# Royalty Stacking and Standard Essential Patents: Theory and Evidence from the World Mobile Wireless Industry

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# Summary of Contribution

**First contribution:**

- Develop Cournot model with royalty stacking
- Predicts more SEP holders lead to increase in prices, fall in margins, & reduced sales
- Only Large firms can survive

**Second contribution:**

- Collect data on 3G Standard Setting Organization (SSO) member firms & attendees
- Number of Standard Essential Patents (SEPs) grew rapidly 1994-2013
- Contrary to model, prices fell, number of manufacturers grew as size fell, avg. gross margins of SEP and non-SEP holders constant

# Discussion of Model

**Galetovic and Gupta (2015) Model:**

- One-shot Cournot model
- Firms decide whether or not to enter
- SEPs set royalties *taking as given* what firms do
- Firms set quantities *taking as given* what SEPs royalties will be
- Solution to model is same whether SEPs move first, or simultaneously with firms

**Discuss Two main assumptions:**

1. SEPs exogenously exist
2. SEP Royalties unrestricted

# Discussion of Model

**Discussion of Assumption 1:** SEPs exogenously exist

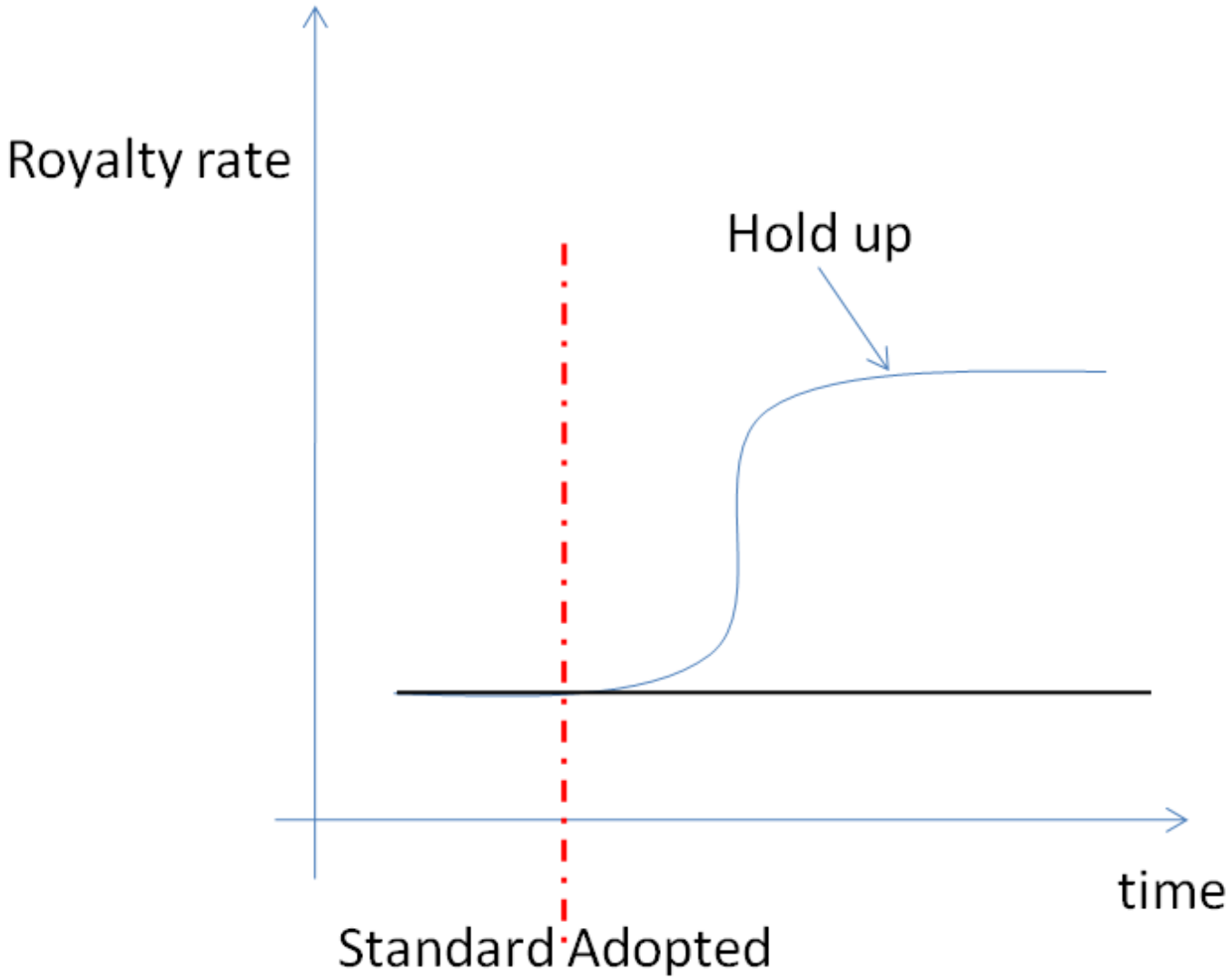
- How do you (the firm with a patent) convince others to adopt your standard? Offer a "low price" (FRAND royalty)
- Very related to Customer capital models (Gourio & Rudanko 2012) – obtain customers by offering a low price
- Once you have customer, holdup derives from switching costs
- What prevents SEPs from doing the same, and asking for more?

# Discussion of Model

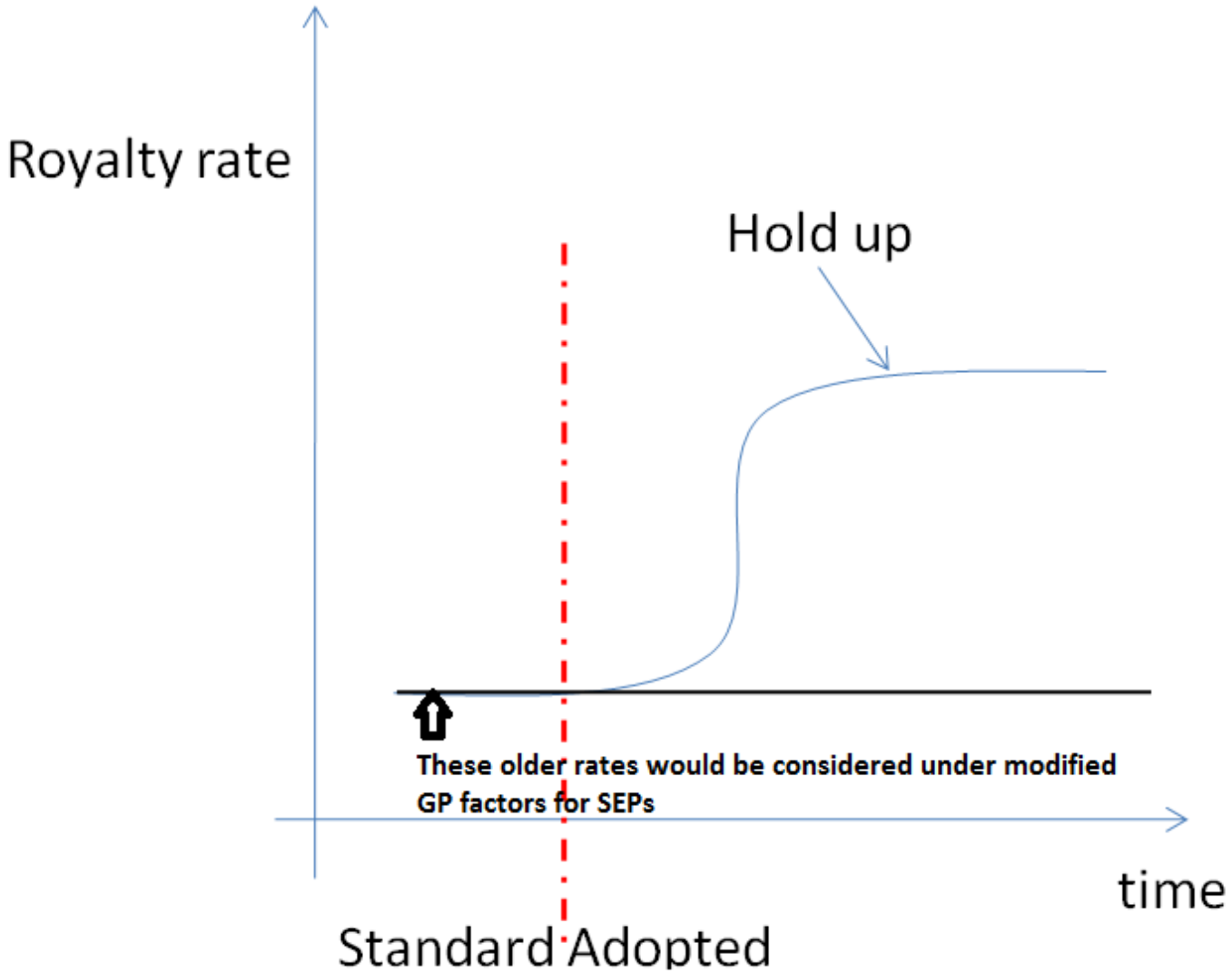
- James William Brady [2013] on modified Georgia-Pacific factors for SEPs
- Summary of U.S. District Judge James Robart's opinion in 2013
- How to calculate Fair, Reasonable, and Non-Discriminatory ("FRAND") patent royalty rates with a modified set of the traditional Georgia-Pacific factors...

  > *"Next, any empirical evidence of other royalty rates that are offered to inform the royalty determination should also be a FRAND royalty or comparable. These would include, for example, previous licensing agreements under FRAND terms, licenses as part of patent pools (collections of patented technology to be licensed as a group), or licenses for comparable contributions to other standards." (Brady [2013])*

# Discussion of Model



# Discussion of Model



# Discussion of Model

**Simple modification of Galetovic and Gupta (2015):**

- 2 periods
- Bertrand competition in the first period among potential SEP holders
- Potential SEP holders compete on "price" (FRAND Commitment) to become a standard
- If immediately default on FRAND commitment, standard will not be adopted [an empirical statement]
- So at least initial license at FRAND royalty rate
- But once a precedent has been set for what a reasonably royalty is, there is limited scope for holdup (**Discussion of Assumption 2:** SEP Royalties unrestricted )

# Discussion of Model

Roger G. Brooks [2011]

- **SSO Rule Selection:** "SSO rules are debated and decided by members before the creation of a standard"

- "Agreed rules are a precondition to all the efforts, technical contributions and FRAND commitments necessary to that standard."

- "...when debating FRAND licensing rules prior to the creation of standard, none of the participants would favor IPR rules that foreseeably threaten depressed returns to patentees, or conversely that would enable 'hold up' of licenses."

- The Bertrand competition by SEPs over royalty and restricted hold-up potential will capture this intuition

- Stands in contrast to Lerner & Tirole (2013) who argue lack of ex-post price commitment, Shapiro (2001) and Lemly and Shapiro (2007)

# Discussion of Model

Market structure and ownership of SEPs in cross section and over time

- Who are SEP holders, and are they also producers? In what sense are they setting royalties taking prices as given?
- Stackelberg and strategic interaction [Quies 2012]

**ROYALTY PERCENT PER PATENT AND SHARE OF TOTAL LTE STANDARD ESSENTIAL PATENTS**

| Company | Announced LTE Rates | Number of LTE Declared Essential Patents [1] | Royalty Percent Per Patent | Share of LTE Standard Essential Patents [2] |
|---|---|---|---|---|
| | (Percent) | (No. of Patents) | (Percent) | |
| | | | (2) / (3) | |
| (1) | (2) | (3) | (4) | (5) |
| 1. Qualcomm[3] | 3.25% | 350 | 0.009% | 18.0% |
| 2. Huawei[4] | 1.50% | 182 | 0.008% | 9.4% |
| 3. Ericsson[5] | 1.50% | 146 | 0.010% | 7.5% |
| 4. Nokia[6] | 1.50% | 142 | 0.011% | 7.3% |
| 5. Nortel[7] | 1.00% | 46 | 0.022% | 2.4% |
| 6. Siemens[8] | 0.80% | 32 | 0.025% | 1.6% |
| 7. Motorola[9] | 2.25% | 16 | 0.141% | 0.8% |
| 8. Alcatel[10] | 2.00% | 9 | 0.222% | 0.5% |

Notes: [1] The total number of LTE standard essential patents was said to be 1,941. Stasik, Eric, "Royalty Rates and Licensing Strategies for Essential Patents on LTE (4G) Telecommunication Standards," *les Nouvelles*, September 2010, p.116, citing ETSI 2010 data.

[2] Share of LTE Standard Essential Patents is calculated as each company's number of LTE declared essential patents (Column 3) divided by the total number of LTE essential patents (1,941).

# Discussion of Data

- Over 300 firms, between 1994 and 2012 who were members or attendees of 3GPP (the 3G SSO)

- Collect data on gross margins [ThomsonOne]
  - Margins computed as ratio of revenues less cost of goods sold to sales
  - As they note themselves, this includes fixed costs etc.

- **Main empirical result:** no trend in gross margins over time for non-SEP holders as well as SEP-holders

- *Usefulness of model enters here* – what would profit margin growth have been if there were no SEPs or SSOs?
  - We move from the Bertrand world in which potential SEPS compete on 'prices' before becoming a standard to a world of thickets and Cournot-complements as in Shapiro (2001).

# Discussion of Data

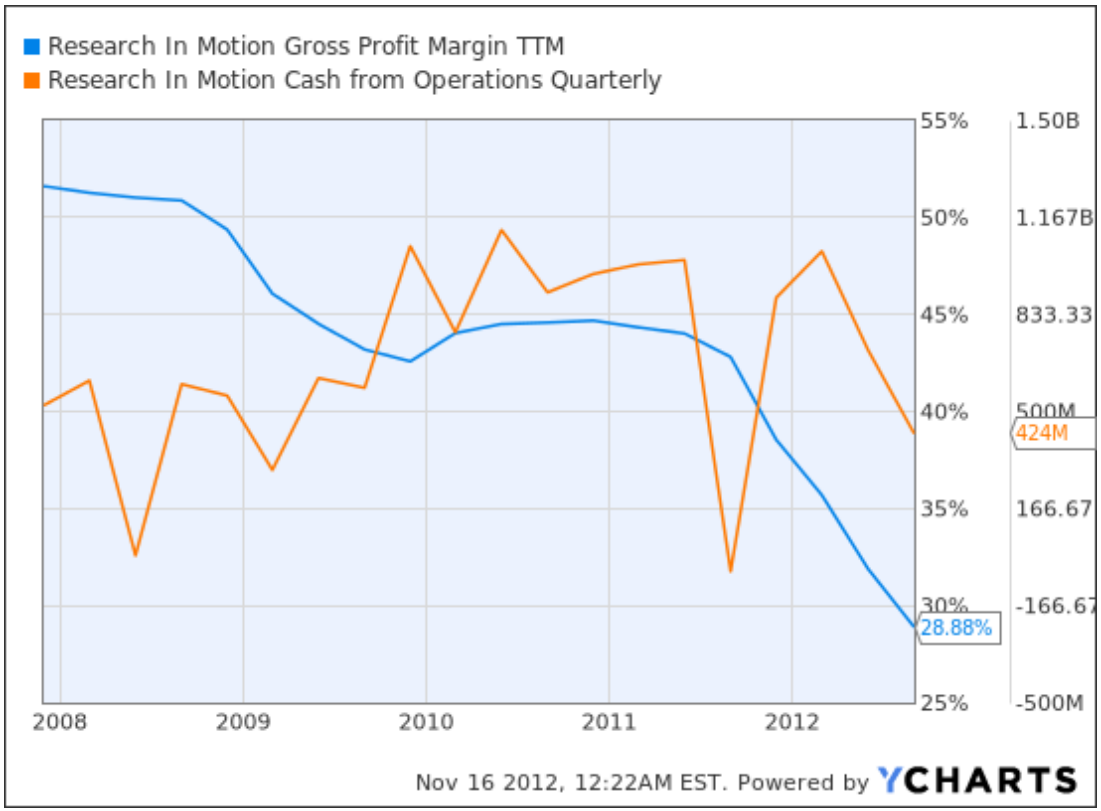
**Current empirical analysis:**

$$Gross\ Margins\ Firm\ i = F(Number\ SEP\ Holders, Dummy\ if\ Firm\ i\ holds\ SEP)$$

- Very rich dataset, much potential still remains
- Namely, **are standard essential patents essential**?
- Is there some way to proxy for 'essentiality' using measures of age, use, citations, court rulings, etc?
- RIM vs. Apple, both SEP holders

# Discussion of Data

- RIM owns several SEPs...



# Discussion of Data

- And so does Apple...

# Discussion of Data

Final comments on data

- The authors have data on members (voting) vs. attendees of 3GPP
- How do voting members fair vs. non-voting members?
- The authors also have data on number of not-for-profit institutions (educational institutions, research institutions) – are any SEP holders?
- Does the presence of not-for-profit SEP holders impact margins?
- How many potential SEPs were discarded in the process of picking a new standard? this is the time at which competition matters

# Conclusion

**Three points from discussion:**

(1) Room for significant theory contribution

(2) Rich set of potential empirical specifications

(3) **Bottom line:** This paper has lots of potential

# Additional Comments

The SSO selection procedures navigate the holdup problem, at least for SEPs, described by Shapiro (2001) associated with a thicket
How many potential SEPs were discarded in the process of picking a new standard? this is the time at which competition matters
Time series on royalties?
Shapiro and Lemley (2007) – simple Nash-Bargaining models to understand hold-up in the presence of SEPs ( read critique by Elhauge (2008))