Inter-firm Patent Litigation and Innovation Competition

Jongsub Lee[1]; Seungjoon Oh[2]; Paula Suh[3]

[1]Seoul National University, [2]Peking University, [2]University of Georgia

Abstract

Using novel inter-firm patent litigation data, we show a significant interplay between intellectual property rights' boundaries and product market dynamics. Instrumenting a firm's patent litigation propensity with the passage of China's National Intellectual Property Strategy reform, we find that patent litigation reduces defendant firms' innovation activity and fosters more exploitative innovations. The effects strengthen with product market overlap between litigants. We further find that patent litigation intensifies product market competition among close rivals and results in lower and more disperse innovation activities within industry, implying an industry structure where Schumpeterian effect of competition is more likely.

Introduction

This paper investigates **inter-firm patent litigation** effects on corporate innovation and product market dynamics.

Patent litigation plays a crucial role in actively protecting valuable intellectual property (IP).
- Patents are key inputs for producing goods and essential in defining product market boundaries.
- The number of patent litigation increased tenfold since 2000.

Patent litigation is distinguished from other types of corporate litigations.
- Shareholder litigation (Lin et al. 2020), Corporate fraud (Dyck et al. 2010, Karpoff et al. 1993), General inter-firm (Bhagat, Brickley, and Coles 1994)
- Other litigations stem from a managerial agency problem.
- Inter-firm patent litigation highlights the operating risk in product market.

Inter-firm (e.g., practicing entity) patent litigation is distinguished from NPE litigation (e.g., different motives: product market-driven vs. cash-driven)
- Negative effect of patent troll-driven litigation on target (Cohen, Gurun, and Kominers 2019, Appel, Farre-Mensa, and Simintzi 2019, Mezzanotti 2021)
- Significant interplay between IP rights' boundaries and product market dynamics

Hypothesis Development

H1: Patent litigation reduces defendant firms' patenting activity.
- The expected litigation costs increase firms' hurdle rate for innovation investment.

H2: Defendant firms are more likely to narrow down the scope of their innovation activities to reduce future litigation risk.
- More exploitative innovation strategy rather than explorative strategy.

H3: The effects are more pronounced among firms with greater product market overlap due to the larger expected damages awards upon litigation.

H4: Plaintiffs gain more dominant market power as defendants shrink with a narrower scope of innovation.
- The overall firm distribution in industries becomes more dispersed in size and patenting activities (Schumpeterian effect)

Data and Sample

Hand-collected inter-firm patent litigation cases from Lex Machina
- All Compustat firms that had at least one patent during 2005-2011
- 15,771 litigation cases filed in the US district court

Lex Machina provides detailed case-specific information
- Litigant and case information (plaintiff and defendant, asserted patent identifier)
- Case outcome: case resolution (e.g., settled, claim defendant/plaintiff win), damages award, remedies (e.g., permanent injunction)

Patent data from the KPSS data (2005-2011)

References

1. Appel, Ian, Joan Farre-Mensa, and Elena Simintzi, 2019, Patent trolls and small business employment, *Journal of Financial Economics*, 708-725.
2. Bhagat, Sanjai, James Brickley, and Jeffrey Coles, 1994, The costs of inefficient bargaining and financial distress, Journal of Financial Economics 35, 221-247.
3. Cohen, Lauren, Umit Gurun, and Scott Kominers, 2019, Patent trolls: Evidence from targeted firms, *Management Science*, 65, 5461-5486.
4. Dyck, Alexander, Adair Morse, and Luigi Zingales, 2010, Who blows the whistle on corporate fraud?, Journal of Finance 65, 2213-2253.
5. Karpoff, Jonathan, and John Lott Jr., 1993, The reputational penalty firms bear from committing criminal fraud, Journal of Law and Economics 26, 757-802.
6. Lin, Chen, Sibo Liu, and Gustavo Manso, 2020, Shareholder litigation and corporate innovation, Management Science 1-22.
7. Mezzanotti, Filippo, 2021, Roadblock to innovation: The role of patent litigation on corporate R&D, *Management Science*

Identification: IV Approach

We use China's passage of **National Intellectual Property Strategy** (NIPS) reform in 2008 as a quasi-natural experiment that exogenously increases the U.S. firms' patent litigation risk.

In 2008, China released NIPS outlining reforms on the laws, regulations, and enforcement of IP. (National Bureau of Asian Research (2011))
- the number of patenting and copyright application has experienced an explosive growth and notable increase in the number of IP litigation (40% increase between 2009-2010)

U.S. firms with China exposure would attempt to secure their IP boundaries against new entrants (potential domestic rivals) through active IP-related litigation strategies.
- The strengthening IP rights in China around NIPS increases sales, royalties, and licensing fees received by the U.S. firms that have already established strong operational exposure in China.

- 1st - Stage Regression
  - $Log\ (1+Number\ of\ Defendant\ Cases)_{ijt} = \beta_0 + \beta_1 Post\ NIPS_t \times China\ Exposure_{ij} + \beta_2 Controls_{it} + FirmFE + YearFE + \varepsilon_{ijt}$

- 2nd - Stage Regression
  - $Innovation\ Outcome_{ijt} = \beta_0 + \beta_1\ Instrumented\ (Log\ (1+Number\ of\ Defendant\ Cases)_{ijt}) + \beta_2 Controls_{it} + FirmFE + YearFE + \varepsilon_{ijt}$

Table 1. Defendant Risk and Innovation: 2SLS using NIPS

	First Stage		Second Stage		
	(1) Log(1+Number of Defendant Cases)	(2) Log(1+Number of Defendant Cases)	(3) Log(1+Patent Application)	(4) Exploitative	(5) Exploratory
Post NIPS × China Exposure	0.04*** (2.94)				
Post NIPS t-1 to t-2 × China Exposure		0.01 (0.84)			
Post NIPS t0 × China Exposure		0.05*** (2.87)			
Post NIPS t+1 × China Exposure		0.03 (1.30)			
Post NIPS t+2 to t+3 × China Exposure		0.05*** (2.85)			
Instrumented (Log(1+Number of Defendant Cases))			-1.87** (2.21)	0.41** (2.30)	-1.92*** (-2.70)
Firm Controls	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	12,611	12,611	12,611	12,611	12,611
F-stat	8.66	8.66			
Adjusted R-squared	0.543	0.543			

Table 2. Industry Overlap, Defendant Risk, and Innovation: 2SLS using NIPS

	Intra-industry			Inter-industry		
	(1) Log(1+Patent Application)	(2) Exploitative	(3) Exploratory	(4) Log(1+Patent Application)	(5) Exploitative	(6) Exploratory
Instrumented (Log(1+Number of Intra-Industry Defendant Cases))	-9.84** (-2.18)	2.14** (2.20)	-10.09** (-2.38)			
Instrumented (Log(1+Number of Inter-Industry Defendant Cases))				-17.82 (-0.49)	0.30 (0.47)	-29.03 (-0.49)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,611	12,611	12,611	12,611	12,611	12,611

Table 3. Industry-level Analysis

	First Stage	Second Stage		First Stage	Second Stage	
	(1) Log(1+Number of Industry Defendant Cases)	(2) SD (Size Distribution)	(3) SD(Patent Application Distribution)	(4) Log(1+Number of Intra-Industry Defendant Cases)	(5) SD (Size Distribution)	(6) SD(Patent Application Distribution)
Post NIPS × China Exposure (SIC3)	0.04** (2.19)			0.004** (2.46)		
Instrumented (Log(1+Number of Industry Defendant Cases))		5.38** (2.05)	2.56* (1.88)			
Instrumented (Log(1+Number of Intra-Industry Defendant Cases))					45.23** (2.23)	21.49** (2.00)
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,228	1,228	1,228	1,228	1,228	1,228
F-stat	4.80			6.03		
Adjusted R-squared	0.627			0.173		

Conclusions

- Patent litigation weakens defendants' innovation activities.
- Defendant firms shift innovation strategy to avoid risk of future litigation.
- The effects of patent litigation is magnified with product market overlap.
- Patent litigation intensifies the product market competition locally among the close rivals but make firms in industries more dispersed.