

Strategic Delays in the Prosecution of Standard Essential Patents

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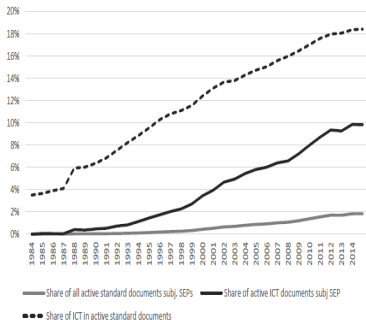
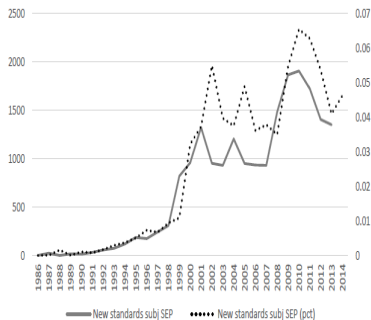
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Introduction

Standard Essential Patents

- SEPs: high private value; hold-up problems.
- More (declared) SEPs over time; more standards covered by (declared) SEPs.



Source: Baron and Pohlmann (2018).

This paper

- Strategic behavior of applicants for SEPs during prosecution
- U.S. patent system provides unique tools to delay claim drafting and claim changes (e.g. provisional applications, continuation applications).
- Key idea: delay application disposal until content of standard is known to increase fit between patents and standards through amendments to claims and filing of continuation applications
- Analyze the delays of SEPs and similar patents
- Relationship between standardization timing and
 - ▶ patent application disposal
 - ▶ filing of continuation applications (CONs)

Results Preview

- Compared with similar patents, SEPs have longer prosecution and accumulate more delays.
- Most SEPs are filed immediately before or after standard publication (many SEPs are CONs of applications filed previously).
- Hazard of application disposal increases immediately after standard publication.
- Large increase in filing of continuation applications of SEPs immediately after standard publication.
- Downstream players drive these results.

Contribution

- Relationship between standards and patents (Bekkers et al., 2002, 2017; Berger et al., 2012; Farrell et al., 2007; Kang and Bekkers, 2015; Lemley and Shapiro, 2007; Lerner and Tirole, 2015; Shapiro, 2001): companies exploit delays to obtain SEPs.
- Strategic patenting Hall and Ziedonis (2001); Hegde et al. (2009); Ziedonis (2004): in the context of standard setting, the use of continuation applications to build a “patent thicket” is related to standardization timing.

Roadmap

- Prosecution of SEPs
- Data
- Comparison of SEPs and similar patents
- Effect of standardization on CON filings: empirical strategy
- Effect of standardization on CON filings: results
- Implication of delays for post-grant outcomes
- Conclusion

Prosecution of SEPs

- The drafting of standards and related patents often occurs simultaneously.
- Incentives for applicants to amend claims or draft new ones to cover standard: U.S. patent systems provides tools that make this strategy more effective (e.g. provisional applications and continuation applications).
- Kang and Bekkers (2015): “just-in-time” patenting.
- Berger et al. (2012): European SEPs have longer pendency and are amended more often; SEPs filed after standard issue more quickly.
- Nagaoka et al. (2009): many SEPs related to MPEG2, DVD and W-CDMA are CONs.
- Our analysis: large sample of U.S. SEPs related to many standards; multiple measures of delays; effect of standardization on CON filings.

Data

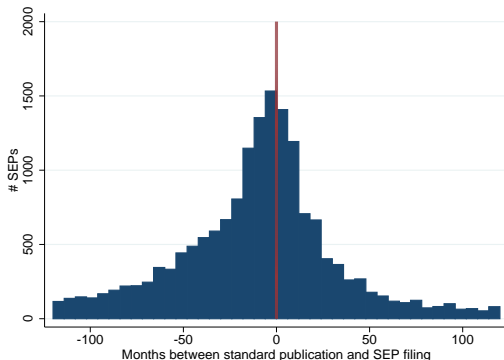
Data sources

- SEPs: Searle Center Database on technology standards and standard setting organizations (SCDB) (Baron and Gupta, 2018; Baron and Pohlmann, 2018; Baron and Spulber, 2018); dSEP database (Bekkers et al., 2017).
 - ▶ **Caveat: declared SEPs.**
- Patents/Applications
 - ▶ Patent Examination Research Dataset (Graham et al., 2015);
 - ▶ PatentsView;
 - ▶ Patent Claims Research Dataset (Marco et al., 2016);
 - ▶ Thomson Innovation;
 - ▶ Patent Citation Similarity Dataset (Younge and Kuhn, 2016).

Sample

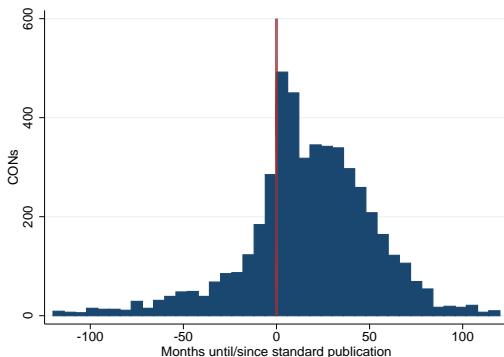
- 22,644 “regular” utility SEPs (patents and applications); 19,539 granted before June 2017.
- 86% of the SEPs are filed after the enactment of the AIPA (November 29, 2000).
- Standardization: for each SEP, we take the earliest standard publication date (month-year): information for 17,417 SEPs.
- 97% of the first standard publications between 2000-2014.

Standard publication and SEP filing date



The sample contains the U.S. regular utility SEPs with a standard-filing lag between -10 years and +10 years. The graph plots the frequency for six-month bins. The vertical red line represents the month of publication of the first standard associated with a SEP.

Standard publication and CON filings



The sample includes all the SEPs filed on or after the enactment of the AIPA (November 29, 2000), before the end of year 2014 and at least one month before the publication of the first standard for which they are declared essential (only standards with publication date before year 2015 are included for this analysis). The graph plots the number of CONs of these SEPs according to the difference between their filing month and the month of publication of the first standard for which their parent application is declared essential. We plot only data for a 20-year window centered on first standard publication. We use only CONs filed until June 2015 to allow enough time for CON publication. The graph plots the frequency for six-month bins. The vertical red line represents the month of publication of the first standard associated with a SEP.

Comparison of SEPs with similar patents

Match SEPs and similar patents

- Only granted patents.

- Match on
 - ▶ filing year (and post-TRIPS dummy if filed in 1995);
 - ▶ art-unit-examiner: similar technologies (Righi and Simcoe, 2017); correlated with speed of examination (Farre-Mensa et al., 2017); correlated with SEP declarations (Kuhn and Thompson, 2017);
 - ▶ 1-to-1 match (random selection if more than one match available).

- Matched 18,923 of the 19,539 granted SEPs (97%).

Comparison of SEPs and similar patents

	(1)	(2)	(3)	(4)
	Matched Controls	Matched SEPs	T-stat	Norm. Diff.
Children: CONs	0.20	0.60	22.80	0.23
CON	0.15	0.25	23.31	0.24
Children: DIVs	0.06	0.18	7.48	0.08
DIV	0.04	0.08	15.63	0.16
Children: CIPs	0.07	0.06	0.75	-0.01
CIP	0.04	0.04	1.44	0.01
Provisional	0.21	0.28	16.74	0.17
PCT	0.18	0.31	31.69	0.33
Foreign priority	0.35	0.48	26.63	0.27
Days earliest-priority-issuance	1,914.94	2,327.30	39.55	0.41
Days filing-issuance	1,244.01	1,248.25	0.64	0.01
Requests for extension of time	0.55	0.69	13.25	0.14
Applicant delay [†]	52.71	79.38	20.09	0.22
Obs.	18,923	18,923		

[†]We exclude strata with missing values for applicant delay for at least one patent.

Effect of standardization on CON filings: empirical strategy

Empirical strategy (1/2)

- Experiment: sample of patent applications; randomly assign standard-essentiality; compare CON filings between standard-essential and controls.
- Endogeneity threat in observational study: more valuable patent applications are more likely to be standard-essential and more likely to have children applications (upward bias).
- Our solution: matching & timing of standardization.
 - ▶ match on art-unit-examiner-filing-month & trend in CON filings before standardization (we use both issued and abandoned applications).
 - ▶ Application fixed-effects.
- Sample: SEPs filed after AIPA, before standard publication and before year 2015; matched controls; observed until June 2015; monthly observations.

Empirical strategy (2/2)

- Differences-in-differences based on:

$$E[CONs_{it}|X_{it}] = \exp(Standard_{it}\alpha + X_{it}\beta + \delta_i + \lambda_t)$$

- i : applications; t : month;
- $CONs_{it}$: CONs filed;
- $Standard_{it}$: equal to 1 starting in month of standard publication;
- X_{it} : control variables (SEP; application age in months);
- δ_i : application fixed-effects;
- λ_t : calendar month effects;
- Poisson models (similar results for OLS);
- Standard errors clustered by application.

Effect of standardization on CON filings: results

Sample balance

	(1)	(2)	(3)	(4)
	Matched Controls	Matched SEPs	T-stat	Norm. Diff.
Children: CONs	0.16	0.41	18.51	0.32
Children: CONs-SEPs	0.00	0.26	28.49	0.49
CON	0.09	0.12	5.17	0.09
CIP	0.03	0.03	1.68	-0.03
DIV	0.03	0.03	0.50	-0.01
Provisional	0.23	0.38	19.38	0.33
PCT	0.21	0.28	10.08	0.17
Foreign priority	0.35	0.42	8.28	0.14
Inventors	2.65	3.30	19.91	0.34
First inventor U.S.	0.40	0.30	11.72	-0.20
Small entity [†]	0.11	0.03	17.88	-0.31
Ind claims [†]	3.60	4.50	16.35	0.30
Obs.	6,834	6,834		

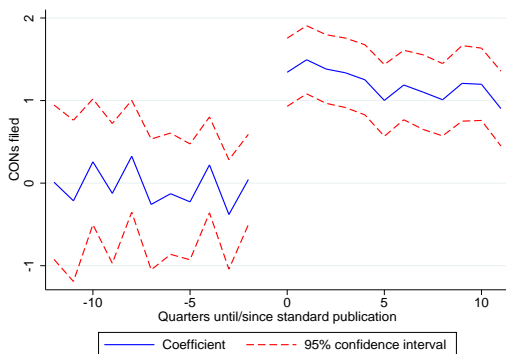
[†] Excluding SEP-control-pairs with missing values.

Effect of standard publication on CON filings

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Matched SEPs and controls				SEPs	
Outcome	CONs		CONs-SEPs		CONs	CONs-SEPs, same standard
Model	C-S	FEs	C-S	FEs	FEs	FEs
1[Standard]	1.44*** (0.09)	1.26*** (0.09)	1.41*** (0.11)	1.53*** (0.13)	0.27*** (0.07)	0.36*** (0.09)
1[SEP]	-0.27*** (0.09)		6.34*** (1.00)			
Month effects	✓	✓	✓	✓	✓	✓
Month-since-filing effects	✓		✓			
Application FEs		✓		✓	✓	✓
Age ² , age ³ & age ⁴		✓		✓	✓	✓
Observations	1,079,470	196,265	1,025,822	94,547	229,115	167,163
Applications	13,668	2,463	13,668	1,161	2,660	1,766

Unit of observation is an application-month. All models estimated with Poisson regressions. Columns "C-S": pooled cross-sectional regressions. Columns "FEs": conditional fixed-effects regressions with application-level fixed effects. Standard errors clustered by application in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Effect on standard publication on CON filings



Coefficients of quarter-until/since-standard-publication indicators from conditional fixed-effects Poisson regression. Unit of observation: application-month. Outcome: CONs of focal application filed in a given month. Other covariates: application-fixed-effects, calendar-month indicators, non-linear terms of a fourth-degree polynomial of months-since-filings. Standard errors clustered at application-level.

Heterogeneous effects by business model

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Matched SEPs and controls				SEPs	
Outcome	CONs		CONs-SEPs		CONs	CONs-SEPs, same standard
Model	C-S	FEs	C-S	FEs	FEs	FEs
1[Standard]*1[Upstream]	1.01*** (0.15)	1.06*** (0.16)	0.96*** (0.17)	1.48*** (0.19)	0.02 (0.11)	0.01 (0.14)
1[Standard]*1[Downstream]	1.60*** (0.11)	1.35*** (0.11)	1.60*** (0.12)	1.59*** (0.15)	0.34*** (0.08)	0.50*** (0.11)
1[SEP]*1[Downstream]	-0.36*** (0.11)		6.25*** (1.00)			
Month effects	✓	✓	✓	✓	✓	✓
Month-since-filing effects	✓		✓			
Application FEs		✓		✓	✓	✓
Age ² , age ³ & age ⁴		✓		✓	✓	✓
Observations	1,079,470	196,265	1,025,822	94,547	229,115	167,163
Applications	13,668	2,463	13,668	1,161	2,660	1,766

Unit of observation is an application-month. All models estimated with Poisson regressions. Columns "C-S": pooled cross-sectional regressions. Columns "FEs": conditional fixed-effects regressions with application-level fixed effects. Models also include an indicator for SEPs with unknown business model and its interaction with the standard-publication dummy. Standard errors clustered by application in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Implications of delays

SEP filing timing and post-grant outcomes: OLS models.

	(1)	(2)	(3)	(4)	(5)	(6)
Outcome	1[Lit 4 yrs]*100		log(1+cites 4 yrs)		log(1+originality)	
Sample	SEPs issued before 2012		SEPs issued before 2013		SEPs issued	
Model	Baseline	App chars	Baseline	App chars	Baseline	App chars
Filing lag	0.19*** (0.04)	0.21*** (0.06)	-0.07*** (0.00)	-0.00 (0.00)	-0.06*** (0.00)	-0.02*** (0.00)
Control vars		✓		✓		✓
Observations	6,450	4,243	7,977	5,738	11,427	9,221
R-squared	0.01	0.18	0.09	0.28	0.06	0.35

Unit of observation is a SEP. All models estimated with OLS. "Filing lag" is the difference in years between the month of SEP filing and the month of the publication of the first standard related to the focal SEP. Models (2), (4) and (6) include the natural logarithms of the number of independent claims on the published application and the number of inventors, indicator variables for CONs, CIPs, DIVs, small entity status of the applicant, patents whose first inventor has a U.S. address, patents claiming priority to provisional applications, PCT applications, and foreign applications, and sets of indicators for filing year, art unit and patent owner. The mean outcome for the samples in columns (1) and (2) are 1.88 and 1.58 respectively. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Conclusion

- SEPs have longer prosecution than similar patents.
- Standardization has positive effect on CON filings.
- Early disclosure of IP may be ineffective if claims change/are added over time: limit continuations?
- Limitations: declared SEPs; standard publication may be imperfect measure; do not measure fit between patents and standards.

Thank You!
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