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Ron D Katznelson, *Bi-Level Technologies*

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ABSTRACT

In the widely publicized campaign to curb purported "patent troll" litigation abuses, there are many anecdotal stories on non-practicing entities' ("NPE") alleged abusive patent assertions. In view of the paucity of accurate accounts of the real stories behind these "patent troll" stories, this paper exposes the machinery used to manufacture one of these fictional "patent troll" fables—profoundly misleading scholarship. The real circumstances of two independent inventors' virtuous patent licensing and enforcement efforts in the medical imaging industry are presented; including their ultimate partnering with an established NPE to license more than a dozen accused infringing companies. Unfortunately, this story was retold under the "patent troll" narrative in a misleading scholarly article purporting to document a cessation of new medical imaging product introductions and reduction of sales by the accused companies after they were sued. The article argues that the patent litigation caused significant reduction of incremental innovation. Through the detailed examination of the article and the facts of the case, it is shown here that the article's biased analysis, omission of critical highly relevant data, use of inappropriate and biased controls, and speculative legal and business counterfactuals led to erroneous inferences, fully invalidating its conclusions.

1 Introduction and summary

One of the largest risks for a successful technology-based small business, startup, or individual inventor, is success itself—successful inventions invite predation by large market incumbents. The only protection many inventors have against loss of substantial investment in bringing a raw invention through the process of R&D, manufacturing, and establishing a market, is the patent system; patents provide the foundation of the market for inventions.² For the patent system to work in "little guy vs. big guy" situations, the help of patent enforcement specialty firms is often required. This help must be financed, and often the best financing is through contingency arrangements,³ partnerships, or outright sale of the patents.⁴ For over a century, such

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² Daniel F. Spulber, "How Patents Provide the Foundation of the Market for Inventions," *Journal of Competition Law & Economics*. Forthcoming (2015), published online [doi:10.1093/joclec/nhv006](https://doi.org/10.1093/joclec/nhv006). (Patents provide a system of IP rights that increases transaction efficiencies and stimulates competition by offering exclusion, transferability, disclosure, certification, standardization, and divisibility. Patents provide incentives for efficient investment in invention, innovation, and complementary assets).

³ David L. Schwartz, The Rise of Contingent Fee Representation in Patent Litigation," 64 *Alabama Law*

patent intermediaries⁵ have provided important avenues for patent owners to keep control and coordinate investments and appropriate returns on their inventions. Like any other market for any other kind of good, there can be very little initial investment in innovation unless there is a secondary market, and like any other secondary market, this one requires specialized intermediaries, for realizing economic efficiencies.⁶

Patent enforcement-specialty firms that do not practice the patents are often called non-practicing entities (“NPEs”), Patent Assertion Entities (“PAEs”), or more commonly referred to pejoratively as “Patent Trolls.” While much has been written about the negative aspects of NPEs, there is an important body of literature describing the salutary effects of these firms that is often ignored. This literature explains how NPEs’ and similar patent intermediaries assist inventors of limited means enforce their patent rights, reduce the costs of search and exchange, enhance liquidity for patent owners, improve market depth and breadth, and increase overall efficiency.⁷ As in other markets, specialized intermediaries are especially valuable in less established, less liquid markets—as markets for new or emerging technology certainly are—and in markets with significant information asymmetries and other transaction costs. NPEs that secure and enforce property rights facilitate contracts and trade, with the attendant benefits of enhanced coordination, capital mobilization, price discovery, and valuation.⁸

In the midst of the push for patent legislation to curb a purported widespread “patent troll” litigation abuses, there were many publicized anecdotal stories on victims who

Review 335 (2012). Available at <http://ssrn.com/abstract=1990651>.

⁴ Stephen Haber, and Seth H. Werfel, “Why Do Inventors Sell to Patent Trolls? Experimental Evidence for the Asymmetry Hypothesis,” (March 5, 2015). At SSRN: <http://ssrn.com/abstract=2552734>

⁵ Naomi R. Lamoreaux, and Kenneth L. Sokoloff. *Intermediaries in the US Market for Technology, 1870-1920*. No. w9017. NBER, (2002); Allen W. Wang, “Rise of the Patent Intermediaries,” 25 *Berkeley Tech. L.J.* 159 (2010). Available at: <http://scholarship.law.berkeley.edu/btlj/vol25/iss1/7>; Frank Tietze and Cornelius Herstatt, “Intermediaries and Innovation: Why they emerge and how they facilitate IP transactions on the markets for technology.” *Technology and Innovation Working Paper No. 59*. (2009). Available at <http://ssrn.com/abstract=2118078>.

⁶ Naomi R. Lamoreaux, et al. “Patent Alchemy: The Market for Technology in US History. 87 *Business History Review* 3-38 (2013).

⁷ James F. McDonough, “The Myth of the Patent Troll: An Alternative View of the Function of Patent Dealers in an Idea Economy,” 56 *Emory Law Journal*, 189 (2006) (Highlighting the salutary role of NPEs, noting that the emergence of patent dealers marks a stage in the natural evolution of the patent market. Documenting the role of NPEs in making the patent market more efficient by realigning market participant incentives, making patents more liquid, and clearing the patent market. Rebutting the common complaints that NPEs stunt innovation and spur unnecessary litigation); Raymond Millien, and Ron Laurie, “A summary of established & emerging IP business models.” In *Proceedings of the Sedona Conference*, Sedona, AZ, pp. 1-16. (2007) (describing NPEs as IP market innovators and highlighting the compelling economic justification for NPE entities); Bonwoo Koo and Brian D. Wright, “Dynamic Effects of Patent Policy on Sequential Innovation, 19 *J. Econ. Mgmt. Strategy* 489, 500 (2010) (ex ante licensing hastens downstream innovations, especially where future innovation is costly); Damien Geradin, et al., *Elves or Trolls? The Role of Nonpracticing Patent Owners in the Innovation Economy*, 21 *Indus. & Corp. Change* 73, 87 (2011).

⁸ *Id.*

purportedly have been abused by NPEs. However, there is paucity of informative and accurate accounts of the *real* stories behind some of these “patent troll” stories. This paper exposes the machinery used to manufacture one of these fictional “patent troll” fables. This paper briefly describes the *real* circumstances of two independent inventors of a medical imaging technology, and their efforts at virtuous patent licensing and enforcement. The attempts were made at substantial personal costs to these inventors, and were only successful when they enlisted the help of an intermediary, Acacia Research Group, an established and well-known NPE.

This story of virtuous patent enforcement has attracted the attention of those who stoke the “patent troll” narrative, who used it as a story of abusive litigation that causes social harm. Indeed, the story could be (and had been) shaped around the ingredients of the “patent troll” narrative: (a) an oft-demonized “patent troll” sues a dozen productive innovative suppliers of life-saving medical imaging systems; (b) the lawsuit unleashed by this demonic “patent troll” brings to a halt the introduction of new product releases and new sales by these otherwise innovative defendants; and (c) the result is to reduce innovation and technology diffusion, causing substantial social harm.

This is presented as a “patent troll” story by Professor Catherine Tucker, in a paper titled “Patent Trolls and Technology Diffusion,”⁹ (the “Tucker Paper”), a paper that turned out to be highly influential, as it was relied upon in a report issued by the White House. Prof. Tucker has familiarity with the healthcare Information Technology industry, demonstrated in previous empirical work showing that healthcare IT saves babies’ lives.¹⁰

In June 2013 the White House issued a report entitled “*Patent Assertion and U.S. Innovation*” (the “White House PAE Report”).¹¹ In keeping with the “patent troll” narrative, the White House PAE Report defines PAEs by their actions of “acquiring and asserting *broad patents, some of questionable validity*, in order to extract settlement fees,”¹² and by conduct alleged to “often *abuse* the U.S. intellectual property system’s strong protections by using tactics that create *outsized costs* to defendants and innovators at little risk to themselves.”¹³

⁹ Catherine E. Tucker, “Patent Trolls and Technology Diffusion,” (March 23, 2013). TILEC Discussion Paper No. 2012-030, at <http://ssrn.com/abstract=2136955>, hereinafter the “Tucker Paper.” Another version of this paper is titled “Patent Trolls and Technology Diffusion: The Case of Medical Imaging.”

¹⁰ Amalia R. Miller and Catherine E. Tucker, “Can Health Care Information Technology Save Babies?” 119 *Journal of Political Economy*, 289-324 (April 2011). Note that this earlier work is in no way questioned or challenged here.

¹¹ www.whitehouse.gov/sites/default/files/docs/patent_report.pdf

¹² White House PAE Report, at 4 (emphasis added). The report does not explain the legal definition of the term “broad patents of questionable validity” and how one arrives at this determination for making the identification.

¹³ White House PAE Report, at 12 (emphasis added). The report fails to define what constitutes an “abuse” of the US patent system and the cost level beyond which costs to defendants constitute “outsized costs.”

The White House PAE Report cites the Tucker Paper as the source for the following statement:

Even if patent assertion entities do not prevail in the courtroom, their actions can significantly reduce incremental innovation while litigation is ongoing, a situation that can persist for years. The reason is that such action could be viewed by courts as an evidence of “willful infringement” if the plaintiff’s patent is upheld, making the firm liable for treble damages. For example, one study found that during the years they were being sued for patent infringement by a PAE, health information technology companies ceased all innovation in that technology, causing sales to fall by one-third compared to the same firm’s sales of similar products not subject to the PAE demand (Tucker 2013).¹⁴

The White House PAE Report’s statement that patent enforcement actions “can significantly reduce incremental innovation”—“a situation that can persist for years”—is a serious challenge to the heart of the economic function of the patent system; it is an assertion that the law of innovation works against itself. Therefore, the cited support for this charge—the Tucker Paper—deserves the detailed analysis and review provided below.

Section 2 describes the two co-inventors’ invention and patents covering medical imaging software systems and their efforts to protect and license their inventions. These efforts ultimately led to their partnership with Acacia, an NPE, who later sued about two dozen medical imaging systems vendors.

Section 3 describes the observations and the flawed analysis in the Tucker Paper that led to erroneous inferences. The Tucker Paper observed a decline of medical imaging software sales and new releases thereof by firms named as defendants in the Acacia litigation after they were sued, compared to firms that were not sued. The Tucker Paper posits that the accused vendors voluntarily ceased sales of accused products and new releases thereof (essentially, imposed an injunction upon themselves, forgoing billions of dollars in sales) for fear of “willful infringement” liability of treble damages. The remainder of Section 3 shows how the Tucker Paper’s biased analysis, omission of critical highly relevant data, use of inappropriate and biased controls, and speculative legal and business counterfactuals led to erroneous inferences.

Contrary to the Tucker Paper’s findings, the true facts show that new product versions *were* released by accused vendors during the litigation and that the major vendors were aware of the patents in suit well before they were sued. It is shown that the Tucker Paper simply documents a downturn in hospital medical imaging purchases that affected all vendors, not a voluntary halt of sales, let alone one related to litigation. The decline in purchases and reduced demand was due in part to purchasing disincentives introduced by the Deficit Reduction Act legislation, and in part due to saturation in the medical imaging market. The Tucker Paper’s inferences that patent enforcement retarded innovation must therefore be fully rejected.

¹⁴ White House PAE Report at 10, citing the Tucker Paper.

2 Individual inventors' story of virtuous patent enforcement

Dr. Jorge Inga and Thomas Saliga, a Neurosurgeon and an electrical engineer respectively, are the named co-inventors of U.S. Pat. No. 5,321,520 titled “*Automated High Definition/Resolution Image Storage, Retrieval and Transmission System*” and a continuation thereof issued as U.S. Pat. No. 5,416,602, both having application filing priority date in 1992. The need for the inventions arose through Dr. Inga’s experience in clinics and operating rooms, requiring access to multiple high resolution images contained in antiquated film-based storage and retrieval systems for medical image data such as X-ray, CAT scans, tomograms and MRI. Traditionally, numerous large envelopes of such films had been collected. Because image films could only be displayed on a light box, and often multiple films from different imaging devices were required but stored separately; ready and immediate access to full image data during examination or surgery was hampered.¹⁵ The invention protected by the patents addressed the need for prompt remote access to these image data for rapid patient assessment and therapy.

The ‘520 and ‘602 patents are directed at facilitating remote access through limited-capacity networks, by selectively choosing which data to transmit first, so that detailed images can be built up quickly from partial data, with higher detail and resolution in specific regions of interest to the user physician.

In attempt to commercialize and license their patented technology, in 1992, the inventors created the Automated Medical Access Corporation (“AMAC”), a Florida corporation to which the patents were assigned. The commercial use of this technology began taking hold in the late 1990s and early 2000s in medical imaging systems categorized in the industry as Picture Archiving and Communication Systems (“PACS”). Dr. Inga’s early identification and participation in devising an inventive solution of these real practical problems in medical imaging proved to cover essential elements of some PACS that were broadly used in medical imaging facilities. The early priority date of the fundamental inventions proved to have been instrumental in sustaining their validity. The two patents survived two invalidity challenges in reexamination proceedings at the PTO that reaffirmed the patentability of *all* claims in each patent.¹⁶ These could hardly be called patents of “questionable validity.”

The market leaders in supplying such PACS were large multinational firms in the healthcare Information Technology industry that had often ignored “little guy” licensing overtures. Dr. Inga approached several of the PACS manufacturers to offer licenses, but was rebuffed and ignored. For example, Philips Electronics offered the

¹⁵ U.S. Pat. No. [5,321,520](#) Specification.

¹⁶ Reexamination Ser. Nos. [90/011,260](#) and [90/011,263](#), confirming all 12 claims and 21 claims respectively. The procedures and burdens of proof during intra-PTO examination are much less deferential than those that apply to validity litigation in court. At the time, reexamination was the most stringent way to test a patent’s validity.

inventors \$500 for their patents, explaining that this was commensurate with the consideration their own employee inventors receive for assigning their inventions to the firm.¹⁷

Although Dr. Inga and Mr Saliga filed a counterpart international application¹⁸ in an effort to protect their invention abroad, following-up in individual countries proved more costly and challenging. They apparently did not have the sufficient financial resources to continue prosecuting their applications in the national offices and their European application was abandoned for failure to pay renewal fees.¹⁹ Throughout their efforts, these inventors have spent several hundred thousand dollars over several years,²⁰ but were making no real progress in licensing or income generation to recover their costs.

Ultimately, the inventors and their company AMAC sought help from Acacia Research Group, a well-capitalized NPE specializing in patent enforcement and holding itself as an “intermediary in the patent marketplace, bridging the gap between invention and application, facilitating efficiency and delivering monetary rewards to patent owners.”²¹ Acacia partnered with the AMAC inventors for sharing patent enforcement profits and formed the subsidiary called Hospital Systems Corporation, the entity that would enforce the patents. Acacia sued and obtained settlements with over two dozen medical imaging vendors²² and in the process had to defend the two patents in reexaminations at the Patent Office. These efforts likely cost millions of dollars and there can be no doubt that the two inventors could not have obtained any deserved monetary compensation for their patents without partnering with an NPE.

3 Flawed inference that patent enforcement suppresses innovation

The Tucker Paper is singly based on one case of patent litigation having multiple defendants. The Tucker Paper identifies two groups of PACS suppliers sued by Acacia for infringement:²³ the defendants in the first group named in September 2007, are GE, Fujifilm, Siemens, Philips and McKesson Corp.²⁴ The nine defendants in the second group named in November 2008 are Sectra, Agfa, Novarad, Merge Healthcare, Infinitt, Emageon, Intelrad, UltraRad and Viztek.²⁵

¹⁷ Dr. Jorge J. Inga, personal communication, (December, 2014).

¹⁸ See [WO9403010](#) (1994).

¹⁹ See European Patent Office register for [EP0651928](#).

²⁰ Dr. Jorge J. Inga, personal communication, (December, 2014).

²¹ See Acacia’s partnership business model at <http://acaciaresearch.com/wp-content/uploads/2013/10/Acacia-Corporate-Presentation-Q3-2014.pdf#page=10>.

²² In addition to the case discussed in the Tucker Paper, case No. [2:07-cv-389-TJW](#), the other cases against additional vendors are Cases [2:09-cv-00100](#) and [2:10-cv-00066](#).

²³ Case No. [2:07-cv-389-TJW](#), Eastern District of Texas.

²⁴ Tucker Paper, at 10.

²⁵ *Id.*

The Tucker Paper purports to document the disproportionate decline of PACS sales and new PACS product releases by firms named as defendants in the first group of the Acacia litigation after they were sued, compared to firms that were not sued. The Tucker Paper's concludes that (a) "the drop in sales was linked to a drop in incremental product innovation," and that (b) "[a]n explanation for this lack of innovation is that the vendors did not want to run the risk of being found guilty of 'willful infringement' in the patent suit and being liable for treble damages."²⁶

As explained below, the causal inference in the Tucker Paper—that "the slow-down in sales is that the product release and attendant sales cycle was halted as a result of litigation"²⁷—is fraught with fundamental methodology flaws, including selective discard of critical data, choice of inappropriate controls, and speculation of business and legal counterfactuals. Each of these elements is addressed separately below.

3.1 Biased analysis, selectively discarding critical data

For tracking the PACS sales activity of the firms involved, Professor Tucker used the 2011 release of the HIMSS Analytics Database, a marketing database for healthcare IT sales professionals.²⁸ The HIMSS database is based on periodic surveys of hospitals in the U.S. and it details the healthcare IT systems that these hospitals have purchased and when they purchased them. The data in the 2011 release covered survey results from 4,829 hospitals.²⁹ Professor Tucker chose a four-year period spanning 2005-2008 for observation, and divided this period in two ("before" and "after" the commencement of litigation). But the "before" period ending in September 2007³⁰ is substantially longer than the "after" period. Thus, the observed difference in sales between the "before" and the "after" periods reflect presentation bias, and the exaggerated differences depicted in Figures 3 and 4 of the Tucker Paper.

More importantly, the study in the Tucker Paper discards critical data on non-objective grounds. First, all defendants in the Acacia litigation settled or took a license, typically in the year following the commencement of suit, but Professor Tucker selectively used only data that ends in 2008, not covering periods *after* the settlement licenses were granted. During these unreported periods, the defendant firms were certainly permitted to resume sales of PACS. However, several methodological flaws come between the data and Professor Tucker's conclusion: (a) Professor Tucker states: "*my data ends in 2008*,"³¹ even though her source, the 2011 HIMSS Analytics database, actually contained survey data ending in 2010, not an end in 2008.³² Therefore, despite

²⁶ *Id.*, at 28-29.

²⁷ *Id.*, at 29.

²⁸ *Id.*, at 10.

²⁹ *Id.*

³⁰ It is entirely unclear how Professor Tucker dealt with purchases in 2007 because the HIMSS Analytics database appears to have no purchase date resolution finer than the calendar year and there is no way to distinguish between sales before and after September in that year.

³¹ *Id.*, (Emphasis added).

³² HIMSS Analytics News Release, "[HIMSS Analytics Report Uncovers Hospitals Top IT Priorities](#)" (July

having the necessary data, the Tucker Paper conspicuously omits and fails to report critical facts; (b) if the Tucker Paper's hypothesis were correct, we would expect to see post-settlement sales rebound to pre-litigation levels. But the Tucker Paper makes no showing relevant to this rebound. The data—considered through 2010—shows the opposite, that no such rebound back to 2007 sales level occurred, only further *declines*.³³ The Tucker Paper omits this fact as well.³⁴

It appears that Professor Tucker ignored the general trends in the sales of PACS and medical imaging systems to hospitals throughout the 2000s. After steady increases, overall sales were in decline starting in 2006 (well before the Acacia litigation) and this decline continued through 2009.³⁵ This decline was in part due to purchasing disincentives, as Congress enacted in February 2006 the Deficit Reduction Act (“DRA”) Limits on medical imaging reimbursement,³⁶ which at the time was projected to reduce government reimbursement for medical imaging by 18-19%.³⁷ Another significant factor for purchasing declines was the gradual hospital market saturation of PACS, wherein percentage of hospitals with PACS installed rose from 8.5% in 2000 to 76% in 2008.³⁸ After a year-over-year record of unit purchase increases prior to 2006, the HIMSS database shows hospital PACS purchases slowing of growth from 2005 to 2006, and an actual decline of 16% from 2006 to 2007.³⁹ This downward trend began about 18 months *before* Acacia filed its first suit in September 2007.

PACS purchases from *all* vendors in the aggregate declined by 32% from 2007 to 2008,⁴⁰ essentially the *identical* rate of decline found in the same period in the Tucker

26, 2011) (using the 2011 edition to report on IT acquisition increases from 2009 to 2010); J. R. Vest et al., “Changes to the electronic health records market in light of health information technology certification and meaningful use,” 20 *J. Am. Med. Inform. Assoc.* 227, 228 (2013) (employing the 2011 HIMSS Analytics Database which includes annual survey data up to and including 2010).

³³ Philips Corp., “Health care historical market development,” in *Philips Third Quarter Results 2014 Information Booklet* (Oct. 20, 2014) at 63, hereinafter “Philips 2014.”

³⁴ The Tucker Paper explains that the analysis concludes before 2009 because of the potential for confounds introduced by the Health Information Technology for Economic and Clinical Health Act of 2009 (“HITECH”), boosting hospitals’ incentives for purchasing healthcare IT (Tucker Paper at 17). However, this explanation is unavailing with respect to actual observations of *declining* PACS purchases because purchasing incentives of the HITECH Act could have only worked in the *opposite* direction.

³⁵ While Professor Tucker recognized the possibility that “the short time span of the data means that [she fails] to capture long-term trends (such as declining sales of imaging software) in the healthcare IT software business that might provide alternative explanations for [the] results” (Tucker Paper, at 21), she provides analysis that includes additional observations *only from 2000-2004*, a period having only increases in sales, thereby generating further bias because the trend of long-term sales declines through 2010 is ignored.

³⁶ P.L. 109–171, 120 Stat. 39, § 5102(b)(2)-*Adjustments in Payment For Imaging Services*. (Feb. 8, 2006).

³⁷ *Assessing the Deficit Reduction Act Limits on Imaging Reimbursement*, The Moran Company (Feb. 2007).

³⁸ *Picture Archiving and Communication Systems: A 2000-2008 Study*, The Dorenfest Institute, HIMMS (2010), hereinafter “PACS Study,” Figure 2, at 5.

³⁹ *Id.*, Figure 3, at 6.

⁴⁰ *Id.*

Paper for four selected defendants⁴¹ after they were sued in September 2007.⁴² Given this essential numerical equality of the sales declines under both accounts and the fact that these defendants commanded only about 50% market share in 2008⁴³ (and therefore could not alone have accounted for the total observed market decline of 32%), it reasonably follows that non-defendant vendors must have experienced sales declines of similar magnitude, contrary to the Tucker Paper thesis. Indeed, had the vendors that were not sued commanded an increased market share, as the Tucker Paper implies, it would not have to provide “a variety of potential explanations for why the hospitals *did not* purchase from the vendors that were not sued.”⁴⁴

Second, the nine defendants in the second group sued in November 2008 *were dropped* from Professor Tucker’s analysis altogether: “my data ends in 2008, so I exclude these vendors from the analysis.”⁴⁵ As explained below, these vendors were excluded from, but should have been part of, the “Not Sued” control group. Moreover, as explained above, data for later years *were* available to Professor Tucker and she could have easily included a similar analysis of “pre” and “post” litigation for this second group of defendants. All defendants in the second group settled no later than January 2010⁴⁶ and Professor Tucker could have included post-settlement observations from 2010 to properly test her thesis, but this was not done.

Finally, the PACS vendors’ sales study in the Tucker Paper is woefully unreliable in supporting its author’s assertions because it relied on a survey that covered only about 43% of the U.S. medical imaging facilities. The HIMSS Analytics survey covered only 4,829 *hospitals* but *none* of the independent medical imaging centers, a growing segment of the U.S. medical imaging market. Studies show that there were 6,455 such imaging centers in 2008⁴⁷ and their substantial purchases of PACS during the study period were totally ignored in the Tucker Paper, rendering invalid its conclusions on actual trends of U.S. PACS sales by *any* vendor.

3.2 Inappropriate and biased controls

3.2.1 Textual data product purchases

As a control, the Tucker Paper uses sales of medical software applications that transfer only textual data and not medical images because text data systems were not covered

⁴¹ Tucker Paper, at 14. (Excluding Fujifilm from the analysis of defendants’ sales.)

⁴² *Id.*, at 19. (“The magnitude of the estimates suggests roughly a drop of one-third of sales after litigation commenced.”)

⁴³ PACS Study, [Figure 6, at 10](#), showing total market share of 51% for GE, Siemens, Philips and McKesson; Tucker Paper, at 14. (Defendants are responsible for just over half of all software sales in imaging software.)

⁴⁴ Tucker Paper, at 25. (Emphasis added).

⁴⁵ *Id.*, at 10. (Emphasis added).

⁴⁶ *Id.*, see Table 2.

⁴⁷ Cheryl Proval, “Imaging-center Growth Hits the Wall in 2013,” [Radiology Business Journal](#) (Aug 30, 2013) pp. 28-32. (Table 1 showing 6,455 imaging centers in 2008).

by the patent.⁴⁸ The textual-data technologies used as control are those that HIMSS Analytics defines as “stage 3” electronic medical record (“EMR”) technologies.⁴⁹ Based on this analysis, the Tucker Paper reports a disproportionate large drop in PACS sales by those vendors who were targeted by the lawsuit relative to their text EMR software sales, with no such pattern for vendors who were not sued.⁵⁰ The Tucker Paper contends that the decline in PACS sales relative to text EMR sales were due to the patent litigation.

The fundamental flaw in using text EMR sales as control for PACS sales is that text EMR products and PACS products have had radically different market penetration levels, resulting in radically different underlying demand and sales trajectories. As explained above, PACS sales experienced decelerating sales and sharp declines after 2006, reaching substantial market saturation of 76% in 2008. In contrast, stage 3 text EMR systems had only 8.1% penetration in 2005,⁵¹ increasing to 35.7% in 2008,⁵² still less than half of PACS. The resulting opposite sales trends cannot be starker: while medical imaging sales declined from \$8.8 billion in 2006 to \$5.6 billion in 2009, text EMR and clinical informatics sales rose from \$3.9 billion to \$4.5 billion during the same period.⁵³ Because of the radically different market dynamics, the Tucker Paper’s use of text EMR sales as a control against PACS sales is inappropriate and leads to erroneous inferences.

3.2.2 *Purchases of medical imaging products from vendors that were not sued*

The Tucker Paper argues for another control—purported PACS sales by vendors that were not sued. It shows that PACS vendors that were not sued had no substantial declines in their sales after suit was brought against the other vendors (see Figure 3: “Not Sued” group, “Imaging Data,” “Before” and “After”).⁵⁴ Note, however, that according to Figure 3, the group labeled “Not Sued” had a market share that is about 1/8 of that of the group that was sued in September 2007, which itself had a market share of about 50%.⁵⁵ This means that for the “Not Sued” control, Professor Tucker inexplicably selected only a *small fraction* of the remaining 50% of sales by true “Not Sued” vendors. With no explanation, the analysis arbitrarily discards more than one year of sales data for 7/8 of the sales made by vendors who were not sued during the period considered in this part of the Tucker Paper—that is, Prof. Tucker discarded about seven times as much eligible data as she used. The discarded data appears to be

⁴⁸ Tucker Paper, at 12. (The applications in this category are software modules for ‘Physician Documentation’, ‘Clinical Data Repository’, ‘Clinical Decision Support’, ‘Order Entry’, ‘Computerized Practitioner Order Entry’, and ‘Physician Portal.’)

⁴⁹ *Id.*, at 13. (‘Clinical documentation installed’, ‘First level of clinical decision support’ and ‘Error checking with order entry’).

⁵⁰ *Id.* at 15; see Figure 3.

⁵¹ HIMSS Analytics, *2006 Annual Report of the U.S. Hospital IT Market* (2006) at 22.

⁵² HIMSS Analytics, *Essentials of the U.S. Hospital IT Market* (5th Edition) at 7, (2010).

⁵³ Philips 2014, at 63.

⁵⁴ Tucker Paper, at 16.

⁵⁵ See note 43 *supra*.

for the nine vendors in the second group that were not sued in September 2007 but were sued later in November 2008.⁵⁶

This selective omission from the control group has essentially rendered the results highly biased, if not invalid. This problem is exacerbated by the Tucker Paper's failure to control for *pricing* of systems sold. Without control for prices, the likelihood of bias in the omission is high, because more established PACS vendors typically sold entire systems at higher prices, leaving niche or peripheral applications to later (smaller) market entrants.

It is therefore likely that the Tucker Paper's observation of only a mild decline in PACS sales of "Not Sued" vendors (likely lower-priced systems) compared to those that were sued (likely full-priced systems) is merely an observation of a substitution effect. In most markets, overall market declines tend to fall harder on higher-priced goods than for lower-priced goods. This well-known effect is called a "reduced income effect" in Hicksian substitution, wherein consumers substitute higher priced goods with lower priced goods for maximizing utility under income constraints. The Tucker Paper's observation of relative changes in sales (exaggerated through the omission of the second group of nine established vendors) is likely no more than an artifact of contracting budgets in the medical imaging market, rather than any effect of the litigation.

Finally, due to omitted data from independent imaging centers, the Tucker Paper does not account for potential differential effects of the shift in PACS sales from hospitals to independent imaging centers. The established market leaders with full system solutions likely shifted more of their sales than the specialized, smaller software companies, because the larger companies would have already seen satiation in demand for *their* products in the established hospital market. This *disproportionate* effect is not addressed in Professor Tucker's study.

3.2.3 Requests for proposals as proxy for product demand

The Tucker Paper rules out reduced demand as the cause of the observed decline in PACS purchases by showing data in Figure 5 that the number of requests for proposals ("RFP") by hospitals for PACS were rather larger after litigation commenced.⁵⁷ The flaw in this method for estimating demand is that the number of mailings of RFPs may have very little to do with actual demand, and is often unreliable indicator because it provides no information on (a) demand satisfied by purchases other than through RFPs, (b) the volume of the products for which proposals were sought, (c) whether budgets were in fact slated for the items in the RFPs, and (d) whether an RFP was geared for long-term facilities planning.

⁵⁶ Even PACS vendors that the Tucker Paper characterizes as "Not Sued" were in fact subsequently sued by Acacia for infringing the same patents in Cases [2:09-cv-00100](#) and [2:10-cv-00066](#).

⁵⁷ Tucker Paper, at 24-25.

Although some of this information was in fact available to the author for improving the estimates, it appears to have been ignored in the Tucker Paper. Examination of the PACS Software Plans section of the HIMSS Analytics Database reveals that it contains for each planned product purchase the following field entries:⁵⁸

- (1) Whether budgeted;
- (2) Whether using RFP, and if so, the date RFP mailed;
- (3) When will vendor decision be made;
- (4) When will contract be signed;
- (5) When is installation planned; and
- (6) Vendors/Products Being Considered.

It appears, however, that the Tucker Paper only counted one field entry—the “date RFP mailed”—without ensuring that it is an appropriate proxy for demand at the designated time. For example, it apparently did not count definitive purchase plans that were in the database but not accompanied by RFPs (empty RFP field entries), did not eliminate counts of RFPs for which contracts or planned installation (items 4,5) are more than one year past the RFP date. Most importantly, the Tucker Paper ignores a most relevant entry for indicating true demand—whether the item was budgeted. Finally, despite having the information, the Tucker Paper does not disclose any data indicating whether the vendors that were sued actually responded to the RFP (named in the “Vendors/Products Being Considered” field) after they were sued. Findings of such vendor responses would directly contradict the Tucker Paper’s thesis that such vendors refrained from subsequent sales to avoid a finding of “willful infringement,” because a response to an RFP is an *offer for sale*, which does constitute infringement.⁵⁹

3.3 The mythical halt of new product releases

A major thrust of the Tucker Paper is a purported finding that “product release and attendant sales cycle was halted as a result of litigation.”⁶⁰ The Tucker Paper claims to have analyzed all new product releases, presenting in Figure 6 a complete halt of new PACS product releases of vendors after they were sued. We find in the text describing Figure 6 a bold statement that “[i]t is clear that there was a complete collapse in the number of new incremental product releases and upgrades during the period of litigation,”⁶¹ and a speculation that “this might offer a partial explanation for why sales dropped so severely during the period of litigation for vendors that were sued.”⁶² The Tucker Paper asserts by the caption of Figure 6, that this constitutes “evidence of

⁵⁸ See [HIMSS Analytics database entry for a sample hospital](#).

⁵⁹ 35 U.S.C. § 271(a) (“whoever without authority makes, uses, *offers to sell*, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent.”) Strict liability attaches to *each* form of infringement *independently* of the others.

⁶⁰ Tucker Paper, at 29.

⁶¹ *Id.*, at 26.

⁶² *Id.*, at 27.

reduction in incremental innovation”⁶³—a serious allegation that patent enforcement works against the very purpose of the patent system. The *real* facts, however, reveal nothing of this sort and contradict these purported findings.

Upon further inquiry into the product description field of the HIMSS Analytics database, one finds that it provides the product brand name only but *not* the actual product version purchased by surveyed hospitals.⁶⁴ Therefore, Professor Tucker was actually *incapable* of detecting any sales of “incremental” improvements in new product versions by using the HIMSS Analytics database; she therefore likely missed all introductions of *new product versions* of the same brand. For example, GE Healthcare was selling medical imaging software under the same Centricity® brand for years, introducing more than a dozen Centricity® PACS product versions.⁶⁵ Rudimentary familiarity in software version control should have informed a user that the product description field of the HIMSS Analytics database is useless for that purpose—that it is essentially devoid of any useful version information; hence the Tucker Paper erroneous findings that many purchases were of the same old product when in fact they were not.

Indeed, true product introduction histories belie the Tucker Paper’s alleged “*complete* absence of new releases of imaging software for any of the sued vendors.”⁶⁶ For example, since the date on which the first group of vendors were sued in September 2007, GE introduced the Centricity® [PACS 3.05](#) product version in August 2008, well before GE settled with Acacia in November 2009; Fujifilm introduced its Synapse® PACS system [Release Version 3.2.1](#) on August 2008, well before it settled with Acacia in July, 2009; and Philips introduced its PACS [iSite Version R3.6](#) in April 2008, well before it settled with Acacia in December 2008. The Tucker Paper’s assertion that “product release ... was halted as a result of litigation” is simply a manufactured myth.

The Tucker Paper’s related finding of several actual new product releases by vendors that were not sued is easily explained by the fact that these were secondary vendors with lower market share. Several of these vendors were new entrants to the medical imaging market, having introduced their products for the first time (new product brand name, no previous version). Contrary to the established vendors’ products, these new entrants’ products have had no previous versions and Professor Tucker’s analysis would have detected (correctly) their previously unsold brand names as new products. This is consistent with the Tucker Paper’s observation that “on average, software vendors that were not sued sold 48 percent more units of an application that year if they had a new product release”⁶⁷—a finding one would expect for an ensemble average

⁶³ *Id.*

⁶⁴ For example, an [HIMSS Analytics database entry for a sample hospital](#) shows a purchase of Radiology PACS identified as Impax from Agfa Healthcare without any further product specificity; Agfa’s Impax product line involves about two dozen [versions for several modalities](#).

⁶⁵ See GE Healthcare list of PACS product versions and conformance statements at http://www3.gehealthcare.com/en/products/interoperability/dicom/radiology_pacs_and_ris_conformance_statements

⁶⁶ Tucker Paper, at 26-27. (Emphasis added).

⁶⁷ *Id.*, at 26-27.

that includes several vendors having new products with *no prior sales* in a previous year. The unavailability of reliable product version information in the HIMSS Analytics database also renders these findings erroneous.

3.4 Speculating business and legal counterfactuals

The main thesis of the Tucker Paper is that as PACS vendors were sued by Acacia, they abruptly ceased selling accused products, “for fear of being found guilty of ‘willful infringement’ in the patent suit and being liable for treble damages.”⁶⁸ In other words, the theory is that vendors were vigorously engaged in sales prior to the suit because *they were unaware of the patents*, and when sued, they ceased selling infringing PACS, and that this resulted in a near-immediate drop of about 30% of sales. This is the only theory that the Tucker Paper seeks to prove from its observations. It is remarkable that as centrally critical this theory is to Professor Tucker’s study, the paper contains no examination of the “willfulness” facts in this case.

First, the Tucker Paper fails to explain how the same consideration—avoidance of “willfulness” liability—did not cause vendors that were not yet sued to similarly halt their sales, even though, with a suit highly relevant to their business, they must have known that they potentially faced identical liability—damages for willful infringement accrue from the date of actual knowledge,⁶⁹ not from the lawsuit date. Thus, the Tucker Paper posits a cause for the behavior of a first tier of vendors that is inconsistent with the observed behavior of the second tier of vendors.

Second, the Tucker Paper by mere speculation implicitly assumes that these PACS vendors were informed of the patents *only when sued* in September 2007; and had no knowledge of them before the suit. But these patents were well-known and heavily-cited in the medical imaging art since they issued in 1994. As described in Section 2 above, the inventors of these patents themselves had approached several of these major vendors in licensing attempts identifying the patents well before Acacia asserted the patents. Moreover, the ‘520 patent alone was cited by more than 170 subsequent U.S. patents—of these citing patents, at least a dozen were filed and prosecuted before the first suit of September 2007, *by the top three vendors sued in the first group – GE, Fujifilm, and Siemens*.⁷⁰ There can be little doubt that at least four of the five PACS vendors had actual knowledge of the relevance of the asserted patents well before they were sued. Because these vendors had actual prior knowledge of at least the ‘520 patent, it is unlikely that the change in their sales behavior after they were sued was influenced by the suit.

⁶⁸ *Id.*, at 28-29.

⁶⁹ Willfulness is established upon showing (1) that the accused infringer “acted despite an objectively high likelihood that its actions constituted infringement of a valid patent”; and (2) that this objectively defined risk was either known or so obvious that the accused infringer should have known about it. *In re Seagate Tech., LLC*, 497 F.3d 1360, 1371 (Fed.Cir. 2007) (en banc).

⁷⁰ The citing U.S. patents of GE are 6198283, 6210327, 6224551, 6351122, 6351547, 7162439; Fujifilm: 6459511, 6618168, 6788431, 6813393; and of Siemens: 6904161, 7680309. It is remarkable that Prof. Tucker would not investigate the identity of the patentees of the citing patents she counted in her Figure A-1, Tucker Paper, at 33.

Lastly, the Tucker Paper's assertion that consideration of "willfulness" had in fact caused the accused PACS vendors to cease selling their products and forgo billions of dollars in revenues appear to be counterfactual on (a) legal, and (b) business grounds:

(a) Parties involved with hundreds of millions of dollars in technology sales routinely avail themselves of a "freedom to operate" ("FTO") analysis, including obtaining a written opinion of competent patent counsel that they do not infringe and/or that the focal patent is invalid, precisely to avoid a finding of *willful* infringement. This legal defense tool was not changed by *Seagate* and the Federal Circuit confirmed that "competent opinion of counsel concluding either that [the accused infringer] did not infringe the ... patent or that it was invalid would provide a sufficient basis for [the accused infringer] to proceed without engaging in objectively reckless behavior."⁷¹ It is simply not credible to presume, as the Tucker Paper does, that in 2007-2008 all the accused PACS vendors would not have availed themselves of such FTO analysis or obtained the appropriate opinion of counsel in order to provide a necessary willfulness defense, if that was desired.

Empirical evidence suggests that patentees very seldom obtain treble damages (or "enhanced damages") through findings of "willfulness." Such damages are awarded in trial or post-trial decisions in only 0.28% of patent cases.⁷² Businesses seldom self-limit based on such remote probabilities.

(b) The Tucker Paper also presumes a business counterfactual. Generally, firms do not undertake self-inflicted injunctions. All accused PACS vendors had entered settlement negotiations within a year or less; none were able to invalidate the patents and there is no evidence that they had contemplated court adjudication on the merits, much less on "willfulness." The matter appears to have simply involved legal exchanges constituting price discovery and negotiations—a resolution with Acacia of "reasonable royalties." These vendors had every incentive to continue sales operations without disruption. As explained below, the first group of accused infringers had annual medical imaging sales in excess of \$3.5 billion. It is simply inconceivable that they would cease making those sales where settling with Acacia involved royalties estimated at less than 0.3%—a small incremental cost of doing business.⁷³ Professor Tucker's hypothesized cause-

⁷¹ *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1339 (Fed. Cir. 2008), *cert. denied*, 555 U.S. 1070 (2008).

⁷² Christopher B. Seaman, "Willful Patent Infringement and Enhanced Damages After *In re Seagate*: An Empirical Study," 97 *Iowa Law Review* 417, (2012). At <http://ssrn.com/abstract=1751831> (Finding "willfulness" decisions in approximately 1.9% of all patent cases, of which 73% had a trial or post-trial decisions, of which 37.2% were found willful, of which 54.9% were awarded with enhanced damages, which comprise only 0.28% of cases).

⁷³ Publicly available information is lacking but high upper bounds can be estimated as follows. According to [Acacia's 10-K annual report](#), it generated \$67.3 million in revenues in 2009 from 30 licensing programs, wherein the two largest licensees individually accounted for 15% and 12%, respectively, of such revenues (a total of \$18.2 M). For a conservative estimate (very high upper bound), assume that these top licensees *were* actually the top two vendors that settled with Acacia in 2009—GE and McKesson, which had a combined estimated PACS market share of 36% (see source in

and-effect is simply not economically plausible as an alternative to the market mechanisms discussed throughout this section.

4 Conclusion

The evidence suggests a downturn in the hospital PACS market at the same time that the text data EMR market expanded, rather than the voluntary halt of sales hypothesized by Prof. Tucker. Unfortunately, the numerous flaws in this study's methodology led to a counterfactual erroneous inference that patent enforcement retarded innovation. The *real* story is quite different. As discussed above, Acacia had partnered with the two individual inventors to enforce their patents; had spent substantial resources in defending the patents in two PTO reexamination proceedings; and ultimately had licensed about two dozen PACS vendors, including large multinational market giants. There can be no doubt that this could not have been done by the inventors alone, as co-inventors Dr. Jorge Inga, and Thomas Saliga later confirmed:

Based on our own experience, we can accurately say that it is extremely difficult for individual inventors like ourselves, to license their patented technology. ... [Acacia] with their technical and legal resources plays an invaluable role for the fair valuation of new contributions in the intellectual property market place. We don't have any doubt that without them, many inventors would be left with no other choice than to surrender their rights.⁷⁴

The Tucker Paper gets the story all wrong. This is an inventors' story of virtuous patent enforcement that was mangled by misleading scholarship into a "patent troll" fable of innovation suppressed by patent enforcement. There is no evidence that the patent law works against itself. Unfortunately, the machinery that Professor Tucker employs appears to have been carried over to another of her investigations of "innovation suppression" at the hands of "patent trolls".⁷⁵ In that study too, Professor Tucker employ fundamentally flawed data and analysis, rendering the results random and wholly unusable. The present author has critiqued this latter study elsewhere.⁷⁶

note 43 supra). Assume further, as the Tucker Paper implies, that only 30% of the imaging product sales infringed and were subject to paid-up royalties, cumulated over the 2000-2007 period. Adding the imaging sales figures shown in [Philips 2014](#) over this period, and applying the assumed market fractions, one obtains a total of about \$6.2 billion in cumulative sales subject to royalties from these vendors, of which \$18.2 million correspond to a royalty rate of about 0.3%. Given that Acacia had reported a net loss that year, the enforcement and overhead costs must have been substantial, indicating that only little profit could have been distributed to the inventors.

⁷⁴ Jorge J. Inga MD, and Thomas Saliga, testimonial at http://acaciaresearch.com/how-we-work/#testimonial_post.

⁷⁵ Catherine E. Tucker, "The Effect of Patent Litigation and Patent Assertion Entities on Entrepreneurial Activity," (May 15, 2014). Available at <http://cdn.arstechnica.net/wp-content/uploads/2014/06/Tucker-Report-5.16.14.pdf>.

⁷⁶ Ron D. Katznelson, "Does the Law of Innovation Work Against Itself?," Working Paper (2014), available at <http://ssrn.com/abstract=2468193>.

Unfortunately, these two erroneous articles continue to be passed as authoritative and are listed in a letter to Congress by 51 professors of law and economics, as part of a purported “body of evidence [indicating] that the net effect of patent litigation is to raise the cost of innovation and inhibit technological progress, subverting the very purpose of the patent system.”⁷⁷ Such articles merely manufacture what appears as plausible evidence for these assertions but because of their profound manifest defects, they must be rejected and given no credence.

⁷⁷ Letter to Congress from 51 economics and law professors (March 2, 2015). Available at www.utdallas.edu/~ugg041000/IPScholarsLettertoCongress_March_2_2015.pdf.