

Legal Systems Comparison: Firms' Strategies in Patent Litigation

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Research questions

Using a dynamic model, we examine:

- How do capital market frictions interact with legal systems in affecting firms' strategies in patent litigation?
 - Motivation: non-troll patent infringement lawsuits vary significantly across countries in terms of litigation and settlement rates.
 - Aoki and Hu (1999) use a game theory model to study the impact of legal cost allocation rule on patent licensing, litigation and R&D decisions, without considerations of capital market frictions.
- How do firms' strategies in patent litigation differ under the English rule ("loser pays") compared to the American rule ("each party pays"), with the consideration of financial constraints?
 - Strategies we investigate include: signing a license agreement before an infringement lawsuit is filed ("ex-ante settlement"), filing an infringement lawsuit, threatening to litigate to force out the alleged infringer, settling during litigation ("ex-post settlement"), unilaterally leaving the lawsuit.

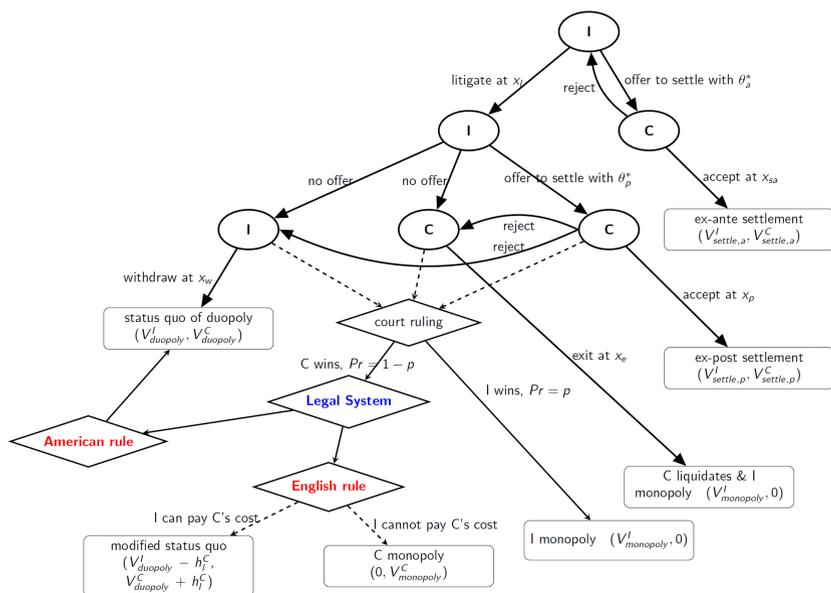
Main contributions

- Take a first theory step towards understanding how legal systems affect corporate innovation (Examples of empirical work on this topic include Caskurlu, 2019 and Mezzanotti, 2020).
- Provide theory evidence that a legal system affects the strength of competitive advantage resulting from financial constraints

Model setup

- Two firms competing in product markets:
 - Incumbent ("I") - patent owner, Challenger ("C") - allegedly infringed.
 - Both earn flow operating profits linear to market demand, i.e., πx_t where $x_t \sim$ GBM ($dx_t = \mu x_t dt + \sigma x_t dW_t$), and no other revenues.
 - $\pi = \pi_1$ in I monopoly, $\pi = \pi_2^I$ or $\pi = \pi_2^C$ in duopoly.
- Once litigation starts, the judgement \sim Poisson (λ). Both firms incur ongoing cost in litigation. Common knowledge that Prob(I wins) = p .
- Firms follow threshold strategies (threshold on x) regarding
 - ex-ante settlement vs. litigate vs. do nothing
 - ex-post settlement vs. leaving the lawsuit unilaterally to save litigation cost (either C exits or I withdraws) vs. waiting for judgement
- Comparison of the US vs UK legal system - focus on cost allocation
 - American rule: each party pays for its own legal costs
 - English rule: the losing party bears all legal costs

Game tree



Implications of the English rule

Compared to the American rule, the English rule ("loser pays", interchangeable with *the UK rule*) has two implications:

- If C wins, I $\xrightarrow{\text{£ (C's litigation cost)}}$ C; if I wins, no transfer due to C's financial constraint. \Rightarrow *The English rule makes litigation more expensive for I.*
- If C wins, I may liquidate b/c of its own financial constraints, if so, C becomes the new monopolist. *Losing the lawsuit becomes more detrimental to I under the English rule.* 2 possibilities with English rule:
 - Case 1. "I remains a going-concern" (always true under American rule)
 - Case 2. "I may liquidate" (only relevant under English rule)

Remark: both implications suggest that the English rule *favours C against I* when firms' financial constraints are taken into consideration.

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Finding: Royalty rate in ex-post settlement

The form of settlement: If settles, C $\xrightarrow{\text{a flow payment of } \Theta_p \pi_2^C dt}$ I.

$$\text{royalty rate: } \Theta_p^* = p\delta(r - \mu) \left(1 - \frac{1}{\frac{\alpha_1}{\alpha_1 - 1} + \frac{1}{\Gamma}}\right) + \frac{p\delta(r - \mu)}{\Phi} \left(\frac{1}{\frac{\alpha_1}{\alpha_1 - 1} + \frac{1}{\Gamma}}\right)$$

"relative cost saving": $\Gamma = \frac{H_I^C - C_p^C}{H_I^I - C_p^I}$. $\Gamma \uparrow \Rightarrow$ high litigation cost for C relative to I

"gain-to-loss ratio": $\Phi = \frac{\pi_2^C}{\pi_1 - \pi_2^I}$. $\Phi \downarrow \Rightarrow$ total(market size) shrinks more due to infringement

Result

Ceteris paribus, the royalty rate in an ex-post settlement is higher under the American rule than under the English rule (i.e., $\Theta_{p,UK}^* < \Theta_{p,US}^*$).

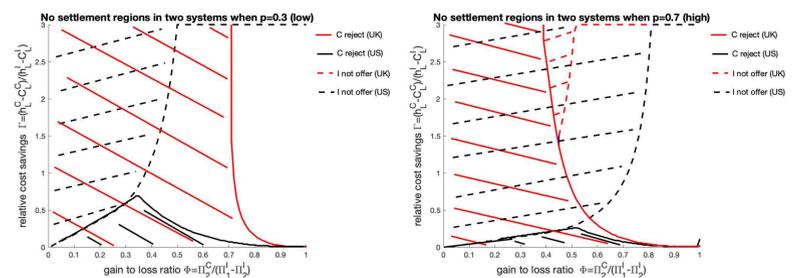
Finding: settlement likelihood w.r.t. p

Result

The effects of the probability of I winning (p) on settlement likelihood are **opposite** in the two legal systems: it increases/decreases the settlement likelihood under the American/English rule.

Implication: If the patent approval process becomes more stringent, so it is more likely for a patent to be ruled valid in court, or if the probability of infringement ruling becomes higher, then the likelihood that the two firms settle decreases under the American rule, but increases under the English rule.

Intuition for the result



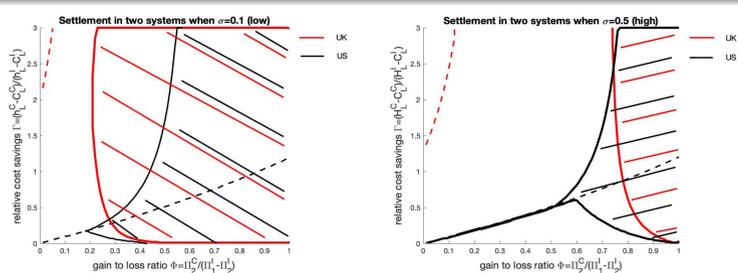
Under both rules: $p \uparrow \Rightarrow$ Area(settlement offer rejected by C) \downarrow Area(I refuses to offer settlement) \uparrow . Because I Withdrawal area is larger under English rule than under American rule, therefore as $p \uparrow$

- English rule: C's rejection matters more for no-settlement \Rightarrow settlement likelihood \uparrow
- American rule: I's refusal matters more for no-settlement \Rightarrow settlement likelihood \downarrow

Finding: settlement likelihood w.r.t. σ

Result

Product market volatility σ reduces settlement likelihood. The effect of σ is more significant under the English rule than under the American rule.



Testable implications

- Litigation rates
 - The litigation rate is higher/lower under the English rule than the American rule if the infringing products are substitutes/complements to I's.
- Settlement rates
 - Under the American rule, policies which increase the winning probability of the plaintiff in a patent infringement lawsuit reduce settlement likelihood. It is opposite under the English rule.
- Settlement terms
 - Everything else equal, the royalty rate in an ex-post settlement is lower under the English rule than under the American rule.

References

- Aoki, R., and J.-L. Hu. 1999. Licensing vs. litigation: the effect of the legal system on incentives to innovate. *Journal of Economics & Management Strategy* 8:133-160.
- Caskurlu, T. 2019. Effects of Patent Rights on Acquisitions and Small Firm R&D. *R&R at Journal of Financial Economics*.
- Mezzanotti, F. 2020. Roadblock to Innovation: The Role of Patent Litigation in Corporate R&D. *accepted at Management Science*.