Do Patent Pools Encourage Innovation? Evidence from Eight Industries in the 1930s

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Theory predicts patent pools encourage innovation

- Reduce litigation risks for members
  - Alleviate patent blocking and litigation (Gilbert 2002; Shapiro 2001)
  - Joint defense agreement (Gilbert 2002; Choi 2004)
- Reduce license fees
  - Eliminate double-marginalization if patents complementary
- Reduce transaction costs
  - For example, Radio Frequency (RFID) pool, licensees negotiate with 1 firm instead of 8 firms
- Recent pools
  - Regulatory approval: MPEG-2 video compression, 1997; 2 DVD pools, 1998; 3G wireless, 2002; RFID, 2008
  - Other: UNITAID, GSK, VP8 video codec

In the sewing machine industry, a pool (1856-1877) slowed and diverted innovation

- Fewer patents and slower productivity increases (Lampe and Moser 2010)
  - Patents per year decline after the pool forms and increase after it dissolves; in absolute terms and relative to other industries
  - No pool in Britain; patents continue to increase
  - Improvements in sewing speed flatten after the pool forms, increase after it dissolves
- Diverted innovation (Lampe and Moser 2011)
  - Threat of litigation diverted innovation towards technologically distant substitutes for the pool technology
  - New firms enter with inferior technology after the pool forms

What has changed between 1856 and now?

- Sherman Act (1890)
- E. Bement & Sons v. National Harrow Co. (1902)
  - Six companies combined patents on harrows used to spread crop residue
  - Supreme Court upheld the pool: “execution of these contracts did in fact settle a large amount of litigation”
- Standard Sanitary Manufacturing v. U.S. (1912)
  - Combined three key patents on enameling process for sanitary ironware such as bath tubs and wash bowls
  - Supreme Court upheld the breakup of the pool because it fixed royalties and prevented sale of unapproved products

1917-45: Period of relative regulatory tolerance

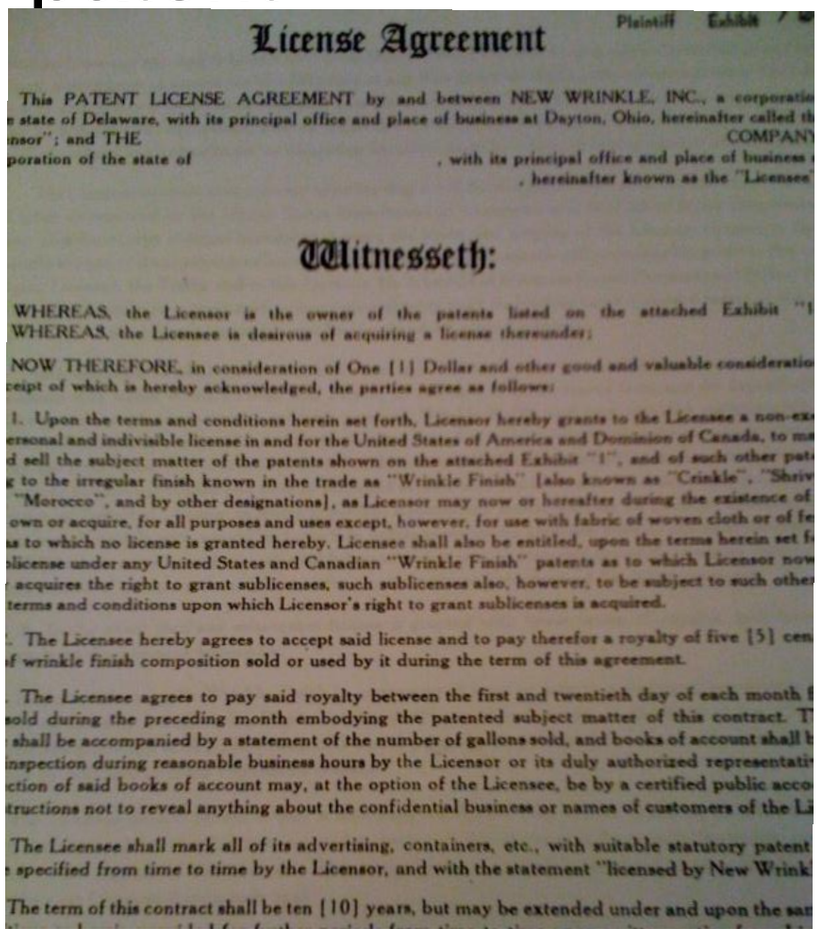
- Aircraft Pool (1917)
  - Government encouraged Wright brothers and Curtis to pool blocking patents that hindered production of airplanes
- Standard Oil v. United States (1931)
  - Supreme Court upholds a pool combining patents for gasoline cracking that does not restrict the freedom of the licensees
  - District court contended that the royalties were onerous
- Hartford Empire v. United States (1945)
  - Supreme Court breaks up a glassware pool that imposed production quotas and product qualities on licensees
  - Marks a period of regulatory intolerance towards pools

Do Pools Encourage Innovation?

- 8 pools between Great Depression WW II
  - Rail joint bars (1931-44), hydraulic oil pumps (1933-52), machine tools (1933-55), Philips screws (1933-49), variable condensers (1934-53), wrinkle finishes (1937-55), dropout cutouts (1938-48), slip covers (1938-49)
  - Six pools licensed to non-member firms
- Compare changes in patenting across USPTO subclasses with and without pool patents
- Across industries, patenting declined by 14 percent after the creation of a pool
- Within industries, patenting declines in 3 industries and increases in 1 industry
  - Decreases in rail joint bars, variable condensers, wrinkle finishes
  - Increases in Phillips screws are due to pre-trends

148 Pool Patents

- Court records and license agreements at the National Archives (Chicago, New York)
- 213 subclasses that include at least one pool patent



License Agreement

This PATENT LICENSE AGREEMENT by and between NEW WRINKLE, INC., a corporati
e state of Delaware, with its principal office and place of business at Dayton, Ohio, hereinafter called th
nsor"; and THE COMPAN
poration of the state of , with its principal office and place of business
, hereinafter known as the "Licensee

Witnesseth:

WHEREAS, the Licensor is the owner of the patents listed on the attached Exhibit "
WHEREAS, the Licensee is desirous of acquiring a license thereunder;

NOW THEREFORE, in consideration of One [1] Dollar and other good and valuable consideratio
ceipt of which is hereby acknowledged, the parties agree as follows:

1. Upon the terms and conditions herein set forth, Licensor hereby grants to the Licensee a non-ex
ersonal and indivisible license in and for the United States of America and Dominion of Canada, to m
d sell the subject matter of the patents shown on the attached Exhibit "1", and of such other pat
g to the irregular finish known in the trade as "Wrinkle Finish" [also known as "Crinkle", "Shriv
"Morocco", and by other designations], as Licensor may now or hereafter during the existence of
own or acquire, for all purposes and uses except, however, for use with fabric of woven cloth or of fe
s to which no license is granted hereby. Licensee shall also be entitled, upon the terms herein set f
license under any United States and Canadian "Wrinkle Finish" patents as to which Licensor no
acquires the right to grant sublicenses, such sublicenses also, however, to be subject to such othe
terms and conditions upon which Licensor's right to grant sublicenses is acquired.

2. The Licensee hereby agrees to accept said license and to pay therefor a royalty of five [5] cen
f wrinkle finish composition sold or used by it during the term of this agreement.

3. The Licensee agrees to pay said royalty between the first and twentieth day of each month f
sold during the preceding month embodying the patented subject matter of this contract. T
shall be accompanied by a statement of the number of gallons sold, and books of account shall b
inspection during reasonable business hours by the Licensor or its duly authorized representati
ction of said books of account may, at the option of the Licensee, be by a certified public acco
tructions not to reveal anything about the confidential business or names of customers of the Li

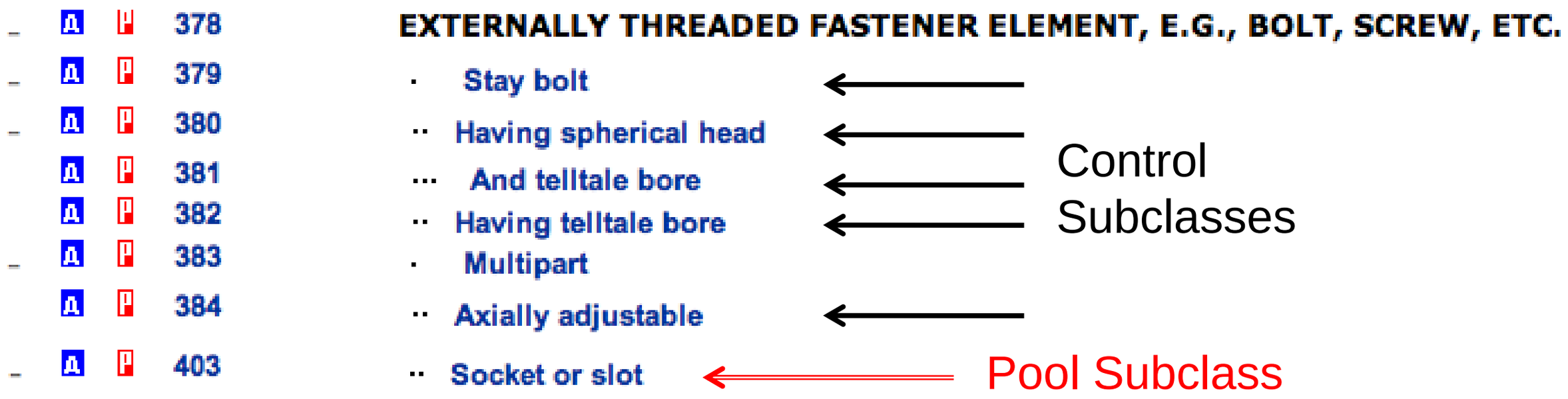
4. The Licensee shall mark all of its advertising, containers, etc., with suitable statutory patent
specified from time to time by the Licensor, and with the statement "licensed by New Wrink

5. The term of this contract shall be ten [10] years, but may be extended under and upon the sa

In 1937 Kay & Ess Company and Chadeloid Chemical Company combine their patents on enamel, paints, and varnishes that produce a hard wrinkled surface

Control Group is Subclasses from Same Mainline Subclass

- Example: Phillips screw driver pool patent 1,908,080
  - Assigned to subclass 403 in main class 411
  - Control group include patents per year in other subclasses (without a pool patent) in main classes 411 under the same mainline subclass 378 “Externally Threaded Fastener Element”



Sample of Patent Pools

Years	Pool	Initial Firms	Initial Patents	Licensees	Resolved Litigation
1931-44	Rail Joint Bars	2	31	9	No
1933-52	Hydraulic Oil Pumps	2	28	0	No
1933-55	Machine Tools	5	3	0	No
1933-49	Phillips Screws	2	2	28	No
1934-52	Variable Condensers	3	59	3	Yes
1937-55	Wrinkle Finishes	2	20	>200	Yes
1938-48	Dropout Cutouts	2	3	10	No
1938-49	Slip Covers	2	2	2	Yes

USPTO Patents to Measure Changes in Invention

- Compare patents in pool subclasses and other subclasses 10 years before and 10 years after the pool was formed

$$Patents_{ct} = \alpha + \beta_1 Pool_t * Pool\ Patents_c + f_c + \varepsilon_{ct}$$

  - Control for differences in patenting intensity across subclasses (e.g. Lerner 1995; Moser 2010) with subclass fixed effects
  - Separate pools that resolved litigation
  - Future robustness checks: citation data, remove pool patents, remove secondary subclasses

Patenting declines by 8% after pool creation

$$Patents_{ct} = \alpha + \beta_1 Pool_t * Pool\ Patents_c + f_c + \varepsilon_{ct}$$

	All Pools	Resolved Litigation	Did Not Resolve Litigation
Pool * Pool Patents	-0.08** (0.03)	-0.15** (0.03)	-0.03** (0.01)
Pool	0.02* (0.01)	0.04** (0.01)	0.01 (0.01)
Pools	8	3	5
Pool Subclasses	213	99	114
Observations	21,544	10,262	11,268

Poisson regressions with subclass fixed effects. ** significant at 1 percent, * significant at 5 percent

Larger effects for pools that resolved litigation

$$Patents_{ct} = \alpha + \beta_1 Pool_t * Pool\ Patents_c + f_c + \varepsilon_{ct}$$

	All Pools	Resolved Litigation	Did Not Resolve Litigation
Pool * Pool Patents	-0.08**	-0.15**	-0.03**
	(0.03)	(0.03)	(0.01)
Pool	0.02*	0.04**	0.01
	(0.01)	(0.01)	(0.01)
Pools	8	3	5
Pool Subclasses	213	99	114
Observations	21,544	10,262	11,268

Poisson regressions with subclass fixed effects. ** significant at 1 percent, * significant at 5 percent

Controlling for number of licensees has no effect

$$Patents_{ct} = \alpha + \beta_1 Pool_t * Pool\ Patents_c + \beta_2 Pool_t * Pool\ Patents_c * Licensees_c + f_c + \varepsilon_{ct}$$

	All Pools
Pool * Pool Patents	-0.07* (0.03)
Pool * Pool Patents * Licensees	-0.03[-2] (0.00)
Pool	-0.04** (0.01)
Pools	8
Pool Subclasses	213
Observations	21,544

Poisson regressions with subclass fixed effects. ** significant at 1 percent, * significant at 5 percent

Increased patenting in 2 industries

$$Patents_{ct} = \alpha + \beta_1 Pool_t * Pool\ Patents_c + f_c + \varepsilon_{ct}$$

	Pool*Pool Patents	Pool	Observations
Rail Joint Bars	-0.05** (0.00)	0.19** (0.02)	2,284
Hydraulic Oil Pumps	-0.03 (0.03)	0.01 (0.01)	6,368
Machine Tools	0.21 (0.19)	0.04 (0.04)	918
Phillips Screws	1.30** (0.24)	-0.63** (0.06)	720
Variable Condensers	-0.15** (0.03)	-0.15** (0.02)	4.136
Wrinkle Finishes	-0.14** (0.03)	0.23** (0.02)	6,092
Dropout Cutouts	-0.12 (0.20)	-0.05 (0.03)	972
Slip Covers	0.49* (0.24)	-0.66** (0.24)	34

Poisson regressions with subclass fixed effects. ** significant at 1 percent, * significant at 5 percent

Decreased patenting in 3 industries

$$Patents_{ct} = \alpha + \beta_1 Pool_t * Pool\ Patents_c + f_c + \varepsilon_{ct}$$

	Pool*Pool Patents	Pool	Observations
Rail Joint Bars	-0.05** (0.00)	0.19** (0.02)	2,284
Hydraulic Oil Pumps	-0.03 (0.03)	0.01 (0.01)	6,368
Machine Tools	0.21 (0.19)	0.04 (0.04)	918
Phillips Screws	1.30** (0.24)	-0.63** (0.06)	720
Variable Condensers	-0.15** (0.03)	-0.15** (0.02)	4.136
Wrinkle Finishes	-0.14** (0.03)	0.23** (0.02)	6,092
Dropout Cutouts	-0.12 (0.20)	-0.05 (0.03)	972
Slip Covers	0.49* (0.24)	-0.66** (0.24)	34

Poisson regressions with subclass fixed effects. ** significant at 1 percent, * significant at 5 percent

Robust to Binary Pool Variable

$$Patents_{ct} = \alpha + \beta_1 Pool_t * Pool\ Subclass_c + f_c + \varepsilon_{ct}$$

	Pool*Pool Patents	Pool	Observations
Rail Joint Bars	-0.32** (0.14)	0.19** (0.02)	2,284
Hydraulic Oil Pumps	-0.05 (0.06)	0.01 (0.01)	6,368
Machine Tools	0.21 (0.19)	0.04 (0.04)	918
Phillips Screws	1.30** (0.24)	-0.63** (0.06)	720
Variable Condensers	-0.23** (0.11)	-0.16** (0.02)	4.136
Wrinkle Finishes	-0.35** (0.07)	0.23** (0.02)	6,092
Dropout Cutouts	-0.12 (0.20)	-0.05 (0.03)	972
Slip Covers	0.49* (0.24)	-0.66** (0.24)	34

Poisson regressions with subclass fixed effects. ** significant at 1 percent, * significant at 5 percent

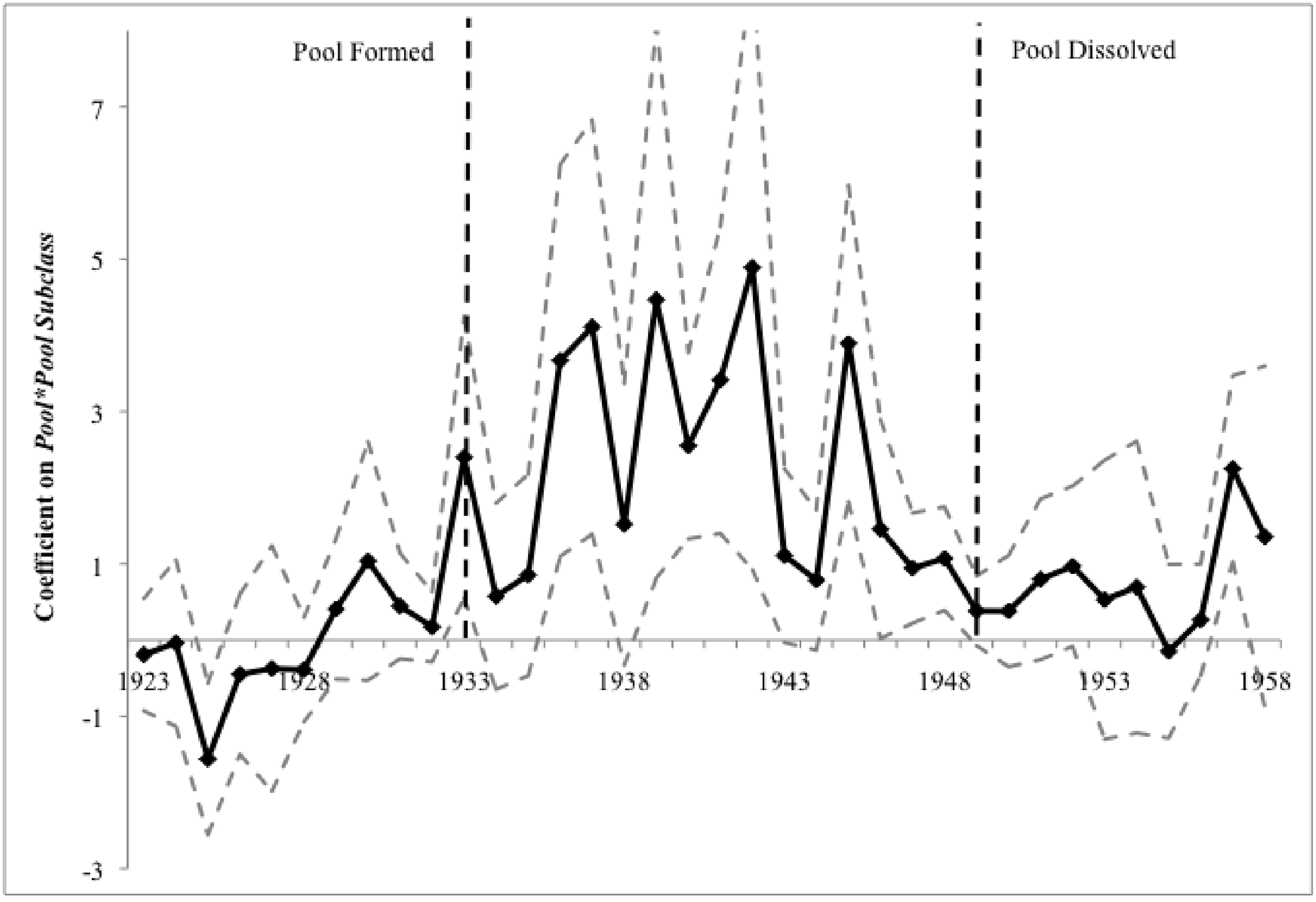
Slip covers not robust to time trends

$$Patents_{ct} = \alpha + \beta_1 Pool_t * Pool\ Patents_c + \beta_2 Post\ Pool_t * Pool\ Patents_c + t * Pool\ Subclass + t^2 * Pool\ Subclass + \delta_t + f_c + \varepsilon_{ct}$$

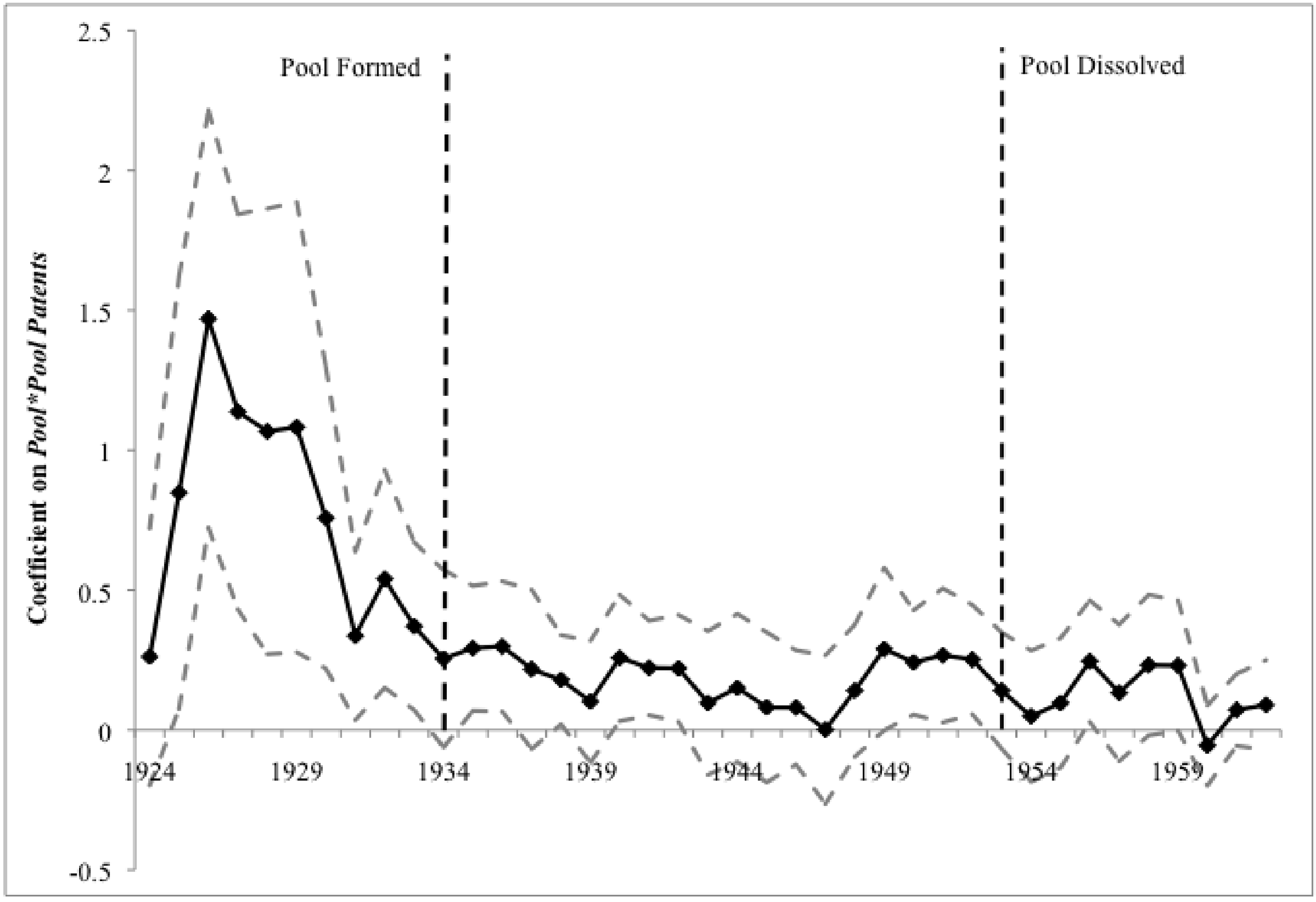
	Rail Joint Bars	Phillips Screws	Variable Condensers	Wrinkle Finishes	Slip Covers
Pool * Pool Patents	-0.05** (0.00)	0.61** (0.16)	-0.19** (0.03)	-0.09** (0.03)	-0.16 (0.43)
Post Pool * Pool Patents	-0.18** (0.02)	-0.08 (0.30)	-0.37** (0.06)	-0.14* (0.07)	-1.10 (0.58)
Pool Subclasses	20	5	52	45	2
Observations	40,256	13,912	86,160	138,450	544

Poisson regressions with subclass and annual fixed effects. ** significant at 1 percent, * significant at 5 percent

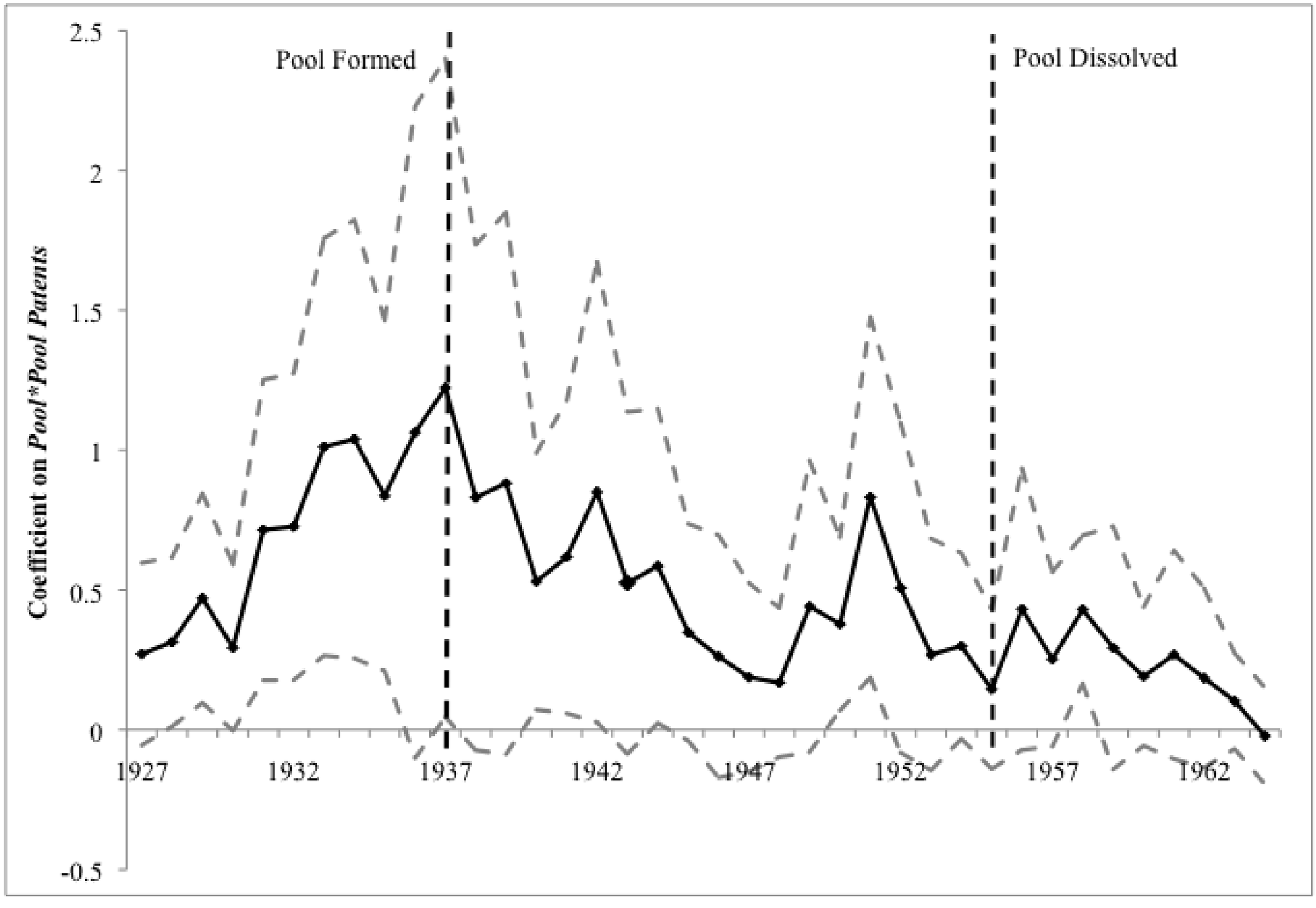
Phillips Screws (1933-49)



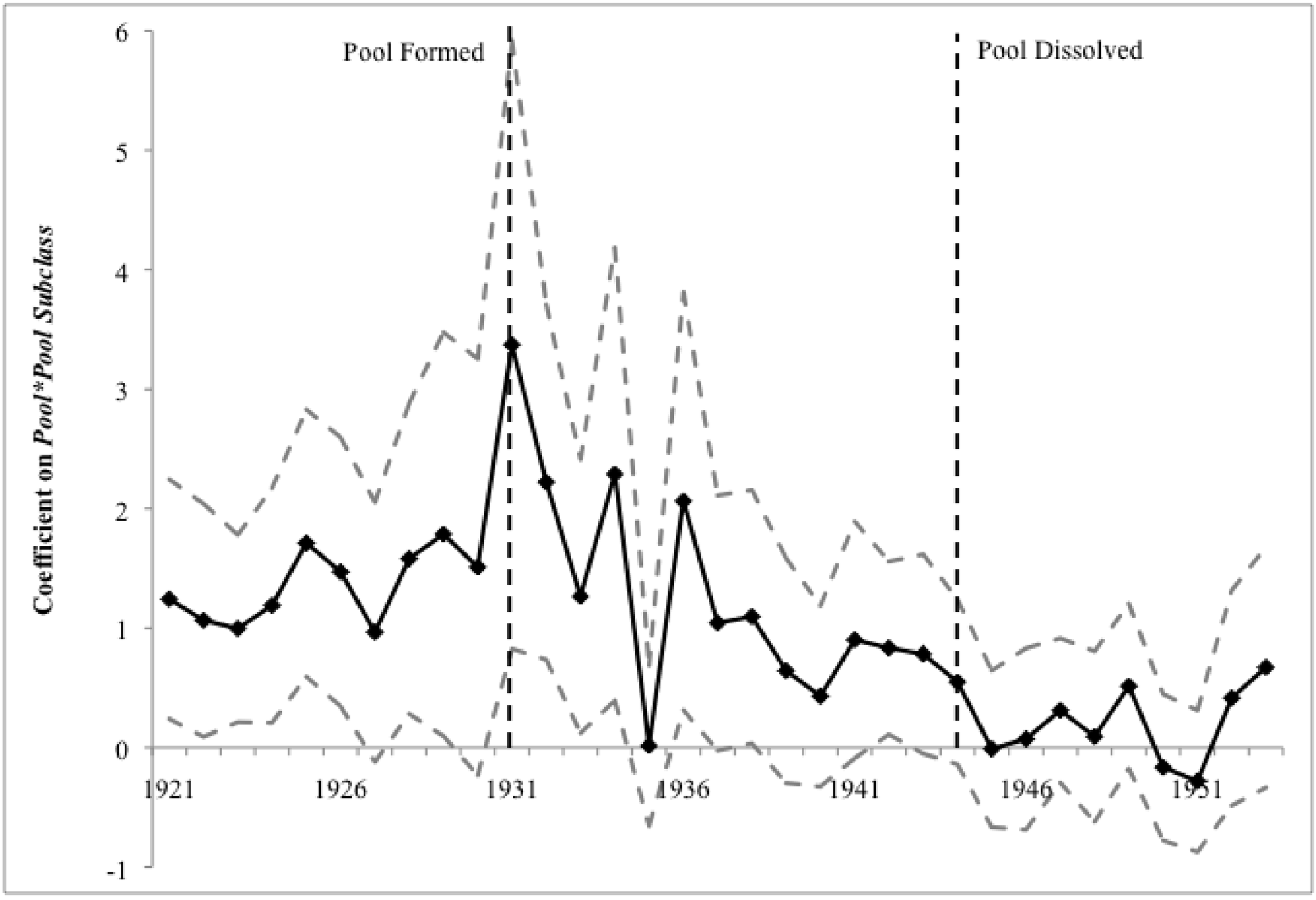
Variable Condensers (1934-53)



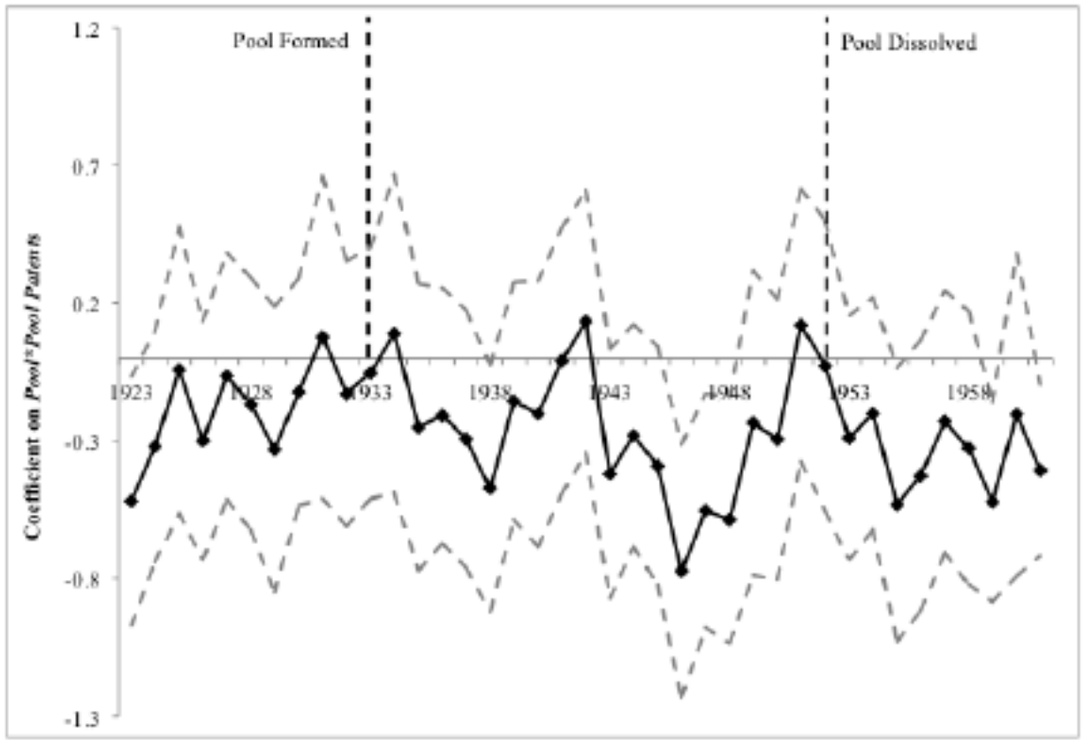
Wrinkle Finishes (1937-55)



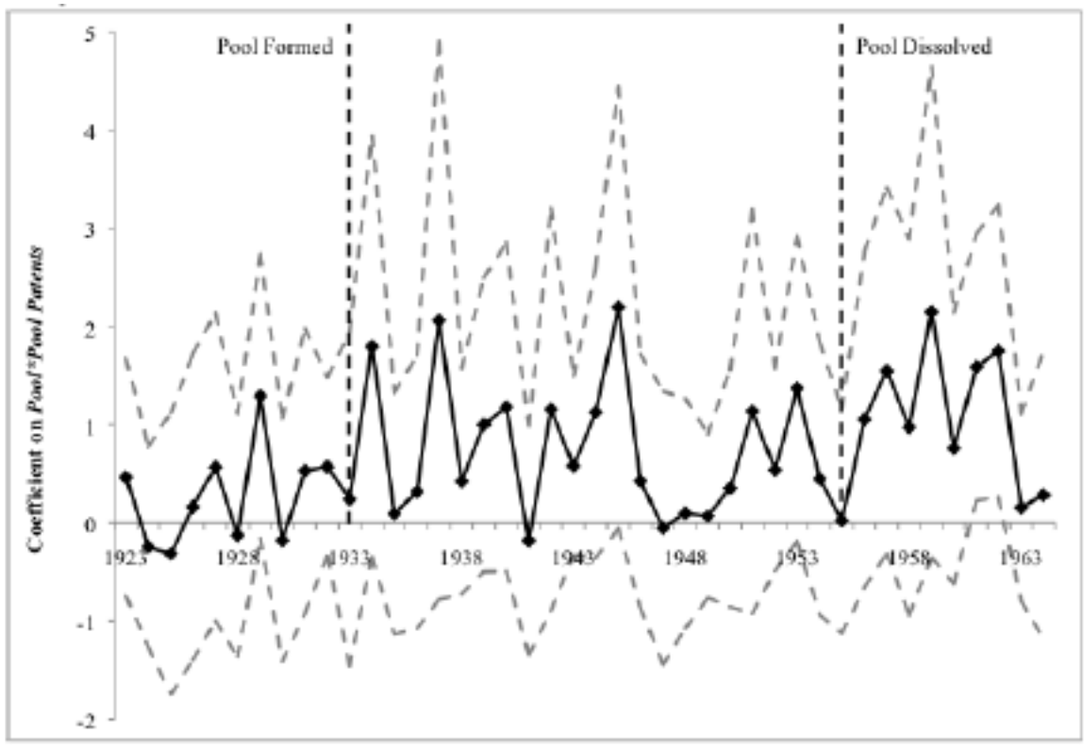
Rail Joint Bars (1931-44)



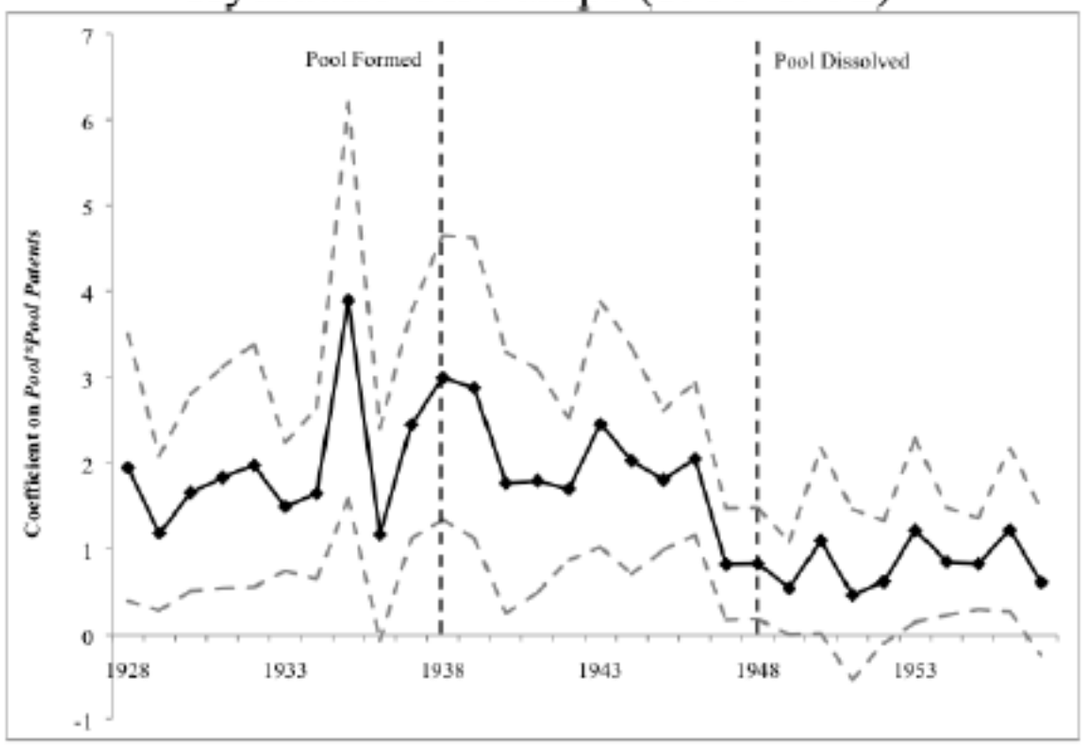
Oil Pumps, Machine Tools, Cutouts and Slip Covers



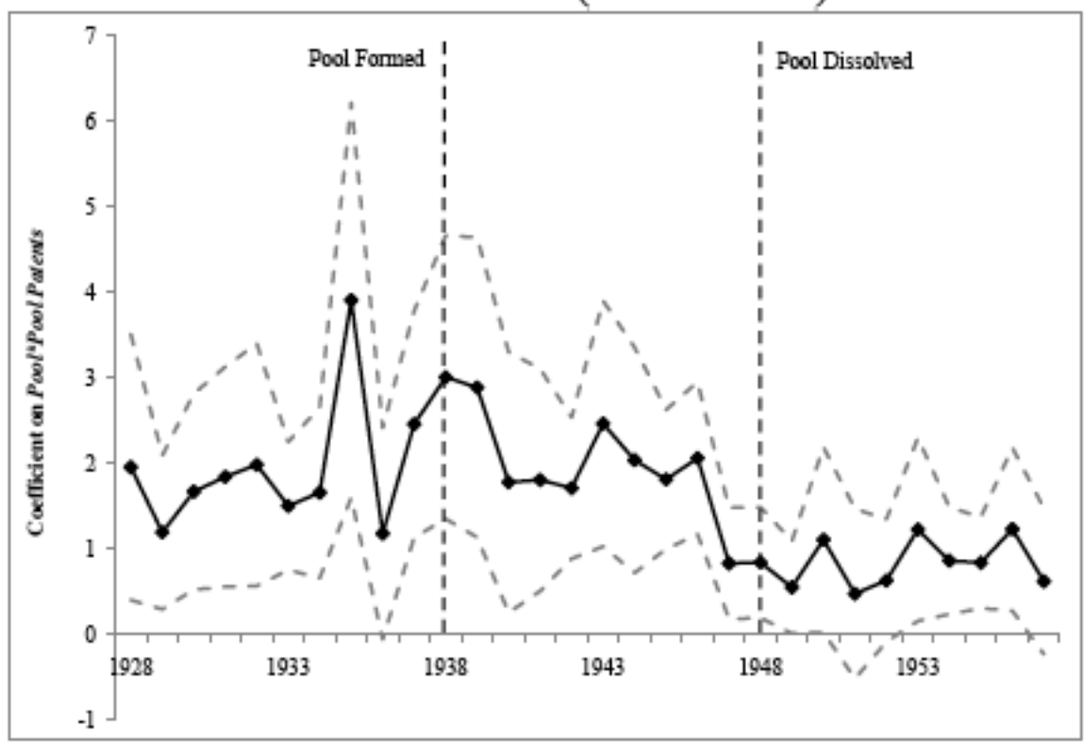
Hydraulic Oil Pumps (1933-1952)



Machine Tools (1933-1955)



Dropout Cutouts (1938-1948)



Slip Covers (1938-1949)

Antitrust Violations

Pool	Anticompetitive Practices
Rail Joint Bars	Fixed price of reformed rail joint bars
Hydraulic Oil Pumps	Acquired important pump patents and denied licenses to competitors
Machine Tools	Granted exclusive licenses to certain fields to pool members. Denied licenses to outside firms
Phillips Screws	Fixed price of Phillips screws and drivers. Prevented licensees from producing competing screws
Variable Condensers	Fixed prices for radio tuning devises. Refused to license. Jointly sued infringers.
Wrinkle Finishes	Fixed price of wrinkle finishes
Dropout Cutouts	Fixed price of dropout cutouts and threatened suits against manufacturers
Slip Covers	Fixed prices and jointly sued infringers

Preliminary results

- Fewer patents in pool technologies after the creation of a pool
  - Across all industries, patenting in pool technologies is 14 percent lower
  - Within industries, patenting is lower in 3 industries and higher in 1 industry
  - Pre-existing trends explain results in 2 industries
- Next steps: alternative control subclasses
  - All subclasses in a main class
  - Subclasses with similar trends in patenting prior to the formation of a pool