary examiner's name;
years of examination experience;
average time it takes the specific examiner to issue a patent;
title of examiner[93] at the time the patent issued;
filing date of patent; and
issue date of the patent.

D. *Hypothesis to Be Tested*

The OP database was used to determine which examiners were issuing litigated patents. We first wanted to determine if there was a correlation between examiner allowance rates and frequency of litigation. Several hypotheses were tested using this database:

Hypothesis 1: Patent examiners who issue patents at the highest rate (those patent examiners who issue more than eighty patents per year) will issue more patents that end up in litigation.

The hypothesis is that these high-volume examiners will end up in litigation more often because they are "rubber stamping" patents,[94] and thus are not completing a thorough review of the prior art or specification, and are granting broader claims.

Hypothesis 2: Patent examiners who issue at a very low rate (those patent examiners who issue less than ten patents per year) will issue relatively fewer patents that end up in litigation.

The hypothesis in this case is that these examiners will end up in litigation at a lower rate because they are able to spend more time reviewing and finding prior art as well as completing a thorough analysis of the specification.

Hypothesis 3: Patent examiners who have the least experience will have more litigated patents than those examiners with four or more years of experience.

Similar to Hypothesis 2, we segment the data based not on allowance rates, but on years of experience at the PTO to determine if there is a higher rate of

93. The title of the examiner could fall into one of three categories: (1) Primary, (2) Secondary, or (3) Both. The "Both" category simply means that the year that the patent issued, the examiner was a primary on some patents and a secondary examiner on other patents.

94. *See* Mark A. Lemley & Bhaven Sampat, *Is the Patent Office a Rubber Stamp?*, 58 EMORY L.J. 181 (2008).

litigation for those examiners early in their career versus later in their career.

E. *Limitations*

The OP database is a broad database but suffers from some selection bias due to the examiner-matching step. Specifically, temporal selection bias occurs in the OP database since the examiner database contains only those patents that were issued between 2001 and 2012. Accordingly, litigations dealing with "older patents" (i.e., those patents issued before 2001) are not included in the OP database.

There are also many inherent limitations with using a litigation-based database. For example, litigated patents may inherently represent a subpopulation of patents with unique characteristics.[95] Additionally, there are many variables associated with litigation in general; for example, the experience and skill of the lawyers, differing jury pools, the experience of the judges (experience with both patent cases and the specific technology in question), witnesses, and resources available to both parties.[96] Accordingly, it is important to note that this subpopulation of patents is not representative of most patents that are issued.

Finally, there are many reasons to bring litigation, but many of these reasons may not represent errors by the patent examiner. For example, a patent could be litigated and found invalid because of inequitable conduct. In this situation, the patent examiner may have issued a valid patent based on the fraudulent information given to her by the applicant. Another example deals with a patent that was found valid, but non-infringed. Here, the litigated patent may have been correctly issued, but litigated due to incorrect interpretation of the scope of the claims. Accordingly, simply because a patent is litigated, does not mean that there were errors made at the patent office.

To address these issues, we are currently working on a study that reviews only those patents that have been litigated to final judgment and found invalid. We then connect these invalidated patents to their corresponding examiners to determine if there are any common characteristics among the examiners who issue invalidated patents. However, we note that the pool of litigations that are litigated to final judgment dramatically reduces the sample size.

IV. RESULTS

A. *Statistical Analysis*

To determine whether the actual count of litigations was significantly different than the weighted average, we calculated the 95% confidence

95. Allison & Lemley, *supra* note 1, at 203; Chien, *supra* note 1, at 283.

96. Allison & Lemley, *supra* note 1, at 204.

intervals for both actual and weighted average distributions. Each confidence interval is centered around the actual count and the weighted average count for each observed data point and is visually represented by a vertical line designating the range of the interval. When the confidence interval of the actual observation overlaps with the confidence interval of the expected count, no significant difference between the two is detected. However, when the two confidence intervals are not overlapping at a particular data point, the difference between the two confidence intervals is significant at that specific data point ($p < 0.05$).

The examined data is assumed to follow a Poisson distribution because (a) Poisson is a model for counting successes (number of litigations) and (b) the observation of successes (number of litigations) in each interval is independent.[97] The mean of every Poisson distribution is usually utilized to calculate confidence intervals. However, when the mean is unknown, the actual count value (X) in each observational point (in this case number of litigations) can be used as an estimate. As a result, the following formula was utilized where z =1.96 corresponds to a 95% confidence interval:

$$X \pm Z_{\alpha/2}\sqrt{X}$$

In its nature, the Poisson distribution is non-normal,[98] being skewed limited by zero on the left because count data cannot be negative and approaching infinity on the right.[99] However, the Poisson distribution approximates the normal distribution when λ is large,[100] as it is in this case. The Poisson distribution is the most common and frequently utilized model for analyzing count data relative to the number of occurrences of a specific phenomenon.[101]

B. *General*

As a preliminary matter, we examined the frequency of litigation between technology centers. Because we did not need to match patent examiners to answer this question, we used the full database, which includes all litigations from 2010 and 2011. As shown in Figure 1, the most litigated patents come from technology center 2600 (Communications). The art units are coded as

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97. A. COLIN CAMERON & PRAVIN K. TRIVEDI, REGRESSION ANALYSIS OF COUNT DATA (2d ed. 2013).

98. DEREK BISSELL, STATISTICAL METHODS FOR SPC AND TQM (1994).

99. GERRY P. QUINN & MICHAEL J. KEOUGH, EXPERIMENTAL DESIGN AND DATA ANALYSIS FOR BIOLOGISTS 11 (2002).

100. ANWER KHURSHID & HARDEO SAHAI, STATISTICS IN EPIDEMIOLOGY: METHODS, TECHNIQUES, AND APPLICATIONS (1996).

101. Manad Khamkong, *Approximate Confidence Interval for the Mean of Poisson Distribution,* 2 OPEN J. STAT. 204 (2012).

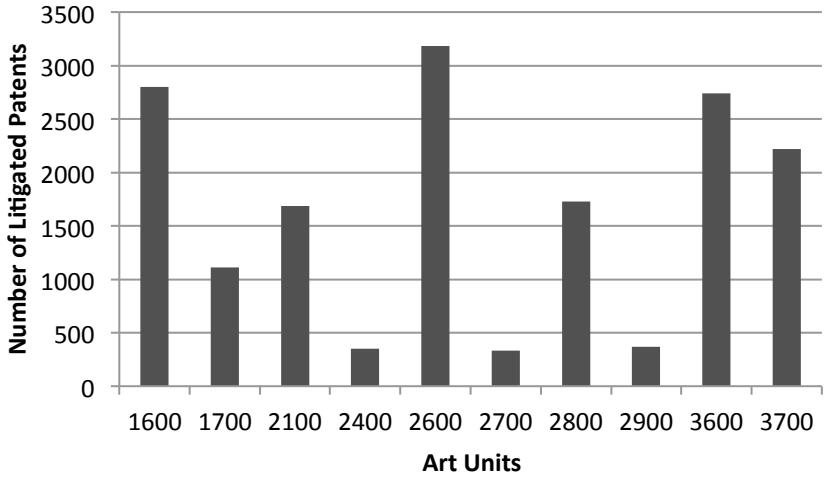
follows[102]:

102. *Patent Technology Centers*, *supra* note 26.

Technology Center	Technology Type
Technology Center 1600	Biotechnology and Organic Chemistry
Technology Center 1700	Chemical and Materials Engineering
Technology Center 2100	Computer Architecture, Software, and Information Security
Technology Center 2400	Computer Networks, Mutliplex communication, Video Distribution and Security
Technology Center 2600	Communications
Technology Center 2800	Semiconductors, Electrical and Optical Systems and Components
Technology Center 2900	Designs
Technology Center 3600	Transportation, Construction, Electronic Commerce, Agriculture, National Security and License & Review
Technology Center 3700	Mechanical Engineering, Manufacturing, Products

Note that Technology Center 2700 was subdivided into Technology Centers 2100 and 2600 to accommodate growth in computer-related applications.[103]

Figure 1



103. Wynn Coggins, *Technology Center 2700 Splits to Accommodate Growth in Computer-Related Applications*, USPTO TODAY, Nov. 2000, at 12, *available at* http://www.uspto.gov/web/offices/ac/ahrpa/opa/ptotoday/ptotoday11.pdf.

Previously Allison, Lemley, and Walker predicted that the most litigated patents are "more likely to be software and telecommunications patents, not mechanical or other types of patents."[104] This study confirms their finding. However, we also find that a significant number of litigated patents come from Technology Center 1600 (Biochemistry and Organic Chemistry). We note that our dataset is based solely on the art unit. In contrast, the data in Allison, Lemley and Walker were categorized by hand into an industry and technology group.[105]

Figure 2 shows the type of examiners (primary or secondary examiners) that are issuing patents that later get litigated. These data required us to match litigations to specific examiners. Accordingly, we reviewed 15,161 litigated patents and matched them to 8,274 primary examiners, 2,349 secondary examiners and 1,125 examiners who were both primary and secondary examiners at the time the patent was issued. Primary examiners are issuing litigated patents at a much higher frequency than secondary examiners, with primary examiners issuing approximately 70% of the litigated patents, while secondary examiners issue approximately 20% of the litigated patents. This result is somewhat unsurprising because primary examiners are issuing many more patents than secondary examiners. We later control for this factor as shown in Figures 4 and 5. Finally, as shown in Figure 2, approximately 10% of the litigated patents are issued by examiners who were "both" primary and secondary examiners. This smaller population "both" represents the fact that some examiners were transitioning from secondary to primary status and were issuing patents as both a secondary and primary. Accordingly, the "both" category includes examiners who were most likely promoted from a secondary examiner to a primary examiner during the year the litigated patent issued.

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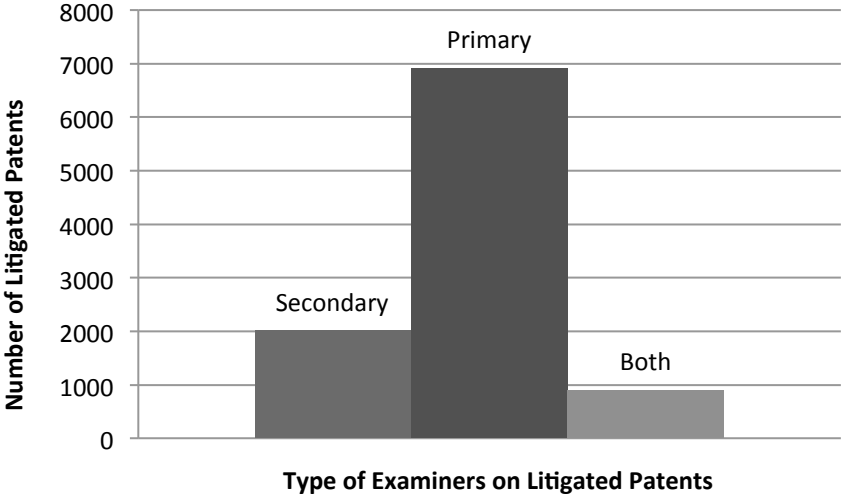
104. Allison, Lemley & Walker, *supra* note 1, at 3.

105. *Id*. at 6; s*ee also* John R. Allison & Mark A. Lemley, *Who's Patenting What? An Empirical Exploration of Patent Prosecution*, 53 VAND. L. REV. 2099, 2114 (2000) (arguing that the PTO classification system is flawed).

Figure 2



C. *The Overall Population (OP) Database*

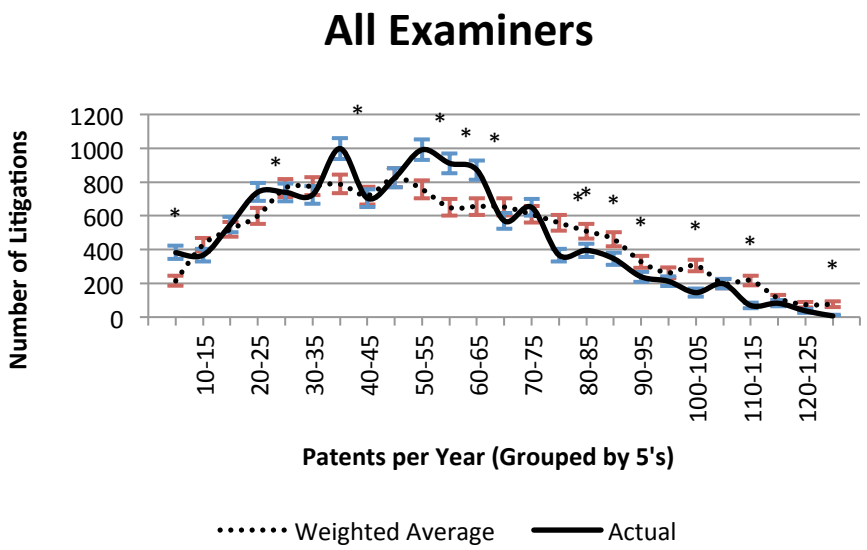
Hypothesis 1 Results: Surprisingly, we found that those examiners who issue at the highest rate (on average more than eighty patents per year), end up in litigation less than expected. *Hypothesis 2 Results:* Primary examiners who issue patents at a lower rate (fewer than ten patents per year), actually experience a slightly higher than expected litigation rate. Interestingly, primary examiners who issue between 45-60 patents issue a disproportionately high number of litigated patents. *Hypothesis 3 Results:* Finally, when we segment the primary examiners by years of experience, the primary examiners who issue a disproportionate number of litigated patents are those with three to six years of experience. In contrast, when we segment the secondary examiners by years of experience, all secondary examiners issue litigated patents in an approximately expected fashion.

Figure 3 graphically depicts the overall results from examiners in all art units. The solid line depicts the actual litigation from 11,748 patents. The *x*-axis represents examiners with a specific average allowance rate. The *y*-axis represents the number of patents that have ended up in litigation. The areas depicted with a star (*) demonstrate that the difference between the expected litigation rate and the actual litigation rate was significant with a 95% confidence interval. For example, there are approximately 1,000 patents that have ended up in litigation that were issued by examiners with an average allowance rate of between 50 and 55 patents per year. The dotted line represents the expected litigation rate if all litigations were random. Specifically, the dotted line represents the total litigations multiplied by the *percentage* of patents issued by the specific population of examiners.

For example, those examiners who issue an average of 50-55 patents per

year issued approximately 6.24% of the total number of patents issued between 2001 and 2012. Accordingly, if litigation was simply random, they should represent 6.24% multiplied by the total number of litigations (which is represented by the dotted line). Thus, when the dotted line is below the solid line, examiners are issuing litigated patents at a higher than expected rate. Conversely, when the dotted line is above the solid line, examiners are issuing litigated patents at a lower than expected rate.

Figure 3

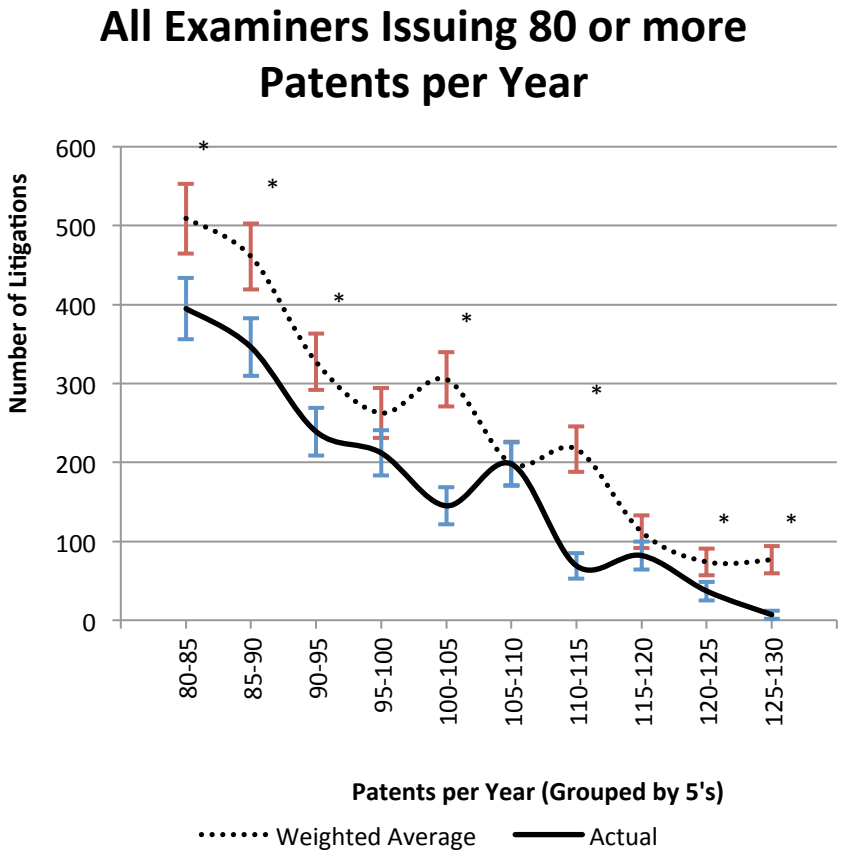


As shown in Figure 3, examiners can be divided into three distinct populations. The first population includes those examiners who issue patents at a high rate (on average greater than 80 patents per year). This first population is issuing fewer than expected litigated patents. The second population includes those examiners who issue patents at a lower rate (on average 35 patents or less per year). This second population is issuing litigated patents at approximately the expected rate. Finally, the third population includes those examiners who issue patents at a rate of between 40-65 patents per year. This third population of examiners is issuing litigated patents at a higher than expected rate.

The results from the first population (examiners issuing on average greater than 80 patents per year) are expanded in Figure 3A. The results from the first population are surprising because one might expect that the highest volume examiners (those examiners who might be "rubber stamping" patents) may not be reviewing patents as closely or searching the prior art as carefully as other examiners who spend more time on each application with less patent issuance per year. However, these highest volume examiners are actually doing much better than expected. Specifically, these examiners issue a lower than expected number of litigated patents. One possible explanation for this phenomenon may

be that these are the most experienced examiners, and thus they are very familiar with the prior art, and can quickly administer the correct rejections while allowing cases. Alternatively, it could be that these examiners can determine which patent applications are commercially valuable, and are able to filter out and allow only those patent applications that are not likely to be litigated.

Figure 3A

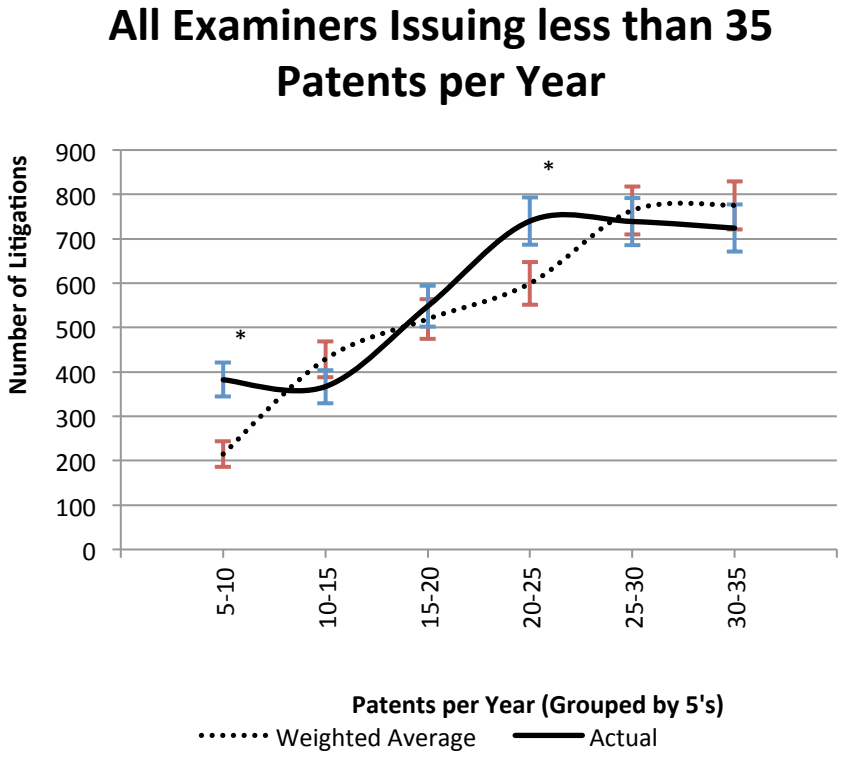


The results from the second population (examiners issuing on average less than 35 patents per year) are expanded in Figure 3B. The second population is issuing litigated patents at a rate statistically proportional to the number of patents issued by this population. In general, these examiners are spending more time to issue a lower volume of patents.[106] These results might be unexpected; because these examiners are issuing at a lower rate, one might expect that these examiners are conducting more comprehensive reviews of

106. Tu, *supra* note 16, at 17, fig. 3.

patent applications. However, one explanation is that these examiners consist largely of secondary examiners, who are still inexperienced, and thereby more careful because they are reviewed not only by quality control examiners, but by their supervising examiners.

Figure 3B



The results from the third population (those examiners who issue on average between 40-65 patents per year) are expanded in Figure 3C. Interestingly, the results from the third population may also be explained by level of experience. We may see a higher litigation rate for these examiners because they have full signatory authority and are working independently for the first time, but may still need guidance.[107] Compounding the problem, these primary examiners with full signatory authority have a corresponding decrease in available examination time and increase in production rates. Thus, to compensate, these examiners may be allowing cases from their docket that they would not have issued given a lower production rate. This effect is more pronounced when we segment the data by years of service as a primary examiner.[108]

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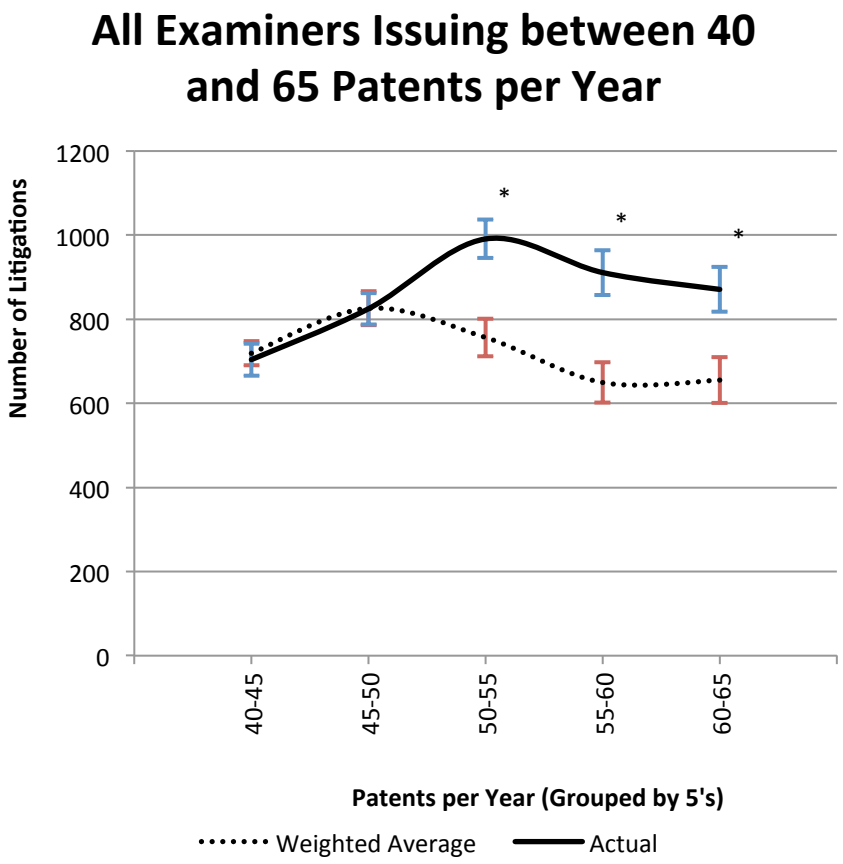
107. *See also infra* Part IV.E (segmenting examiners by years of service).

108. *Id.*

Figure 3C

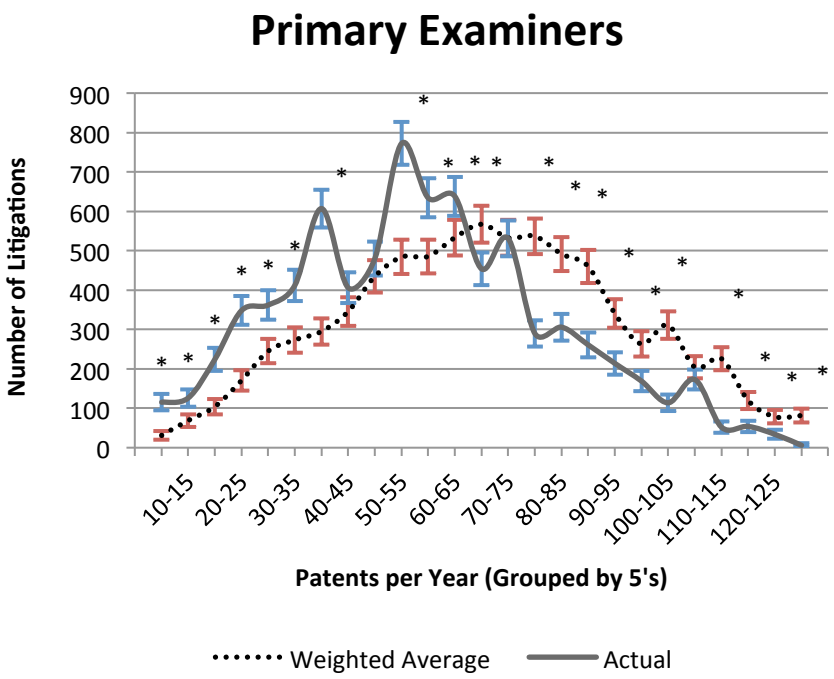


D. *Segmentation by Primary Versus Secondary Examiners*

We segmented these overall results into two categories: (1) primary examiners and (2) secondary examiners. Accordingly, Figures 4 and 5 depict litigated patents by primary and secondary examiners, respectively, who issue litigated patents at specific rates.

Interestingly, as shown in Figure 4, primary examiners who issue patents at a rate lower than 40 patents per year are issuing litigated patents at a higher rate than expected. Additionally, primary examiners who issue more than 80 patents per year are issuing litigated patents at a lower rate than expected.

Figure 4



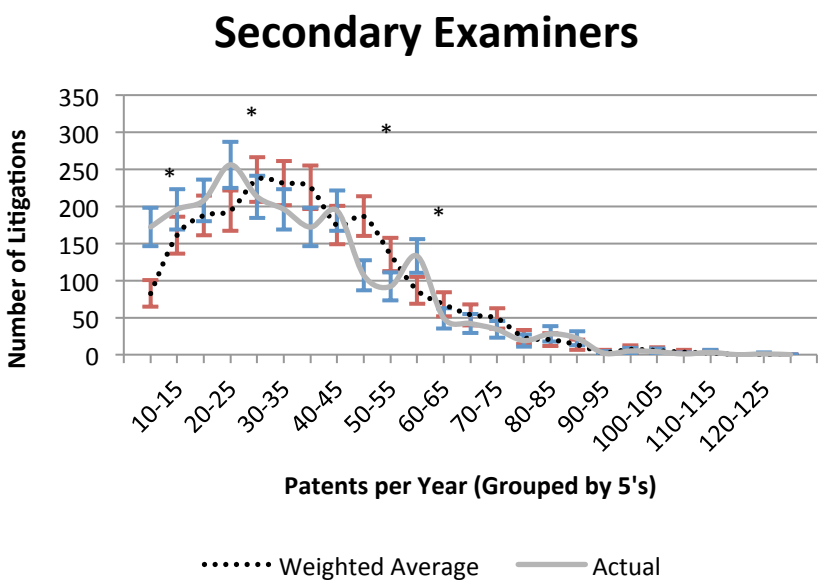
One possible explanation for this phenomenon is that the examiners who issue patents at the highest rate are the examiners with the most experience. Thus, these high rate examiners know how to quickly and correctly reject or grant patents based on their knowledge of the prior art and patentability standards. These high volume examiners may represent the best of both worlds, that is, granting valid patents and reducing the backlog of applications, all while avoiding costly litigation.

Another possible explanation for this phenomenon is that high volume examiners are not simulating innovation, but simply know how to filter out commercially valuable patents to avoid issuing litigated patents. Thus, it is possible that these examiners are simply better able to select out those patent applications that may be litigated or broad enough to encompass competitors' commercial embodiments. This type of selection bias is difficult to control. Specifically, without examining each individual patent and comparing each patent against control patents (those issued by lower volume examiners), it is impossible to determine if this selection bias is occurring.

As shown in Figure 5, we segment the data to assess secondary examiners. The general trend that higher volume examiners issue less litigated patents while lower volume examiners issue more than expected litigated patents also holds true for secondary examiners, albeit to a lesser extent. As shown in Figure 5, the magnitude of this result is less significant when applied to secondary examiners. This may be unsurprising because the population of

secondary examiners is self-selecting. That is, those examiners who have the most experience will become primary examiners. Accordingly, the population of highly experienced secondary examiners is small.

Figure 5



E. *Segmentation by Years of Service*

The data was then segmented into the primary and secondary examiners by years of service. Accordingly, Figures 6 and 7 depict litigated patents by primary and secondary examiners segmented by the number of years of service at the PTO when the patent was litigated.[109]

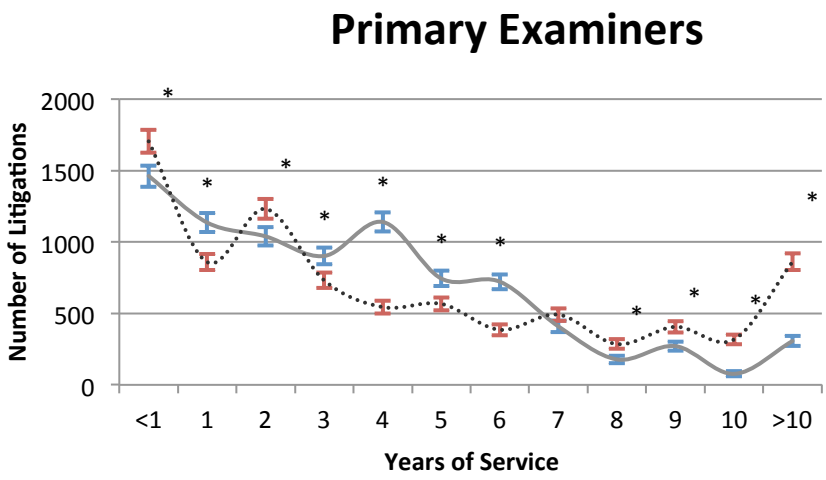
Interestingly, as shown in Figure 6, it was not the primary examiners with the least experience (less than 2 years) who were issuing the highest number of litigated patents. The examiners with 3-6 years of experience were issuing a disproportionate number of litigated patents. One explanation could be that when an examiner first becomes a primary examiner, the examiner is still under review.

To obtain permanent full signatory authority, an examiner must first go through a four-step program: (1) the examiner is granted temporary partial signatory authority, (2) the examiner is granted permanent partial signatory

109. Years of service means issuing at least one patent per calendar year. To determine total years of service, we simply totaled up the total number of years where the examiner issued at least one patent per calendar year.

authority, (3) the examiner is granted temporary full signatory authority, and finally (4) the examiner is granted permanent full signatory authority.[110] This partial signatory authority process takes at least 13 bi-weeks, or approximately six months, but could take more time depending on whether the examiner wishes to move to the next phase. When the partial signatory program is complete, then the examiner can be granted temporary full signatory authority. Again, the process to move from temporary full signatory authority to permanent full signatory authority can take more than six months to complete. Additionally, when an examiner has partial signatory authority or temporary full signatory authority, that examiner undergoes more scrutiny. Accordingly, the additional scrutiny during the first few years as a primary examiner could act as a gatekeeper for litigated patents.

Figure 6



In contrast, primary examiners who have permanent full signatory authority (usually years 3 and above) are no longer heavily scrutinized. Compounding this problem is the fact that production rates increase when primary examiners acquire full signatory authority (usually an examiner moves to a GS-14 after gaining permanent full signatory status). Specifically, when examiners move to GS-14, they are usually required to produce at least 135% over the GS-12 benchmark.[111] Thus, new primary examiners who have

110. *See also supra* Part I.B.

111. Additionally, there are other programs that could increase both the pay rate and the production requirements of a primary examiner with permanent full signatory authority. For example, "Expert Level" rating will raise an examiner to a GS-15 level and require 150% of the GS-12 production numbers. Additionally, a "Senior Level" rating will raise an examiner to a GS-15 level and require 40% of the GS-12 production numbers. Finally, a "Generalist" or "Ph.D." credit can raise the full signatory authority examiner to a GS-15 level but will

permanent full signatory authority are in the new position of increased production rates while experiencing reduced supervision. Accordingly, these primary examiners (usually with more than 2-3 years of experience as a primary examiner) may issue those applications on their docket that they would have been hesitant to allow beforehand. This phenomenon is supported by the fact that these applications that are "on the fence" might be more litigated than most patents. This is because strong patents could be allowed quickly by the examiner, and competitors would most likely need to license these patents, thereby avoiding litigation. Correspondingly, weak patents might take longer to issue, but would most likely not be litigated because of their weak standing. However, applications where validity is unclear may require litigation. These unclear applications may be issued at a higher rate when the primary examiner first receives full signatory authority (without supervision), thereby explaining the higher litigation rates in years 3-6. This explanation would comport with the selection bias described by Priest-Klein.[112]

Interestingly, primary examiners in years 4-6 steadily decrease the number of litigated patents they issue. This could be because the numbers of unclear applications are depleted from their docket. Alternatively, primary examiners with more experience may be simply getting better at filtering out commercially valuable patents as discussed in Part IV.B above. Most likely, it is a combination of these two factors.

As shown in Figure 7, secondary examiners issue litigated patents by experience almost exactly as expected. That is, secondary examiners issue litigated patents as a function of percentage patents issued. Again, the population of secondary examiners who have more than five years of experience is self-excluding because the most experienced secondary examiners are most likely to become primary examiners.

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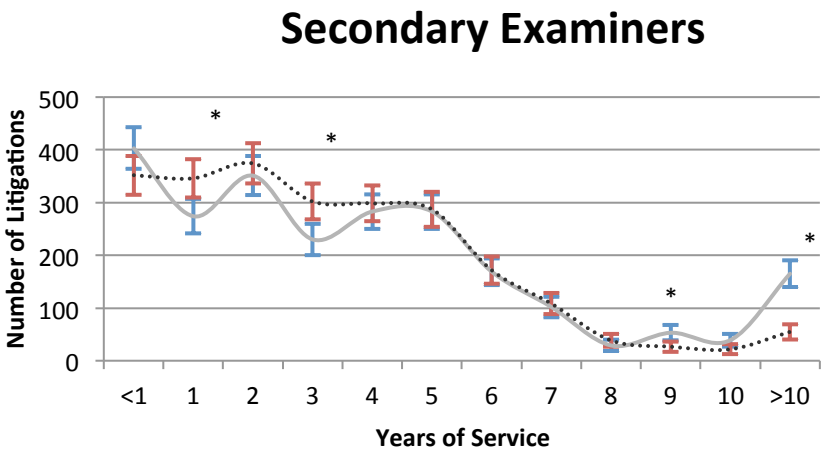
keep the examiner at 135% of the GS-12 production numbers. These programs can take one to five years to clear before credit is given.

112. George L. Priest & Benjamin Klein, *The Selection of Disputes for Litigation*, 13 J. LEGAL STUD. 1 (1984); George Priest, *Selective Characteristics of Litigation*, 9 J. LEGAL STUD. 399 (1980).

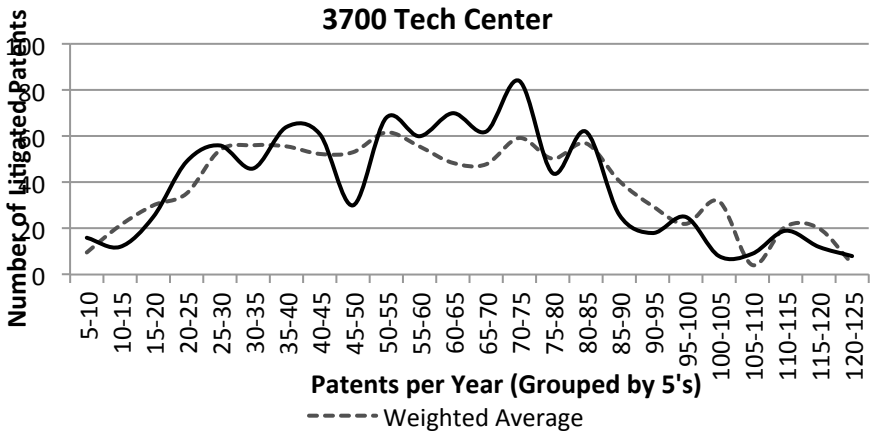
Figure 7



F. *Segmentation by Technology Centers*

We segmented the data by specific technology centers in Appendix A. For example, Figure 8 represents the number of litigated patents from Technology Center 3700 (Mechanical Engineering, Manufacturing and Products). Although not all points along the spectrum are significant, the general trend holds true. Specifically, (1) examiners who issue patents at a lower rate are issuing litigated patents at a rate similar to random chance, (2) examiners who issue patents at a higher rate issue litigated patents at a lower than expected rate, and (3) those examiners who issue between 50 and 75 patents per year issue litigated patents at a higher than expected rate.

Figure 8



G. *Segmentation by Workgroup*

Finally, we segmented the data by workgroup, focusing on those workgroups that contained a disproportionate number of litigated patents. We found some workgroups that could be targeted for secondary review, thereby possibly lowering the issuance of litigated patents. Targeting specific workgroups and examiners within these specific workgroups for secondary review may be a cost effective means to decrease the number of litigated patents issued by the Patent Office.

One example is Workgroup 2610 (Digital Communications, General Communications, Optical Communications, Telephony, Audio, Multiplex Communications, Cellular Telephony, Radio, and Satellite Communications) in Technology Center 2600 (Computer Architecture, Software and Information Security). The total number of litigated patents in Technology Center 2600 is shown in Figure 9a. Interestingly, many of the litigated patents are coming from Workgroup 2610, which encompasses digital communications, Figure 9b. More specifically, many of these litigated patents are coming from examiners who issue on average between 55 and 70 patents per year. One solution may be to target these examiners for quality review more frequently to ensure quality control.

A second example is Workgroup 3720[113] (Manufacturing Devices and Processes, Machine Tools, and Hand Tools) in Technology Center 3700 (Mechanical Engineering, Manufacturing and Products). The total number of

113. Art Units 3721 (Sheet Material Container Making, Package Making, Elongated Member Driving, Tool Driving or Impacting) and 3728 (Shoes, Special Receptacle or Package) are not included in this workgroup because they are included in Workgroup 37B (Sheet Container Making, Package Making, Receptacles Shoes, Apparel, and Tool Driving or Impacting).

litigated patents in Technology Center 3700 is shown in Figure 10a. Many of these litigated patents are coming from Workgroup 3720. It is difficult to specifically target one particular group (by volume) of examiners in this workgroup. However, all patents issued from 3720 could be reviewed at a higher rate for quality control because this workgroup is issuing litigated patents at a higher rate.

Figure 9a

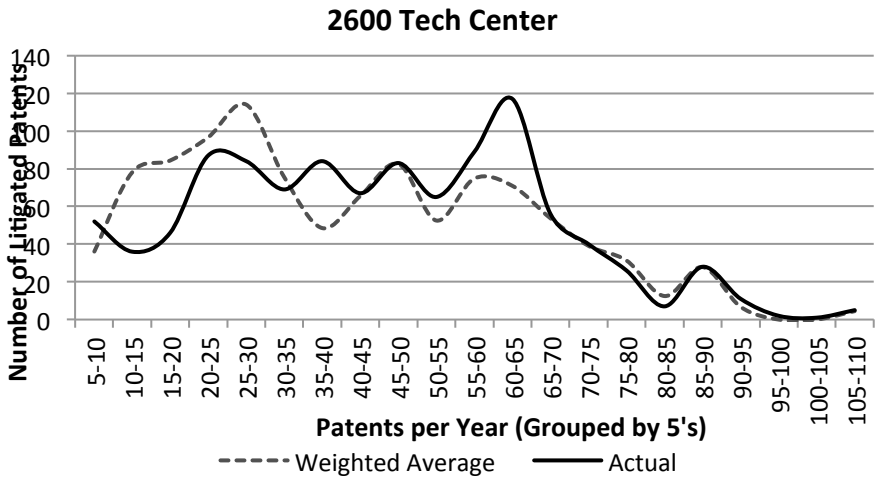


Figure 9b

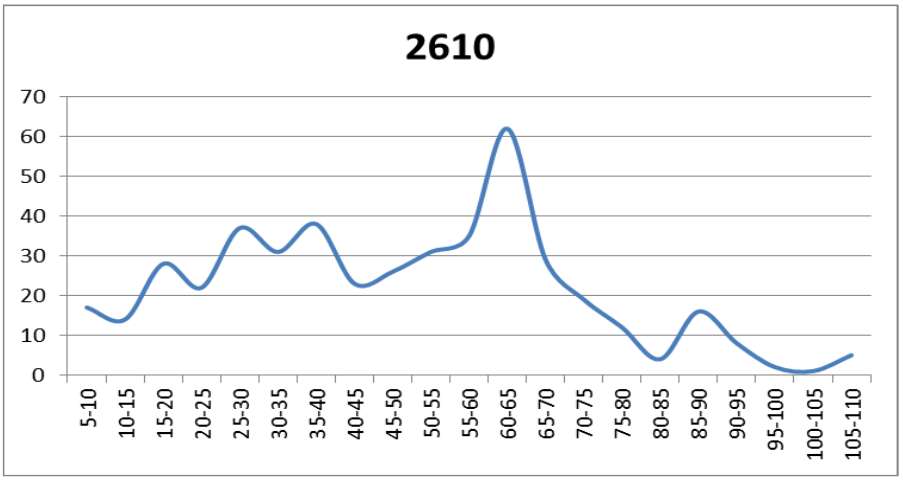


Figure 10a

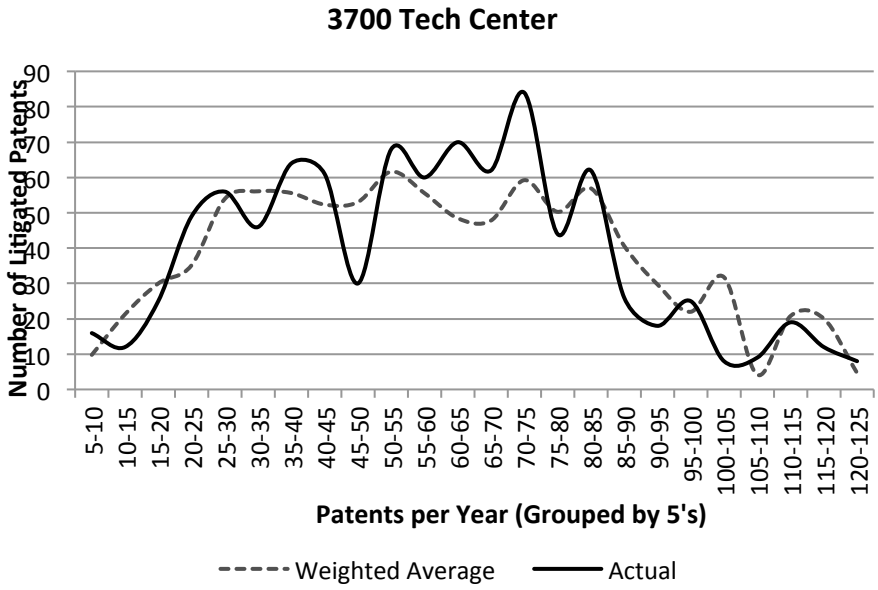
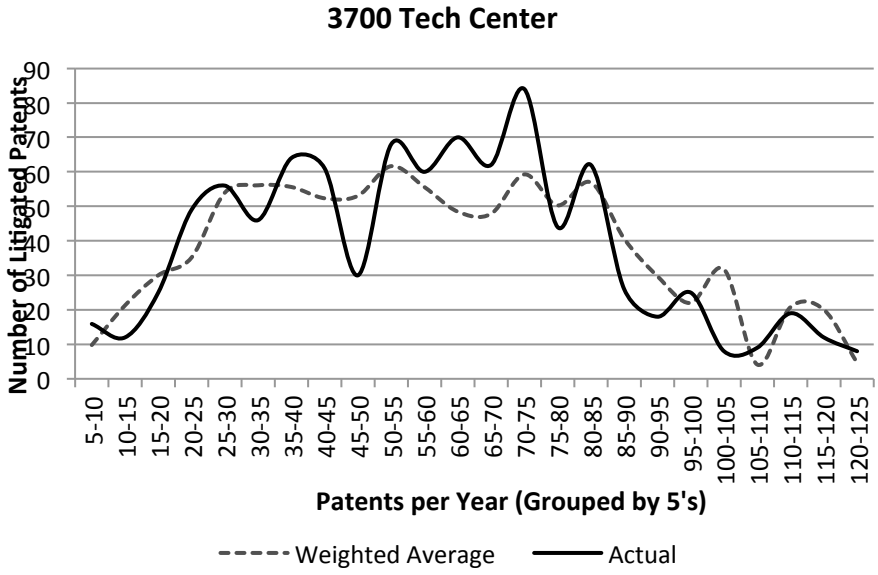


Figure 10b



H. *Possible Solutions*

As with any descriptive study, it is difficult to make causal links. As described above, there are many situations where litigation could not be avoided by measures taken by the PTO. Each of the solutions below is based on the implication that there is a causal link between examiners and litigation, which may not be the case. Thus, if we assume that many of these litigations could have been prevented by examiners at the PTO level, then there are solutions that may be implemented to increase patent quality.

One solution to lower the number of litigated patents may be to create a two-track specialization system for patent examiners. This may allow the PTO to simulate the experience of one 10+ year examiner in a much shorter amount of time. A division of labor where one group of examiners specializes in prior art searching, while another group of examiners specializes in drafting office actions could mimic the specialization of one senior examiner in a much shorter timeframe. This solution would not only help the backlog of RCEs, but also help the general backlog of unexamined patent applications.

Specifically, the first track (1) would be a prior art searching track, and the second track (2) would be an office action generation track. Prior art searching examiners would specialize and have sole responsibility for completing prior art searching. This would allow some examiners to deeply specialize in creating targeted keyword searches for a variety of different inventions within the same art unit or workgroup. The second track would consist of office action generation, based in large part on the results gathered from the prior art searchers. Office action generation examiners would specialize in understanding the relevant patent law and would have sole responsibility for composing complete office actions that correctly apply the law. This would allow specialization in the writing skills necessary to convey clear rejections.

Patent examiners (or their supervisors) would choose which track to go into when moving from a secondary examiner to a primary examiner. This would allow examiners to specialize in those skills that are best suited for the specific examiner, thus allowing for better rejections with clearly written office actions. Specialization should also decrease the workload per examiner, and result in faster and more efficient application processing rates.

Additionally, this two-track system would combat the incomplete or piecemeal search by examiners in the first action, with a more complete search in the "final" action. Patent quality should increase because relevant prior art would be determined in the first instance. Additionally, prosecution times would decrease because office actions would be written in a clear and coherent manner on relevant patent laws such that applicants could determine the real issues at hand. Applicants would be able to identify the precise points of rejection so that the applicant could provide well-targeted responses. In general, there may be an increase in "quality" patents because relevant art would be found and clear rejections would be written. Prosecution histories would be clearer, and in litigation those issues that had been previously vetted by the

examiner would be distinct.

There are several possible limitations with this two track system. Foremost, this division of labor would limit the "office action generation" examiners' knowledge of the relevant prior art, and therefore dull their ability to gauge the novelty / non-obviousness of the invention.

The Japanese Patent Office (JPO) has embraced a variation of this model by outsourcing its prior art searches.[114]About 65% of all examined applications in 2010 (about 246,000 applications) were searched using an outsourced search company.[115] This outsourced search cost the JPO approximately $236 million, which represents approximately 40% of the direct cost of patent examination.[116] Interestingly, a study done by Yamauchi and Nagoka has shown that outsourcing the prior art search led to decreased appeals against rejection decisions as well as increased speed of examination.[117] Although most of the outsourced applications did not deal with "complex" technologies, Yamauchi and Nagoka argue that this outsourcing has led to not only increased speed, but also increased patent quality.[118]

A second possible solution to increase the number of "quality" patents would be to increase the number of experienced examiners. These data suggest that one way to increase the number of "quality" patents is to retain patent examiners to leverage their higher experience levels. A previous report has shown that the percentage of examiners with less than three years' experience has grown from less than 50% in 1996 to about 80% in 2009.[119] In contrast, the percentage of examiners with ten or more years of experience has decreased from 20% to less than 10% in the same period. These data are particularly disturbing in light of the fact that it takes approximately three years for an examiner to become proficient at searching and familiar with the nuances of patent law.

Finally, a third possible solution to decrease the number of litigated patents would be to increase the length of time primary examiners are supervised. Alternatively, full signatory authority might be given only after the sixth year as a primary examiner. This solution may, however, only simply delay the number of litigated patents to a period of time when the primary examiner becomes independent.

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114. Isamu Yamauchi & Sadao Nagaoka, *Does the Outsourcing of Prior Art Search Increase the Efficiency of Patent Examination?* (Institute of Innovation Research, Hitotsubashi Univ., Working Paper WP#13-12, 2013).

115. *Id*. at 2.

116. *Id*.

117. *Id*. at 3.

118. *Id*.

119. Dennis Crouch, *Patent Examiner Experience Levels*, PATENTLYO (Feb. 5, 2010), http://www.patentlyo.com/patent/2010/02/patent-examiner-experience-levels.html.

V. CONCLUSIONS

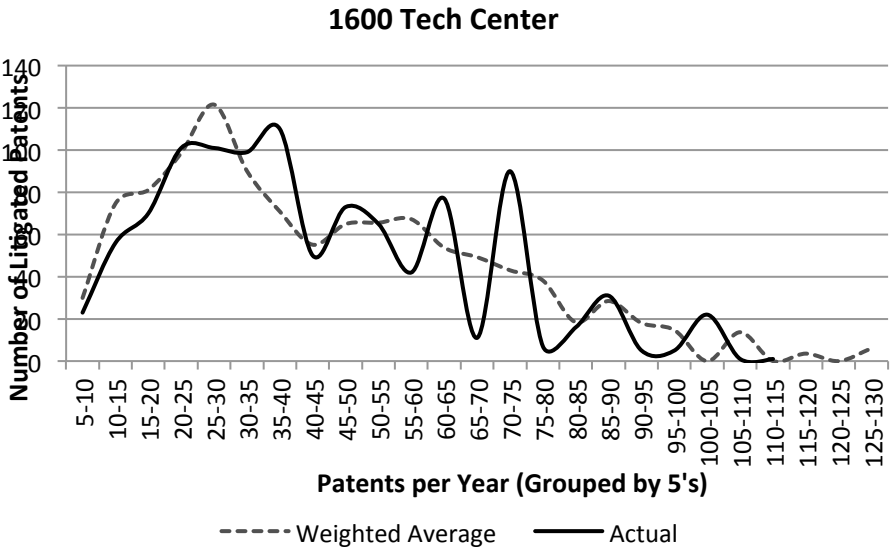
Patent litigation goes to the heart of the incentive structure established by the patent system. However, patent litigation is costly and time consuming. As discussed in Part I, previous studies have focused on patent characteristics that may lead to an increased chance of litigation. However, few studies have focused on examiner characteristics that may lead to an increased likelihood of litigation.

This study suggests that not all patent examiners issue litigated patents at the same rate. As an initial matter, when we segment the data by secondary examiner, we find that secondary examiners are issuing litigated patents at approximately the expected rate. In contrast, when we segment the data by primary examiners, we find that primary examiners, who have 3-6 years of experience or issue on average between 45 and 65 patents per year, issue litigated patents at a higher rate than expected. Furthermore, certain workgroups within specific technology centers issue litigated patents at higher rates than other workgroups. These data suggest that some groups of examiners and some workgroups should be scrutinized more heavily before allowing applications to issue as patents.

Interestingly, primary examiners who issue patents at the highest rate and have the most years of experience are issuing litigated patents at a much lower than expected rate. One explanation is that this population of examiners is better able to quickly filter out commercially valuable patents. Alternatively, it could be that this population of examiners is simply better able to determine those claims that are too broad in scope, and/or do not meet the patentability standards.

Finally, we note that there are many reasons why firms choose to engage in patent litigation. However, some litigations are baseless and do not result in invalidation of the patent. Thus, simply filing a patent suit may not be the ideal measure of patent quality. To address this issue, we are currently creating a database that contains every patent that was litigated to final judgment from 2010-2011. However, the major limitation to this new database is that the power is greatly reduced because sample size is diminished (from approximately 15,000 to approximately 300).

APPENDIX A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Number of Litigated Patents
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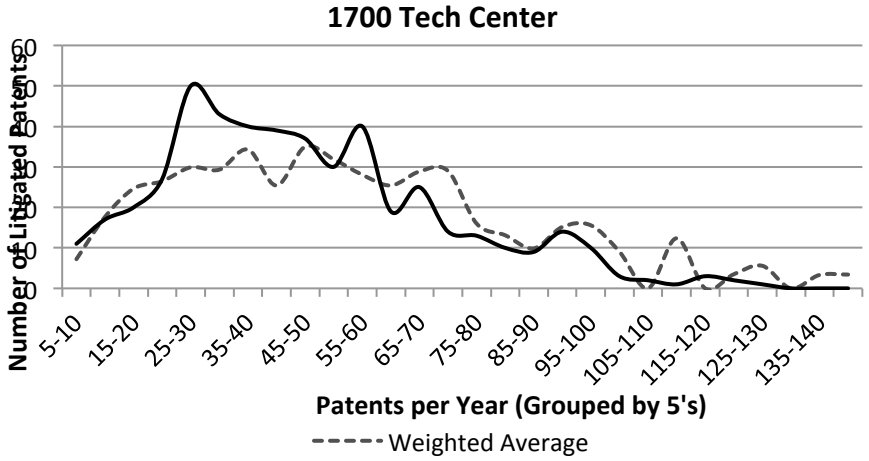
120
100
80
60
40
20
0
5-10
10-15
15-20
20-25
25-30
30-35
35-40
40-45
45-50
50-55
55-60
60-65
65-70
70-75
75-80
80-85
85-90
90-95
95-100
100-105
105-110
110-115
115-120
120-125
125-130
Patents per Year (Grouped by 5's)
Weighted Average
Actual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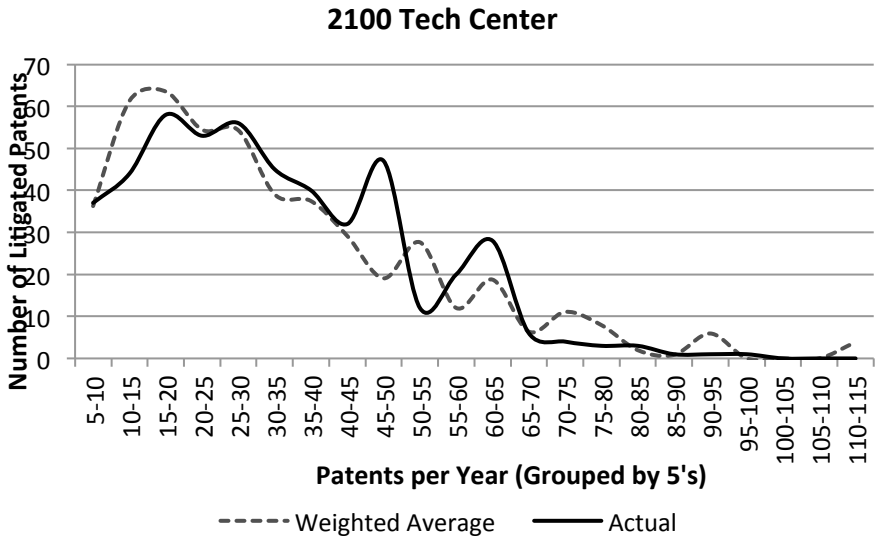
105-110
115-120
125-130
135-140
Patents per Year (Grouped by 5's)
Weighted Average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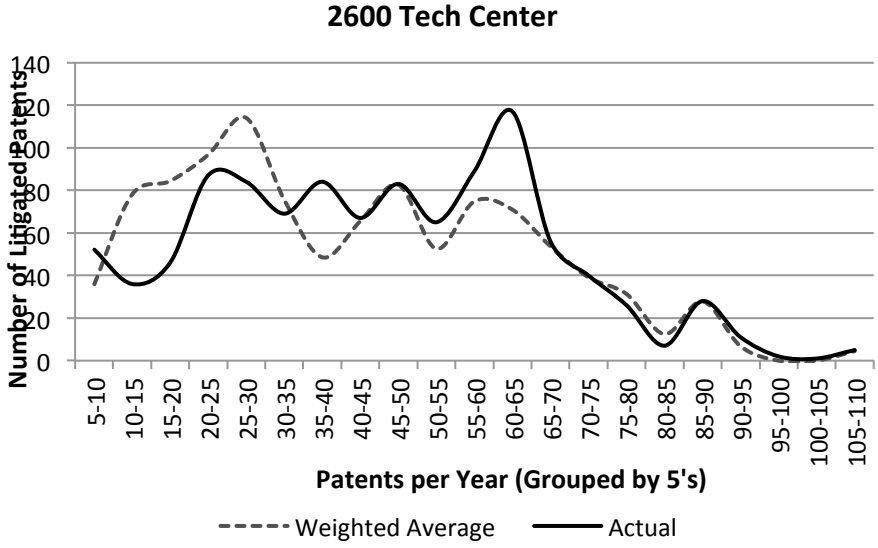
100-105
105-110
110-115
Patents per Year (Grouped by 5's)
Weighted Average
Actual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60-65
65-70
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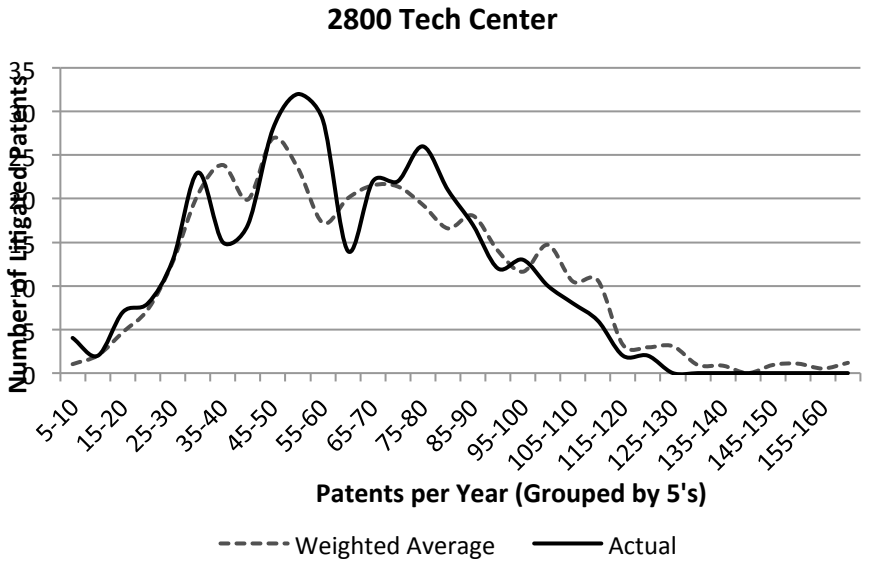
95-100
100-105
105-110
Patents per Year (Grouped by 5's)
Weighted Average
Actual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135-140
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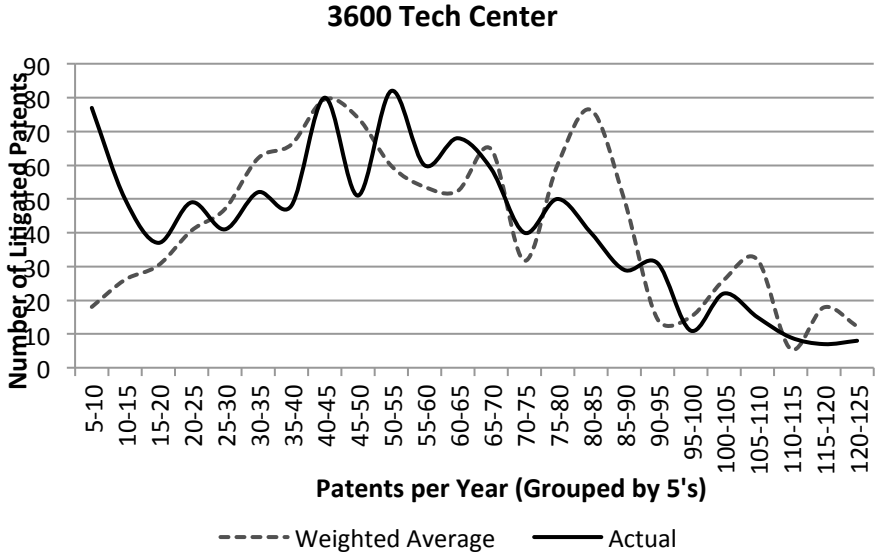
155-160
Patents per Year (Grouped by 5's)
Weighted Average
Actual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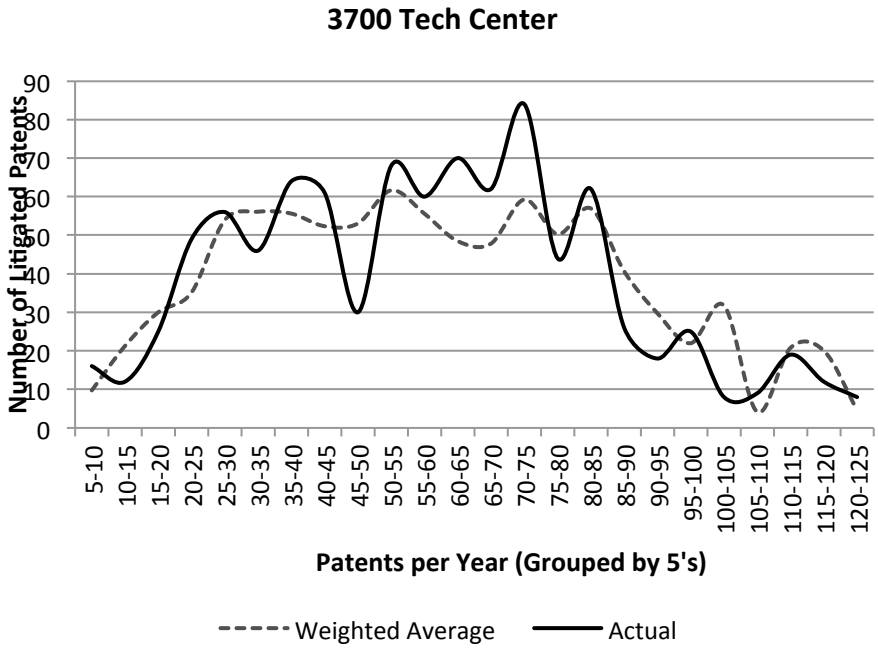
115-120
120-125
Patents per Year (Grouped by 5's)
Weighted Average
Actual


3700 Tech Center
Number of Litigated Patents
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105-110
110-115
115-120
120-125
Patents per Year (Grouped by 5's)
Weighted Average
Actual