Patent Trolls and Technology Diffusion

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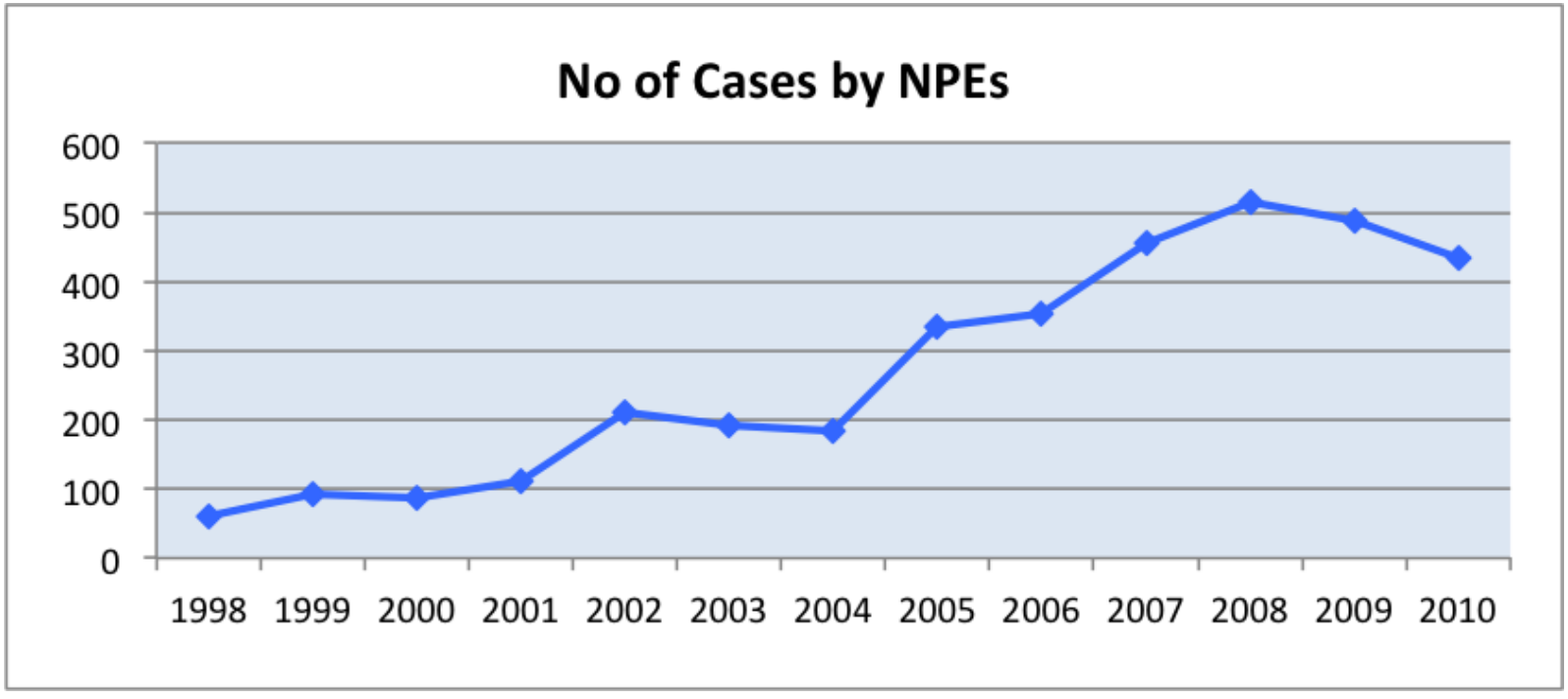
How do patent trolls affect technology sales?



Source: PatentFreedom.com

Motivation

- There is a long tradition of market-makers in patents who facilitate the commercialization of inventions.
- New evidence suggests that lawsuits involving patent assertion entities do not lead to a simple transfer of stock market value.
- Instead, the gains in stock market value enjoyed by the patent assertion entity are far smaller than the loss of stock market value experienced by the defendant (Besse et al 2011).

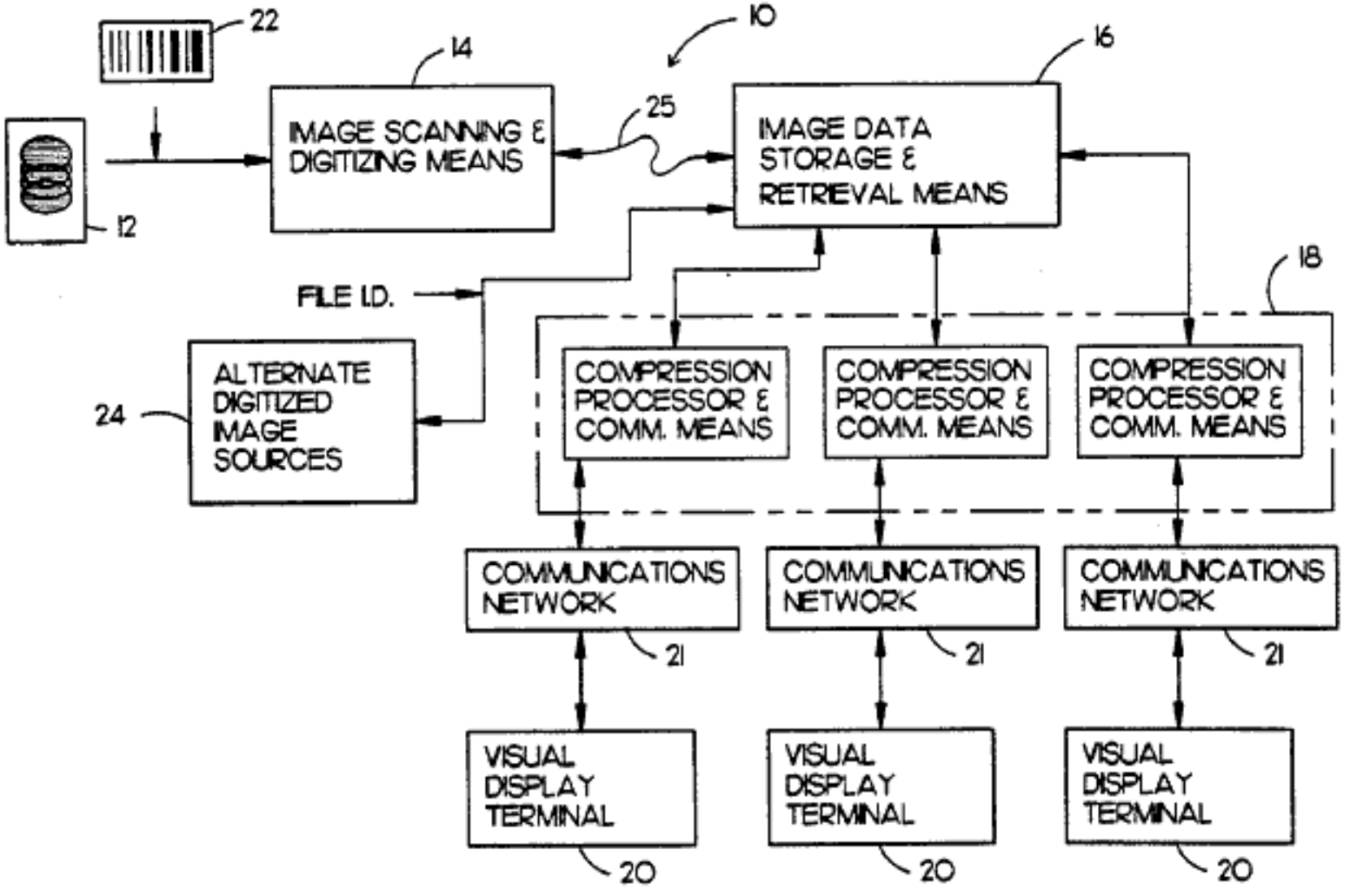
Empirical Setting

- Study effects of patent litigation by Acacia
  - Acacia is first publicly-held patent assertion entity
  - Patents governed digitized medical images
- Use data on sales of digital medical technology
- Difference-in-Difference-in-Difference setting
  - Before and after lawsuit
  - Products covered by patent and not
  - Companies sued and companies not sued

Findings

- Decrease in sales of technologies to hospitals within patent scope after lawsuit relative to non-covered technologies
- No such decrease for firms that were not sued by Acacia
- Not reflective of changes in demand
- Reflected decrease in incremental innovation for these technologies by affected firms

The Patents Covered Digitized Medical Imaging Systems



Old World

New World

Table: The Two Disputed Patents

Name	Number	Abstract
Automated high definition/resolution image storage, retrieval and transmission system	5,321,520	An automated high definition/resolution image storage, retrieval and transmission system for use with medical X-ray film or other documents to provide simultaneous automated access to a common data base by a plurality of remote subscribers upon request, the automated high definition/resolution image storage, retrieval and transmission system comprising an image scanning and digitizing subsystem to scan and digitize visual image information from an image film or the like; an image data storage and retrieval subsystem to receive and store the digitized information and to selectively provide the digitized information upon request from a remote site, a telecommunication subsystem to selectively transmit the requested digitized information from the image data storage and retrieval subsystem to the requesting remote visual display terminal for conversion to a visual image at the remote site to visually display the requested information from the image data storage and retrieval subsystem.
Medical image system with progressive resolution	5,416,602	A storage, retrieval, and transmission system is configured to provide fast, efficient telecommunication access to digitized images (e.g., medical diagnostic X-ray images) to multiple requesting subscribers. Image data are downloaded, via the telephone lines, to a remote display terminal as a plurality of portions of a compressed digital image representation. Data from a first transmitted portion is used to construct a displayable image at the terminal. Data from subsequently transmitted portions are combined with the displayable image data to provide an image with an improved resolution.

Dr. Jorge Inga and Thomas V. Saliga submitted patents in early 1990s

Acacia Research acquired patents at end of 2005

- Launched lawsuits Fall 2006.
- Named GE Healthcare, Fujifilm Medical Systems, Siemens Medical Solutions, Philips Electronics and McKesson Corp
- ‘Each defendant manufactures, provides, sells or distributes infringing Picture Archiving and Communication Systems.’
    - On average, each made 4,755 sales of different software components to hospitals.
    - The 163 software firms that were not targeted had made an average of 138 sales of software components to hospitals.

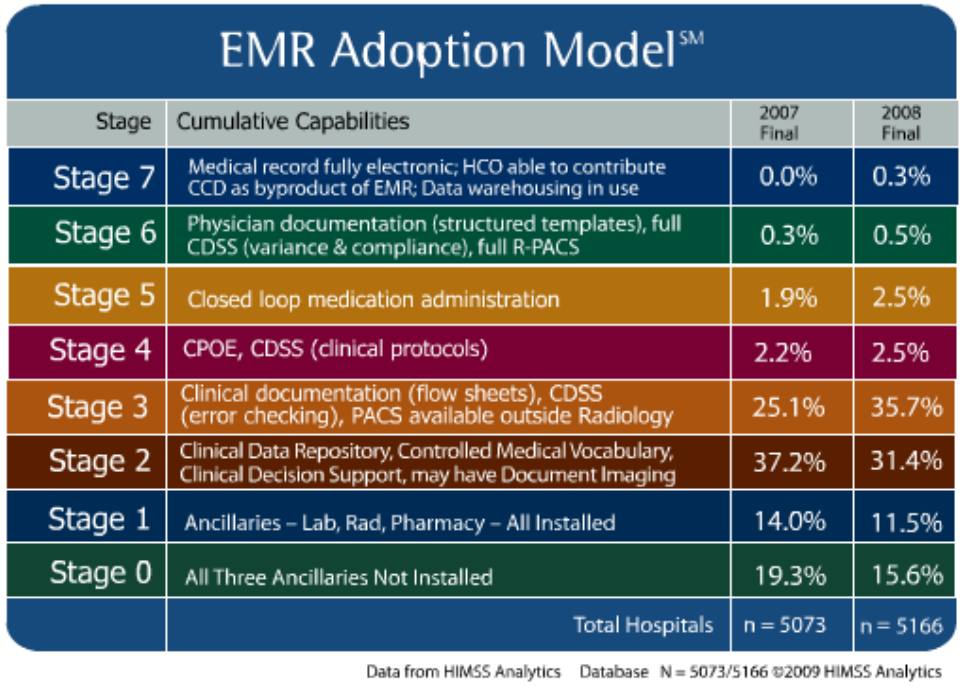
Litigation venue

- Eastern Court of Texas
- 51 Defendant lawyers
- 232 Court Dockets
- Ultimately all parties agreed to license

Use Comprehensive Data on Sales of Healthcare IT

- Healthcare IT marketing database gives data on contract year of sales of different types of software by different kinds of vendors at hospital level
- Look at data 2004-2008
  - Software components which allow remote access to Ultrasound, Mammography, Magnetic Resonance Imaging (MRI), Radiography, Fluoroscopy, Computed Tomography (CT), Computed Radiography (CR), Angiography, and Orthopedic images.

Use Comprehensive Data on Sales of Healthcare IT



EMR Adoption Model℠

Stage	Cumulative Capabilities	2007 Final	2008 Final
Stage 7	Medical record fully electronic; HCO able to contribute CCD as byproduct of EMR; Data warehousing in use	0.0%	0.3%
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), full R-PACS	0.3%	0.5%
Stage 5	Closed loop medication administration	1.9%	2.5%
Stage 4	CPOE, CDSS (clinical protocols)	2.2%	2.5%
Stage 3	Clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology	25.1%	35.7%
Stage 2	Clinical Data Repository, Controlled Medical Vocabulary, Clinical Decision Support, may have Document Imaging	37.2%	31.4%
Stage 1	Ancillaries – Lab, Rad, Pharmacy – All Installed	14.0%	11.5%
Stage 0	All Three Ancillaries Not Installed	19.3%	15.6%
	Total Hospitals	n = 5073	n = 5166

Data from HIMSS Analytics Database N = 5073/5166 ©2009 HIMSS Analytics

- Organization body sets up taxonomy of technological sophistication of IT components
- Use as ‘control’ set of technologies software components which allow remote access to:
  - ‘Physician Documentation’, ‘Clinical Data Repository’, ‘Clinical Decision Support’, ‘Order Entry’, ‘Computerized Practitioner Order Entry’, and ‘Physician Portal’

Use Comprehensive Data on Sales of Healthcare IT

- Construct panel dataset at hospital level
  - American Hospital Association as controls
- Will also show aggregate level-analysis

Figure: Changes over time in imaging software sales relative to non-imaging software sales for vendors targeted by litigation and vendors not targeted by litigation.

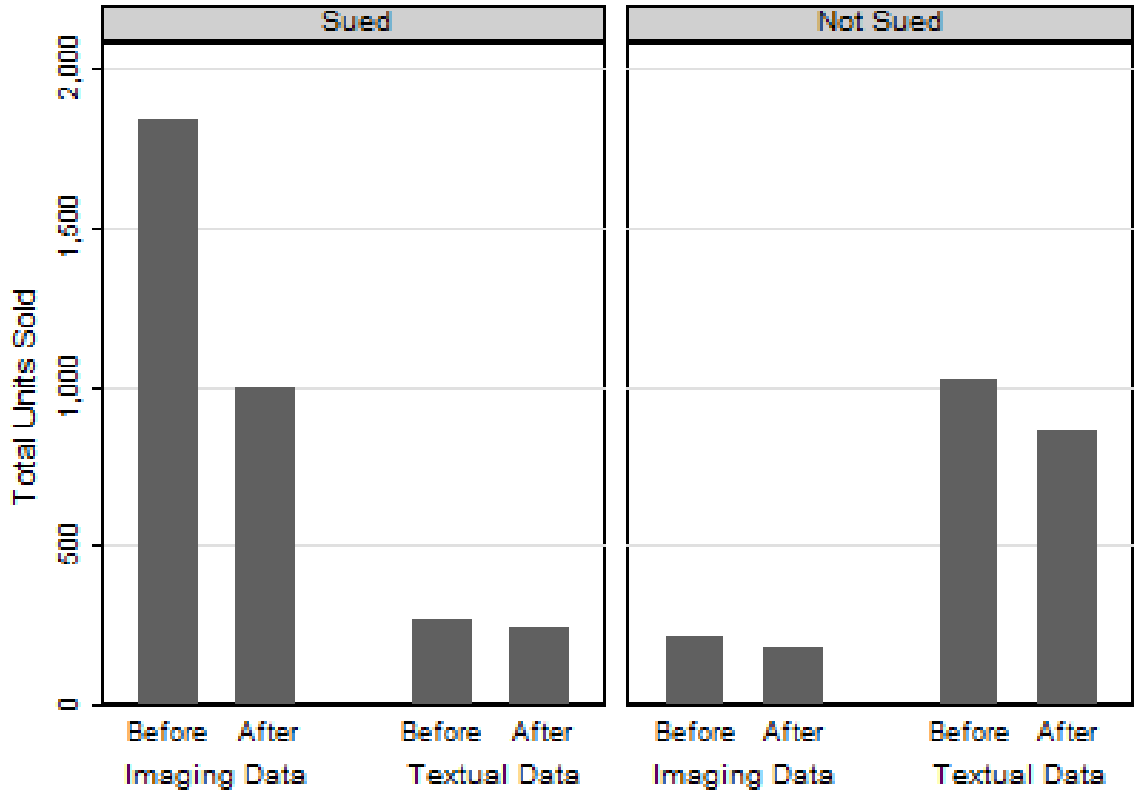


Table: Summary statistics for sales by vendors involved in litigation

	Mean	Std Dev	Min	Max	Observations
Technology Sale (Vendor involved in Litigation)	0.03	0.17	0	1	214179
Imaging Software	0.73	0.44	0	1	214179
Staffed Beds	0.14	0.16	0	2	214179
Inpatient Days (000,000)	0.03	0.05	0	1	214179
Medicare Inpatient Days (000,000)	0.02	0.02	0	0	214179
Medicaid Inpatient Days (000,000)	0.01	0.01	0	0	214179
Births (000)	0.70	1.19	0	19	214179
Total Operations (000,000)	0.00	0.01	0	0	214179
Total Outpatient Visits (000)	0.11	0.17	0	3	214179
No. Doctors (000)	0.01	0.07	0	2	214179

Each observation is a hospital-technology-year.

$$
\begin{aligned}
Sale_{ijt} = \beta_1 Postlitigation_t \times ImagingSoftware_j + \\
\beta_2 Postlitigation_t + \beta_3 ImagingSoftware_j \\
+\alpha_1 X_{it} + \delta_t + \gamma_j + \epsilon_{ijt}
\end{aligned} \tag{1}
$$

	SuedVendor					NotSued
			Cluster2	TimeTrend		
PostLitigation × ImagingSW	-0.019***	-0.011***	-0.020***	-0.020***	-0.026***	-0.004
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)
ImagingSoftware	0.028***					
	(0.002)					
PostLitigation	0.001					
	(0.002)					
Imaging linear time trend					0.005***	
					(0.000)	
Linear time trend					-0.000	
					(0.000)	
Staffed Beds			0.114***	0.114***	0.051**	-0.042***
			(0.043)	(0.042)	(0.023)	(0.016)
Inpatient Days (000,000)			-0.393***	-0.393***	-0.197**	0.086
			(0.144)	(0.146)	(0.082)	(0.060)
Medicare Inpatient Days (m)			0.572***	0.572***	0.423***	0.121
			(0.162)	(0.169)	(0.096)	(0.089)
Medicaid Inpatient Days (m)			-0.305**	-0.305**	-0.109	0.082
			(0.144)	(0.138)	(0.091)	(0.090)
Births (000)			0.004***	0.004***	0.003***	-0.001
			(0.002)	(0.002)	(0.001)	(0.001)
Total Operations (000,000)			-0.015	-0.015	0.435*	0.281
			(0.291)	(0.281)	(0.229)	(0.241)
Total Outpatient Visits (000)			-0.022**	-0.022**	-0.004	0.001
			(0.009)	(0.009)	(0.006)	(0.005)
No. Doctors (000)			0.009	0.009	-0.003	0.003
			(0.024)	(0.023)	(0.016)	(0.012)
Constant	0.017***					
	(0.001)					
Application Controls	No	Yes	Yes	Yes	Yes	Yes
Year Controls	No	Yes	Yes	Yes	Yes	Yes
Observations	213712	213712	213712	213712	544220	213712

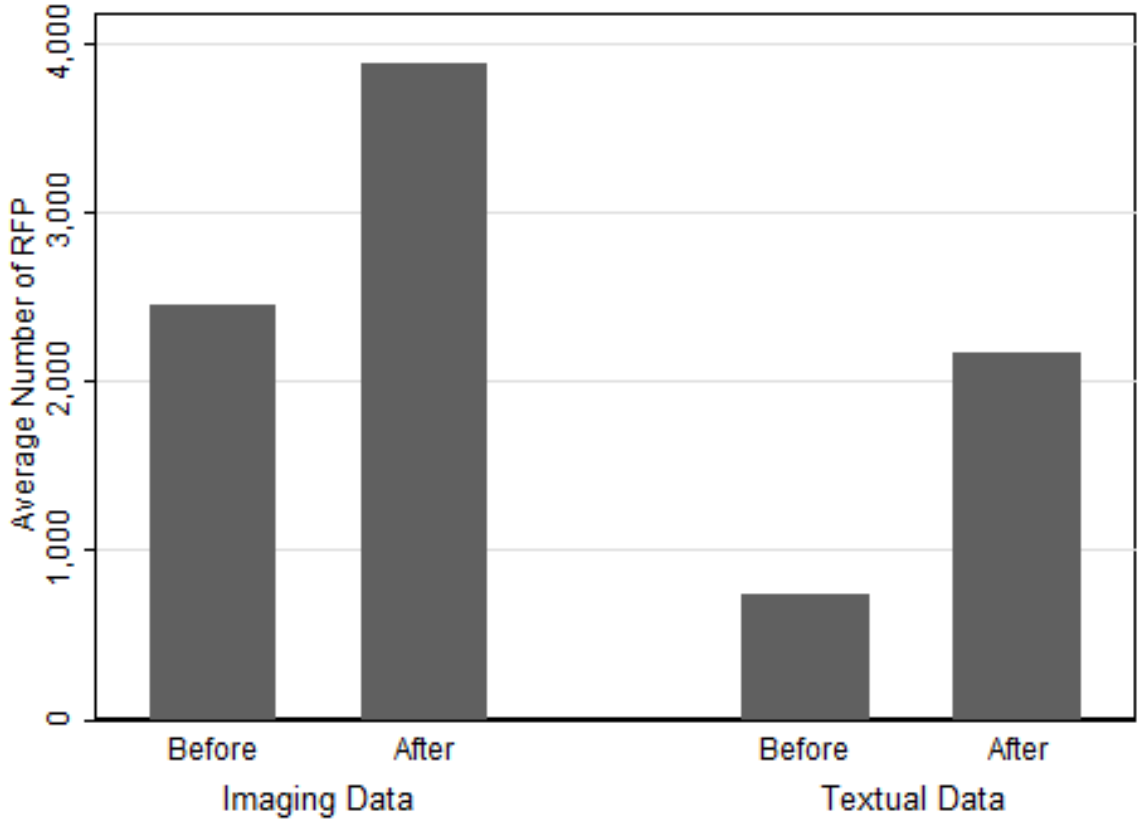
OLS Estimates. Dependent variable is whether or not hospital adopts that technology a year. An observation is hospital-technology pair. The sample is all hospitals that have not yet adopted that technology.
Robust standard errors clustered at hospital-level. * $p < 0.10$, ** $p < 0.05$,*** $p < 0.01$

Ruling out alternative explanations

We also report results from triple difference specification.

- Maybe, hospitals were deterred from demanding these technologies because of fears of ex-post licensing problems for any use of the DICOM standard
  - Letters from hopeful lawyers emphasizing potential of lock-in may have scared them
- Maybe something to do with hospital demand unrelated to litigation (such as satiation)
- To investigate this I look at ‘RFP’ which are requests for proposals by hospitals for different technologies

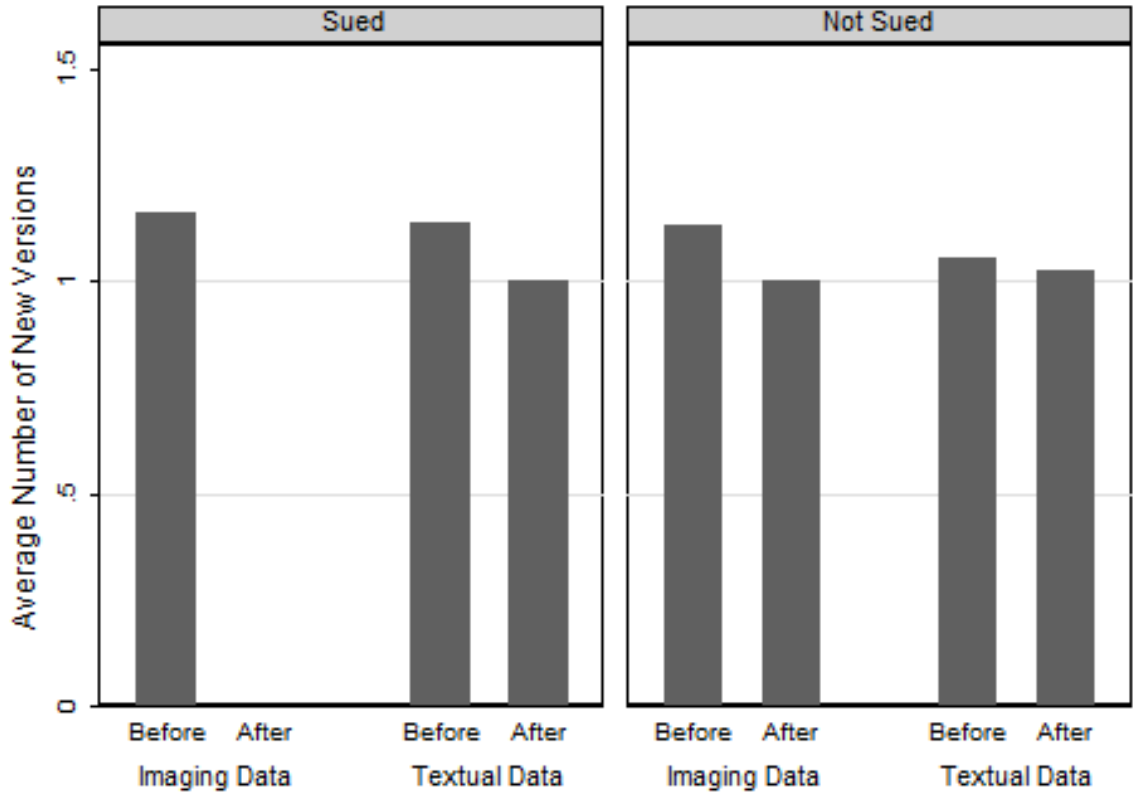
Little evidence of slowdown in hospital demand



Wilful Infringement Risk

- If a firm is found guilty of wilful infringement they face triple damages.
- A new product release would definitely be interpreted as wilful infringement.

Evidence of reduction in incremental innovation



Interpretation

- After litigation commenced, 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.
- Not causal (as there is a sales cycle) but indicates importance of new release sales cycle for business to business industries.
- For economic growth, work of Trajtenberg (1989) has emphasized the importance of incremental innovation.

First empirical study of patent trolls' effect on technology diffusion

- Find evidence that litigation over patents slowed down spread of affected technologies by affected vendors relatively
- Initial evidence suggests that firms slowed down marketing efforts rather than suppression in consumer demand
- Strength of IP policy where inventors can sell patents and non-manufacturers can sue enables activities of patent trolls
    - Results suggest a trade-off for downstream innovation from activities of these IP intermediaries