Antitrust and (Foreign) Innovation: Evidence from the Xerox Case

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Research question: How does antitrust enforcement against patent-based monopolies affect innovation by domestic and foreign firms?

Motivation

Increasing Interest in the Effect of Antitrust on Innovation:

- In the US: concerns that antitrust may undermine American dominance of the high-technology sector
- Little empirical evidence about which antitrust measures are effective under which circumstances
- This paper: focus on abuse of intellectual property (IP) as one important source of market power

The Antitrust Case Against Xerox in the 1970s:

- Xerox Corporation was the monopolist in the copier market throughout the 1960s
- FTC complaint alleged monopolization by strategic abuse of the patent system
- Case was settled by consent decree in 1975 and Xerox had to license all its copier-related patents

⇒ **How did compulsory licensing affect subsequent innovation in the copier industry?**

Contributions:

- Effects of antitrust on innovation (Baker, 2007; Federico et al., 2020; Segal & Whinston, 2007; Watzinger et al., 2020, Poege, 2022)
  ⇒ **Empirical analysis of one of the most important US antitrust cases in the 20th century**
  ⇒ **Impact on domestic vs. foreign innovation**
- Compulsory licensing and IP rights (Acemoglu & Akcigit, 2012; Galasso & Schankerman, 2015; Moser & Voena, 2012; Watzinger et al. 2020)
  ⇒ **Effectiveness of compulsory licensing when monopoly is based on IP**
- Case against Xerox (Bresnahan, 1985; Scherer, 2005; Tom, 2001)
  ⇒ **First empirical evidence of impact on innovation**

Historical Background

The Origins of Xerox:

- 1938: dry photocopying technique (= xerography) invented
- 1946: Xerox started to commercialise novel technology
- 1959: breakthrough with release of the Xerox 914

Xerox's Patent-Based Monopoly in the 1960s:

- Xerox became the only seller of "plain-paper copiers" (PPCs)
- Required no special paper and made copying cheaper
- Technology was patent-protected but Xerox refused to license
- 1970: first entry into PPC market (by IBM)

FTC Complaint and 1975 Consent Decree:

- 1972: FTC alleged illegal monopolization of the PPC market
- Strategic (ab)use of the patent system viewed as main barrier to entry
- 1975: consent decree obliged Xerox to license all its domestic and foreign copier-technology patents

Figure 1. Xerox Logo and 914 Office Copier

Effect on Cumulative Innovation

Empirical Approach:

- Patent applications as measure of innovation
- Compare patenting across similar technology classes with differential exposure to compulsory licensing
- Panel of 2,210 six-digit CPC subclasses within 141 four-digit CPC classes

Difference-in-Differences Model:

$$\text{Patents}_{c,s,t} = \beta \cdot \text{Share}_s \cdot \text{Post}_t + \alpha_s + \lambda_{c,t} + \epsilon_{c,s,t}$$

- $\text{Patents}_{c,s,t}$ — number of patent applications (at USPTO) in subclass s of class c in year t
- Share_s — share of unexpired patents (as of 1975) in subclass that were compulsorily licensed
- Post_t — indicator for years after 1975

Figure 2. Comparison of Averages

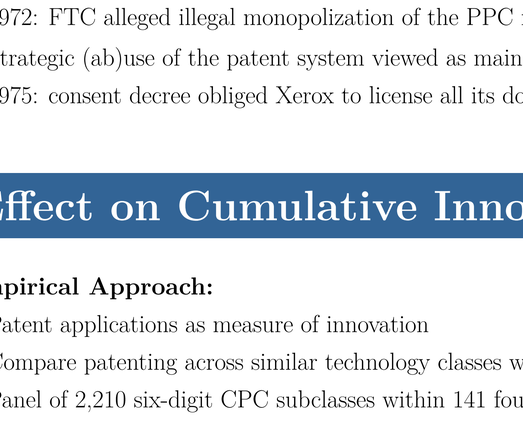
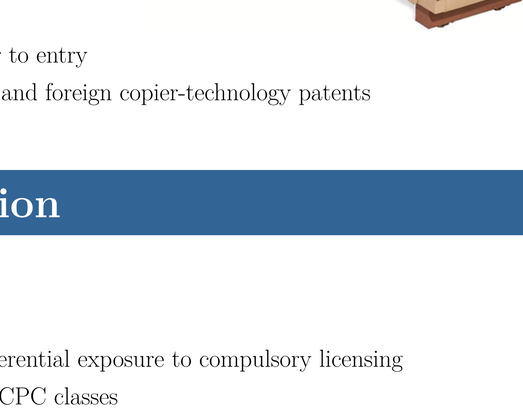


Figure 3. Event-Study Estimates



Result: **Increase in patenting in technologies where Xerox patents became available for licensing**

Robustness Checks:

- Increase in innovation is driven by patents that (indirectly) cited Xerox
- Complementary approach: increase in citations to licensed Xerox patents relative to matched control patents
- Additional checks: results are robust to alternative model specifications (e.g., Poisson), treatment definitions, etc.

Which Firms Benefited?

Table 1. Heterogeneity by Applicant Country

	Baseline	Applicant Country			
		USA	Non-USA	Among Non-USA	
				Japan	Others
	(1)	(2)	(3)	(4)	(5)
$\text{Share}_s \cdot \text{Post}_t$	0.189**	0.029	0.162**	0.143**	0.020
	(0.094)	(0.038)	(0.073)	(0.064)	(0.013)
Mean of Outcome	15.13	8.93	5.74	2.25	3.49
4-Digit CPC Classes	141	141	141	141	141
Observations	35360	35360	35360	35360	35360

Notes: All regressions include subclass and year × class fixed effects. Standard errors clustered at the four-digit CPC technology class level are in parentheses. Significance levels: $^*p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Result: **Positive innovation effect is driven by increased patenting by Japanese applicants**

Closeness to Xerox:

- Firm-level measure: $\text{Closeness}_i = \Sigma_s \, \text{w}_{is} \cdot \text{Share}_s$
- w_{is} — share of firm i's unexpired patents (as of 1975) that are in subclass s

Figure 4. Closeness to Xerox

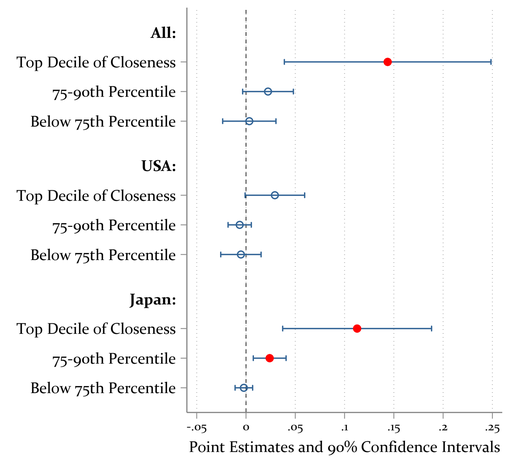
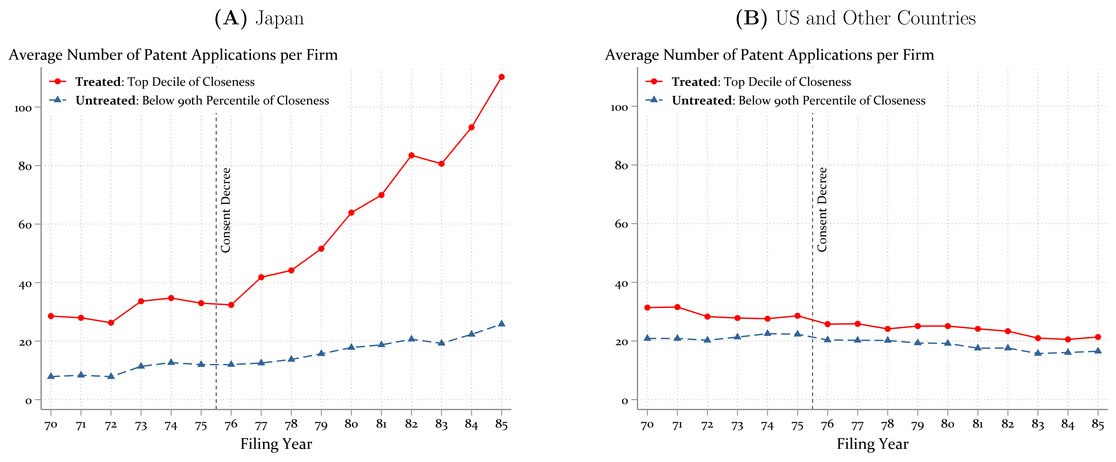


Figure 5. Patenting Trends Across Firms



Result: **Only Japanese firms with prior experience in copier technologies benefited**

Japanese Focus on Smaller Desktop Copiers:

- Several Japanese copier producers (e.g., Canon, Konica, Ricoh) successfully entered the American market
- Japanese competitors started producing small, low-volume desktop copiers
- In contrast: important American entrants (e.g., IBM, Kodak) competed with Xerox in high-volume segment

Evidence in Line With This Narrative:

- Japanese patents more frequently contained words in title/abstract related to smaller copiers
- Diversity of (Japanese) innovation increased after 1975, but no reduction in quality
- Results are consistent with Japanese competitors producing a more differentiated product from existing copiers

Effect on Xerox

- Synthetic control method to estimate how much Xerox would have patented in absence of antitrust case
- Only small reduction in Xerox's patenting after 1975

Conclusion

- Antitrust case against Xerox promoted innovation in the copier industry
  ⇒ **Compulsory licensing was effective in target sector as it removed the main entry barrier**
- Positive innovation effect primarily driven by Japanese competitors
  ⇒ **Antitrust allowed Japanese competitors to build on Xerox's technology**
  ⇒ **Consumers benefited from lower prices, greater variety, higher quality**

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