Innovation, Patent Holdup, and Equilibrium Effects of RAND Commitments

Luke M. Froeb  Bernhard Ganglmair

---


2 luke.froeb@owen.vanderbilt.edu

3 ganglmair@iew.uzh.ch
Motivation: Broadcom v. Qualcomm

- **2006 Complaint**: Qualcomm acquired monopoly power by inducing the SDO to adopt a standard that incorporated its patents by promising to license its patents on FRAND terms.

- **Finding**: “... a patent holder’s intentionally false promise to license essential proprietary technology on FRAND terms, ... is actionable anticompetitive conduct”.
  
  - Broadcom Corp. v. Qualcomm Inc., 501 F.3d 297, 314 (3d Cir. 2007)
Motivation: EC v. Rambus

- **Charge:** In 2007, Rambus abused its dominant position in the market for DRAM chips by engaging in a “patent ambush” by intentionally concealing its patents and patent applications, which were relevant to an industry-wide DRAM standard, and then subsequently claiming exorbitant royalties on those patents.

- **Settlement:** In 2010, Rambus agrees to reduce maximum royalty from 3.5% to 1.5%.

- Commissioner Neelie Kroes commented: “…Abusive practices in standard setting can harm innovation and lead to higher prices for companies and consumers.”

Motivation: EC investigates Qualcomm

- **Investigation**: In 2007, “whether the royalties that Qualcomm has been charging since its patented technology became part of Europe’s 3G standard are unreasonably high.”
- The Commission stated: “The Qualcomm case has raised important issues about the pricing of technology after its adoption as part of an industry standard. In practice, such assessments may be very complex, and any antitrust enforcer has to be careful about overturning commercial agreements.”
Economic models of patent ambush

- Patent ambush (post-investment holdup): Once a user (manufacturer) of a patented technology makes technology-specific investment, the manufacturer can be held up by the patent owner (innovator).

- Standard setting organizations provide for safeguards: Patent owners must commit to license their IP on “reasonable and nondiscriminatory (RAND) terms.”

<table>
<thead>
<tr>
<th>Paper</th>
<th>Source of holdup</th>
<th>Innovation decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shapiro (2006)</td>
<td>deception</td>
<td>fixed</td>
</tr>
<tr>
<td>Farrell &amp; Shapiro (2008)</td>
<td>weak patents</td>
<td>fixed</td>
</tr>
<tr>
<td>Froeb &amp; Ganglmair (2010)</td>
<td>incomplete contracts</td>
<td>dependent on investment returns</td>
</tr>
</tbody>
</table>
Policy question: Can *ex post* litigation help mediate transactions between creators and users of intellectual property?

Model: Bilateral contracting between creators and users of IP; sequential investment and double-sided holdup.

Result 1: *Ex post* litigation is sometimes better than nothing.
- Solves manufacturer’s holdup but worsens innovator’s holdup.

Result 2: Bilateral contracts dominate *ex post* litigation.
- Solves manufacturer’s holdup and (indirectly) mitigates innovator’s holdup.

Result 3: *Ex post* litigation nullifies effects of contract.
- Takes us from Result 2 back to Result 1.
Case 1: No contracts

Figure: Sequence of events

Innovator: innovation at cost $D$; standard setting
Manufacturer: investment $k$ at cost $k$

Negotiations: price offers $p_i, i = M, I$

Manufacturer: adoption if $v(k) - p_i \geq v_0$

Proposition: Under-investment by both parties

To protect herself against holdup, she will under-invest. This causes further under-investment by the innovator.
Case 2: Option-to-license contract

Proposition: Under-investment by innovator only

A simple option-to-license contract restores the manufacturer’s incentive to invest. This indirectly increases the innovator’s investment return.

Note: This is the hypothetical license price a court would reference to determine whether an ex post price is “reasonable” (RAND).
Case 3: Ex post litigation without a contract

**RAND Enforcement**

1. The innovator violates his RAND commitment by demanding an *ex post* license fee that exceeds the hypothetical license price.
2. In case of a violation, the innovator is compelled to pay damages, equal to some multiple of the difference between the actual price and the RAND price.

**Proposition**

*Ex post* litigation solves the manufacturer’s holdup problem but worsens the innovator’s holdup problem.

Result 1: *Ex post* litigation is sometimes better than no contract (Case 1).
Result 2: Bilateral contracts (Case 2) dominate *ex post* litigation.
Case 4: Ex post litigation with a contract

Bargaining in the shadow of ex post litigation

*Ex post* litigation reduces the ex ante contract price.

The alternatives to agreement determine the terms of agreement, and *ex post* litigation improves the manufacturer’s alternative.

Proposition

Result 3: *Ex post* litigation (Case 4) nullifies effects of contract (Case 2).

Note: Litigation on top of a contract takes us back to litigation without a contract.
*Deception v. Anticipated Holdup:* If holdup in EC v. Rambus was due to incomplete contracts rather than deception then the decision may have been wrong (Result 1).

*How should courts define RAND:* Even using an *ex ante* measure, as opposed to the court’s *ex post* measure, it is not clear that *ex post* litigation will make things better.
When does holdup occur?

- Innovator develops $T$ for all $D$ lower than $I^{PA}$ so that royalties are higher than costs.
- Suppose $D = 2$: Shaded region depicts the range of $\beta$ for which we observe long-run innovation.
- R&D breakdown (no innovation for any $D$!) if either the innovator (for $\beta = 0$) or the manufacturer (for $\beta = 1$) sets the license price ex-post.
- The innovator is best off for some intermediate value of bargaining power $\beta$. He receives a smaller share of a much larger pie.

$v(k) = 10\sqrt{k}$, $\pi = 1/2$, $v_0 = 3$
Holdup vs. option-to-license contract

- The innovator develops $T$ for all $D$ under $I^C$.
- Suppose $D = 2$: Light-shaded region depicts the range of $\beta$ for which we observe long-run innovation in the C-case; dark-shaded region for the NI-case.
- Not surprisingly, an option-to-license contract (bilateral price commitment) solves the manufacturer’s holdup problem and increases the likelihood of innovation.
- Because $k^*$ for any $\beta$, the innovator is best off when setting the price (for $\beta = 0$).

$$v(k) = 10\sqrt{k}, \pi = \frac{1}{2}, v_0 = 3$$
Figure: *Ex post* Litigation limits the innovator’s *ex-post* price offer

\[
\begin{align*}
\text{Manufacturer} & \quad \text{Innovator} \\
\text{accept} & \quad p_{lj} \leq R & p_{lj} > R \\
(\begin{array}{c}
\nu(k) - p_{lj} \\
p_{lj}
\end{array}) & \quad (\begin{array}{c}
\nu_0 \\
0
\end{array})
\end{align*}
\]

\[
\begin{align*}
\text{Manufacturer} & \quad \text{Manufacturer} \\
\text{accept} & \quad \text{litigate} \\
(\begin{array}{c}
\nu(k) - p_{lj} \\
p_{lj}
\end{array}) & \quad \gamma & 1 - \gamma \\
(\begin{array}{c}
\nu_0 \\
0
\end{array}) & \quad & (\begin{array}{c}
\nu_0 \\
0
\end{array})
\end{align*}
\]

\[
\begin{align*}
\text{Manufacturer} & \quad \text{Manufacturer} \\
\text{accept} & \quad \text{reject} \\
(\begin{array}{c}
\nu(k) - R \\
p_{lj} - \tau(p_{lj} - R)
\end{array}) & \quad (\begin{array}{c}
\nu_0 \\
-\tau(p_{lj} - R)
\end{array})
\end{align*}
\]
RAND solves manufacturer’s holdup but deters innovation

- RAND enforcement solves the manufacturer’s holdup problem.
- The innovator develops $T$ for all $D$ under $I^R$.
- Only for low $\beta$ (innovator has high bargaining power): RAND yields high royalties than NI and facilitates innovation.
- Shaded region depicts the range of $\beta$ for which RAND deters innovation relative to the NI-case because it yields lower royalties.

$v(k) = 10\sqrt{k}$, $\pi = 1/2$, $v_0 = 3$