Prepared for: AFA Ph.D. Student Poster Session

Competition, Non-Patented Innovation, and Firm Value

Presented by: Scott B. Guernsey (*University of Cambridge*)

Job Market Paper

- **Primary research questions:**

- **How does competition affect corporate innovation?**

- **What are its ramifications for firm value?**

Motivation (1/3)

- Prior research **has** studied these questions
  - Commonly using empirical proxies of competition: HHI, market share, Lerner index
  - (e.g., Sundaram et al., 1996; Blundell et al., 1999; Aghion et al., 2005; Gu, 2016)

- But has found **mixed** results…
- More alarming, the results tend to be **proxy-dependent**
  - (see Cohen, 2010, for a review)

- For instance, Blundell et al. (*RES*, 1999) **find** that:
  - Market share (concentration) is positively (negatively) associated with corporate innovation, and that a
  - Positive correlation between innovation and value is stronger for firms with higher market shares

- In contrast, Gu (*JFE*, 2016) **sorts portfolios** on R&D and market concentration:
  - And finds that R&D-intensive firms in less concentrated industries earn higher expected returns

Motivation (2/3)

- Two key empirical obstacles render the **identification** challenging:

- (1) Causality could run in the **reverse direction**
  - Concentrated industries may be a natural consequence of past innovation by successful firms
    - **"Success breeding success"**

- (2) **Economic conditions** and other **exogenous factors** could also
  - Simultaneously codetermine competition, innovation, and firm value

Motivation (3/3)

- Adding to the **difficulty** of identification
  - Theory gives ambiguous predictions on competition's effect on innovation and value
    - (e.g., see Aghion et al., 2001, 2015; Gilbert, 2006; Cohen, 2010)

- **Schumpeterian growth theory** (e.g., Gilbert and Newberry, 1982; Aghion and Howitt, 1992; Caballero and Jaffe, 1993):
  - More competition reduces the flow of rents to innovators
    - Thereby **reducing** their **incentives** to innovate and grow

- **Arrow's "replacement effect"** (e.g., Arrow, 1962; Aghion and Howitt, 1992):
  - Dominant incumbent does not innovate since this partially displaces rents it already earns
  - Whereas in a competitive industry, firms have more potential to realize the full return from innovation

- **"Inverted-U"**:
  - Aghion et al. (2005) assume innovation occurs step-by-step
  - Such that industries are either "neck-in-neck" or "unleveled"
    - Competition **encourages** neck-in-neck firms to innovate to **"escape from competition"**
    - Competition **discourages** innovation by **laggard firms** in unleveled sectors
      - Since it reduces any short-run incremental profit from catching the leader

"Inverted-U" (Aghion et al., 2005)

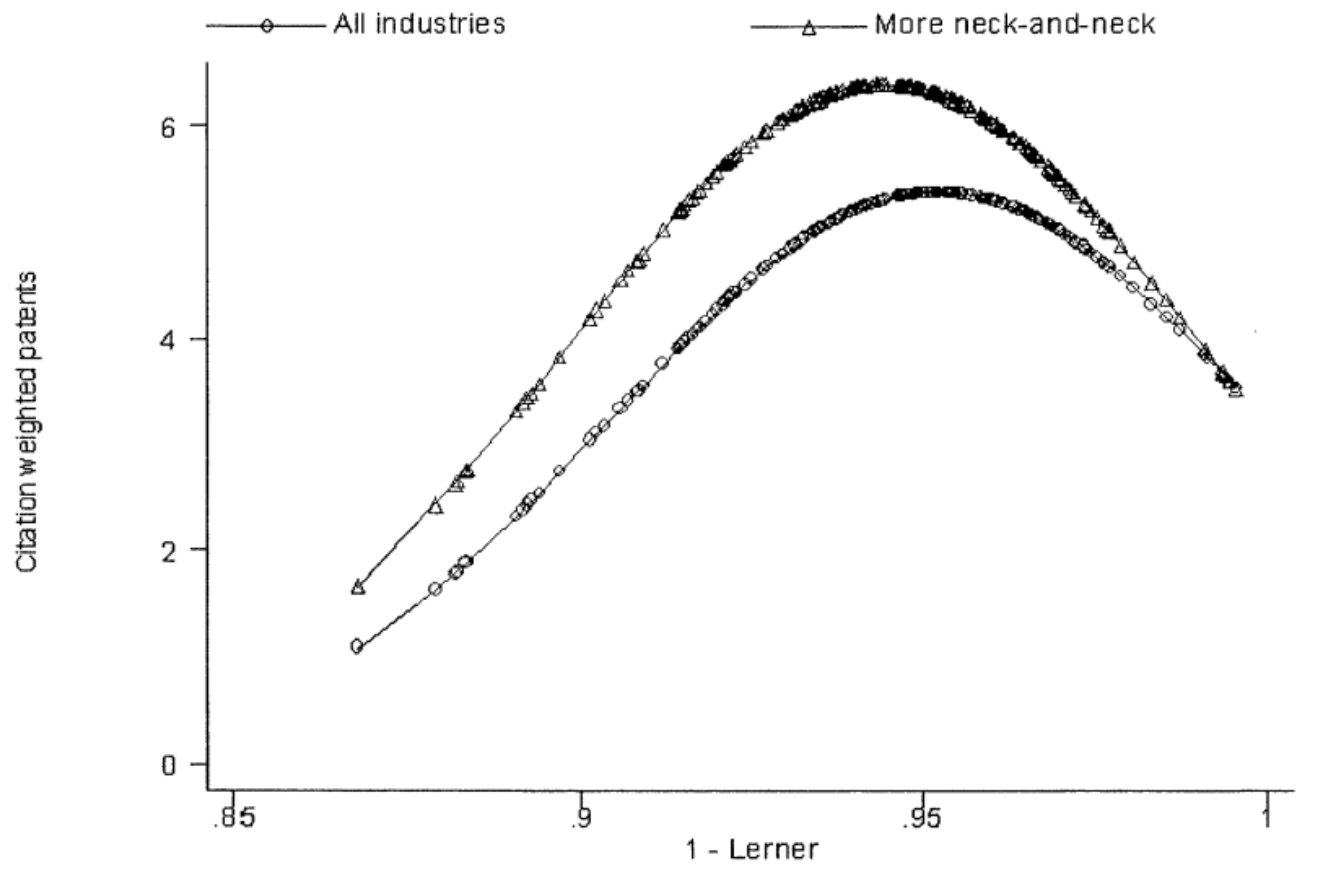


FIGURE III
Innovation and Competition: The Neck-and-Neck Split

- **Main contribution:**

- **I test these conflicting predictions by shifting the focus from**
  - Endogenous proxies of competition to a tandem of arguably exogenous events
    - That **directly influence** the intensity of product market competition

- **The events:**
  - State legislatures' passage of anti-plug molding laws – **that reduce competition**
  - U.S. Supreme Court decision to overturn the laws – **which reinstates competition**

- **Preview of the main findings:**

- **I find that firms experiencing a reduction in competition in their product markets:**
  - Show increasing investment spending: e.g., R&D, CAPEX, Intangible Capital, Advertising
  - And become more profitable (Gross Profit, Operating Margin) and valuable (Q and Stock Returns)

- **And after the laws are struck down**
  - The increases in investments spending, profitability, and value dissipate

- **Consistent with Schumpeterian growth theory**
  - More intense competition disincentivizes value-enhancing corporate innovation

Anti-plug molding laws (APMLs)

- APMLs were adopted in a **staggered fashion** by 12 states over the period 1978 to 1987

- And they decrease product market competition by **prohibiting** competitors from:
  - Using an "unscrupulous" form of reverse engineering (RE) to make an identical but competing product

- **Quick digression:**
- Forward engineering: Idea ⇒ Drawing ⇒ Model ⇒ Mold ⇒ Product
- Reverse engineering (RE): Product ⇒ Idea ⇒ Drawing ⇒ Model ⇒ Mold ⇒ Product

- The "unscrupulous" form of RE **prohibited by APMLs**:

- Direct molding process RE: Product ⇒ ~~Idea ⇒ Drawing ⇒ Model~~ ⇒ Mold ⇒ Product
  - Provides rivals with a competitive **cost advantage**
    - Allows them to manufacture duplicate items
    - And at a small fraction of the originator's total production costs

Jurisdictional scope

- The history of court cases related to APMLs suggests the **relevant jurisdiction** is:
  - The state where the plaintiff maintains its principal place of business
    - (e.g., Althauser, 1989; Carstens, 1990; Heald, 1990)
  - Which is typically interpreted as the plaintiff's state of headquarters
    - (e.g., Ribstein and Kobayashi, 1996; Almeling et al., 2010)

- For example, the **most important** court decision pertaining to APMLs
  - Was a dispute between two boat manufacturers that were headquartered in different states
    - The plaintiff was headquartered in **Florida** and the defendant in **Tennessee**
    - The case went through Florida's lower courts before finally making it all the way to its **Supreme Court**
      - And eventually to the U.S. Supreme Court – **More on this court case soon!**

- ∴ APMLs **decrease** competition for firms headquartered in the enacting state
  - Both from competitors within and outside of the adopting state

Table 1

Panel A: The month and year of APML adoption

State	Statute	Month/Year Adopted	Covered Products
California	*CAL. BUS. & PROF. CODE § 17300*	10/1978	All items
Florida	*FLA. STAT. § 559.94*	05/1983	Boat hulls
Indiana	*IND. CODE §§ 24-4-8-1*	08/1987	Boat hulls
Kansas	*KAN. STAT. ANN. § 50-802*	07/1984	Boat hulls
Louisiana	*LA. REV. STAT. ANN. § 51: 462.1*	07/1985	Boat hulls
Maryland	*MD. COM. LAW CODE ANN. § 11-1001*	04/1986	Boat hulls
Michigan	*MICH. COMP. LAWS §§ 445.621*	03/1983	All items
Mississippi	*MISS. CODE ANN. § 59-21-41*	03/1985	Boat hulls
Missouri	*MO. REV. STAT. § 306.900*	04/1986	Boat hulls
North Carolina	*N.C. GEN. STAT. §§ 75A-27*	07/1985	Boat hulls
Tennessee	*TENN. CODE ANN. § 47-50-111*	07/1983	All items
Wisconsin	*WIS. STAT. ANN. § 134.34*	06/1983	Boat hulls

- Three states adopt APMLs that protect **"All items" (all manufacturing items that are "moldable")**
  - 445 (3,530) protected firms (firm-years)
- The other nine are specific to **"Boat hulls" (and their component parts)**
  - 249 (2,169) manufacturers are headquartered in these states
  - But only 3 firms (and 24 firm-years) are boat-manufacturers
- I **focus** on the All-APMLs, and use the Boat-APMLs as a **placebo**

Table 2: Describing industries with “Moldable Products”

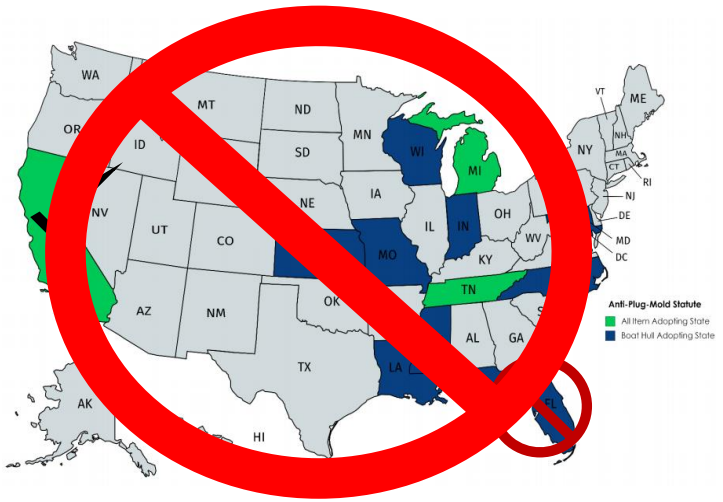
Two-digit SIC codes	Description	“Moldable Products” industry
20	Food and Kindred Products	No
21	Tobacco Products	No
22	Textile Mill Products	No
23	Apparel and other Finished Products Made from Fabrics and Similar Materials	No
24	**Lumber and Wood Products, except Furniture**	**Yes**
25	**Furniture and Fixtures**	**Yes**
26	Paper and Allied Products	No
27	Printing, Publishing, and Allied Industries	No
28	Chemicals and Allied Products	No
29	Petroleum Refining and Related Industries	No
30	**Rubber and Miscellaneous Plastics Products**	**Yes**
31	**Leather and Leather Products**	**Yes**
32	**Stone, Clay, Glass, and Concrete Products**	**Yes**
33	Primary Metal Industries	No
34	**Fabricated Metal Products, except Machinery and Transportation Equipment**	**Yes**
35	**Industrial and Commercial Machinery and Computer Equipment**	**Yes**
36	**Electronic and other Electrical Equipment and Components, except Computer Equipment**	**Yes**
37	**Transportation Equipment**	**Yes**
38	**Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks**	**Yes**
39	**Miscellaneous Manufacturing Industries**	**Yes**

Are APMLs constitutional?

Sample periods:
- 1975 to 1988
- 1975 to 1992

State APM Statutes

- 12 state adoptions
  - 1978 – 1987
    - 3 states **"All Item"**
    - 9 states **"Boat Hulls"**



State Court Cases

- Bonito v. Thunder Craft
  - 1987: **Invalidates FL's law**
- Interpart v. Imos Italia
  - 1985: **Validates CA's law**

U.S. Supreme Court

- Grants certiorari to Bonito
  - 1989: **Invalidates all laws**

[Link to supplemental slides]

Are APML adoptions plausibly exogenous?

Following a similar approach as in Acharya et al. (2014)

Sample period:	**1975 – 1988**		
Dependent variables:	$All\ APML_{[t]}$		$Boat\ APML_{[t]}$
$Ln(GDPPC)_{[t-1]}$	0.006 (0.014)	**Ruling out confounders**	-0.007 (0.076)
$Est.Entry_{[t-1]}$	0.002 (0.004)		0.003 (0.012)
$R\&D\ Credit_{[t-1]}$	-0.002 (0.004)		0.058 (0.062)
$SY\Delta\ Ln(1+Patent)_{[t-1]}$	-0.027 (0.047)	**Ruling out reverse causality**	0.008 (0.273)
$SY\Delta\ Tobin's\ Q_{[t-1]}$	0.004 (0.005)		0.001 (0.012)
Other predictors: GDP Growth, Democrat, Ln(Population), Unemployment, Est. Exit, Antitakeover laws, Trade Secrets laws, Wrongful Discharge laws, SY Ln(1+Patent), SY Tobin's Q			
Year FE	Yes		Yes
State FE	Yes		Yes
Observations	417		414
Adjusted R^2	0.067		0.098

Are APML adoptions relevant for competition?

Sample period:	1975 – 1988	
Dependent variables:	$State\text{-}Industry\ HHI_{[t]}$	$State\text{–}Industry\ Lerner_{[t]}$
$All\ APML_{[t]}$	0.068*** (0.019)	0.035* (0.018)
$Boat\ APML_{[t]}$	-0.004 (0.016)	0.021 (0.016)
$Ln(GDPPC)_{[t]}$	0.154* (0.079)	-0.069 (0.064)
$Democrat_{[t]}$	-0.063* (0.032)	-0.023 (0.034)
$IDD_{[t]}$	0.069** (0.033)	0.029* (0.014)
Other controls: GDP Growth, Antitakeover laws, UTSA, R&D Tax Credits, Wrongful Discharge laws		
Year FE	Yes	Yes
State FE	Yes	Yes
Observations	3,060	3,055
Adjusted R^2	0.336	0.147

Is the Supreme Court decision plausibly exogenous?

No anticipatory effect

Following the approach in Serfling (2016)

Classic four-factor model

Sample firms:	$All\ APML_{[t]}$		$Boat\ APML_{[t]}$	
CAR Window:	**EW Index**	**VW Index**	**EW Index**	**VW Index**
$[-21,-4]$	-1.29% (-1.38)	-0.88% (-0.75)	-0.03% (0.11)	0.34% (0.56)
$[-2,+2]$	-0.65%** (-2.05)	-0.57%* (-1.81)	-0.05% (-0.30)	-0.00% (-0.13)
$[-0,+0]$	-0.52%** (-2.35)	-0.49%** (-2.14)	0.37% (1.23)	0.39% (1.32)
$[-0,+2]$	-0.50%** (-2.04)	-0.48%* (-1.89)	-0.27% (-0.65)	-0.30% (-0.61)
Observations	346	346	192	192

A surprise to capital markets

No effect on non-boat manufacturers

The identification strategy

- The empirical approach – **staggered difference-in-differences (DD)**:

$$y_{ijs(t+n)} = \beta_1 All\ APML_{st} + \beta_2 Boat\ APML_{st} + \gamma_i + \lambda_{jt} + \alpha' \mathbf{X}_{ijst} + \varepsilon_{ijst}$$

  - where γ is for firm, and λ is for industry-by-year fixed effects
  - and $\mathbf{X}$ represents a vector of other law, state-level, and firm-level controls

- Compares outcomes of firms headquartered in APML states to firms headquartered elsewhere **and**:
  - Operating in the same industry

- Industry-by-year FEs help **control for** M&A activity and regional economic conditions
  - Merger waves strongly clustered by industry (e.g., Mitchell and Mulherin, 1996; Harford, 2005)
  - Industries tend to cluster by geography (e.g., Ellison and Glaeser, 1997, 1999; Ellison et al., 2010)

- Identification strategy is **further enriched** by the U.S. Supreme Court decision to overturn the APMLs **(DDD)**:

$$y_{ijs(t+n)} = \beta_1 All\ APML_{st} + \beta_2 Boat\ APML_{st} + \beta_3 Post88_t \times All\ APML_{st} + \beta_4 Post88_t \times Boat\ APML_{st} + \gamma_i + \lambda_{jt} + \alpha' \mathbf{X}_{ijst} + \varepsilon_{ijst}$$

Do APMLs provide a partial substitute to patents?

Sample period:	1975 – 1992		
Dependent variables:	$Ln(1+Patent)_{[t+2]}$	$Ln(1+CW\ Patent)_{[t+2]}$	$Ln(1+SM\ Patent)_{[t+2]}$
$All\ APML_{[t]}$	-0.009*** (0.003)	-0.045* (0.025)	-0.054*** (0.015)
$Post88_{[t]} \times All\ APML_{[t]}$	0.036*** (0.009)	0.108** (0.050)	0.084* (0.042)
$Boat\ APML_{[t]}$	0.005 (0.010)	0.016 (0.050)	-0.013 (0.031)
$Post88_{[t]} \times Boat\ APML_{[t]}$	0.011 (0.012)	0.070 (0.069)	0.031 (0.041)
Control Variables: Antitakeover laws, trade secrets laws, R&D credits, wrongful discharge laws; Ln(GDPPC), GDP Growth, Democrat; Ln(Assets), Ln(Age), Debt, OCF, HHI, SG, Loss, FLIQ, R&D/Sales, CAPX/Assets			
Firm FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Observations	17,600	17,600	17,600
Adjusted R^2	0.908	0.828	0.912

Do APMLs alter investment spending?

Sample period:	**1975 – 1992**			
Dependent variables:	$R\&D/Sales_{[t+1]}$	$CAPX/Assets_{[t+1]}$	$Advertising_{[t+1]}$	$Organizational\ Capital_{[t+1]}$
$All\ APML_{[t]}$	0.003* (0.001)	0.006*** (0.001)	0.011*** (0.002)	0.001*** (0.000)
$Post88_{[t]} \times All\ APML_{[t]}$	0.006 (0.005)	0.000 (0.003)	-0.010* (0.005)	-0.002*** (-0.000)
$Boat\ APML_{[t]}$	0.000 (0.002)	-0.001 (0.003)	-0.003 (0.006)	-0.001 (0.001)
$Post88_{[t]} \times Boat\ APML_{[t]}$	-0.001 (0.003)	0.002 (0.003)	-0.009 (0.008)	-0.001 (0.001)
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Observations	17,476	17,476	17,476	17,476
Adjusted R^2	0.794	0.445	0.811	0.817

Are APML-firms more profitable (i.e., earn rents)?

Sample period:	1975 – 1992			
Dependent variables:	$Gross\ Profit_{[t+1]}$	$Operating\ Margin_{[t+1]}$	$ROE_{[t+1]}$	$Loss_{[t+1]}$
$All\ APML_{[t]}$	0.010***	0.014***	0.017***	-0.022*
	(0.004)	(0.004)	(0.005)	(0.012)
$Post88_{[t]} \times All\ APML_{[t]}$	-0.003	-0.000	-0.025**	0.008
	(0.005)	(0.011)	(0.012)	(0.016)
$Boat\ APML_{[t]}$	-0.003	0.002	-0.003	0.001
	(0.004)	(0.005)	(0.023)	(0.027)
$Post88_{[t]} \times Boat\ APML_{[t]}$	-0.001	-0.007	0.010	-0.013
	(0.006)	(0.013)	(0.041)	(0.041)
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Observations	14,149	14,148	17,560	17,531
Adjusted R^2	0.752	0.699	0.226	0.288

Do APMLs improve firm value?

Sample period:	1975 – 1992		
Dependent variables:	$Q_{[t]}$	$Stock\ Return_{[t]}$	$Total\ Q_{[t]}$
$All\ APML_{[t]}$	0.074*** (0.015)	0.064* (0.033)	0.055*** (0.018)
$Post88_{[t]} \times All\ APML_{[t]}$	-0.072 (0.064)	-0.026 (0.019)	-0.087 (0.106)
$Boat\ APML_{[t]}$	0.036 (0.040)	0.026 (0.035)	-0.011 (0.054)
$Post88_{[t]} \times Boat\ APML_{[t]}$	-0.021 (0.035)	-0.044 (0.029)	-0.028 (0.051
Control Variables	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Observations	17,600	12,411	17,577
Adjusted R^2	0.683	0.007	0.637

Robustness checks

- **Parallel trends**:
- Expand the sample to include **all manufacturing firms** (SIC codes: 2000-3999)
  - I.e., not just firms in the industries I identified as having moldable products (Table 2)
  - Results continue to hold (but as expected are less significant due to the added noise)
- Exclude firms from **Boat-APML states**
  - Results continue to hold

- **Next**
- **Heterogeneous value effects…**
  - **Patenting vs. Non-patenting firms (e.g., Kultti et al., 2006, 2007)**
  - **Firms with greater innate innovative ability (e.g., Knott, 2008; Cohen et al., 2013)**

Do APMLs differentially affect patenting vs. non-patenting firms?

Sample period:	**1975 – 1988**			
Dependent variable:		$Tobin's\ Q_{[t]}$		
$All\ APML_{[t]}$	0.127*** (0.012)	0.134*** (0.013)	0.139*** (0.013)	-0.048 (0.06)
$All\ APML_{[t]} \times Ln(1 + Patent)_{[t-1]}$	-0.207*** (0.036)			
$All\ APML_{[t]} \times Ln(1 + CW\ Patent)_{[t-1]}$		-0.035*** (0.006)		
$All\ APML_{[t]} \times Ln(1 + SM\ Patent)_{[t-1]}$			-0.061*** (0.009)	
$All\ APML_{[t]} \times Patentless\ R\&D_{[t-1]}$				0.128*** (0.049)
Interacted and Control Variables	Yes	Yes	Yes	Yes
Firm FE and Industry × Year FE	Yes	Yes	Yes	Yes
Observations	13,139	13,139	13,139	9,909
Adjusted R^2	0.705	0.705	0.706	0.713
$Patent\ Activity$ mean	0.182	1.179	0.682	0.866
Test for joint significance:				
$[All\ APML_{[t]} \times Patent\ Activity_{[t-1]}] + [All\ APML_{[t]}]$	0.089*** (0.011)	0.092*** (0.011)	0.097*** (0.012)	0.080*** (0.021)

Do APMLs differentially affect firms with greater innovative ability?

Sample period:	1975 – 1988		1975 – 1992	
Dependent variable:	$Tobin's\ Q_{[t]}$			
$All\ APML_{[t]} \times RQ_{[t-1]}$ **Knott (2008)**	0.364***		0.269**	
	(0.091)		(0.115)	
$All\ APML_{[t]} \times RQ\ High_{[t-1]}$		0.054***		0.128***
		(0.019)		(0.026)
$All\ APML_{[t]} \times RQ\ Low_{[t-1]}$		0.018		0.031
		(0.013)		(0.026)
$Post88_{[t]} \times All\ APML_{[t]} \times RQ_{[t-1]}$			-2.285***	
			(0.472)	
$Post88_{[t]} \times All\ APML_{[t]} \times RQ\ High_{[t-1]}$				-0.210**
				(0.084)
$Post88_{[t]} \times All\ APML_{[t]} \times RQ\ Low_{[t-1]}$				0.099
				(0.112)
$All\ APML_{[t]}$	-0.056**	-0.029	-0.064**	-0.090**
	(0.024)	(0.022)	(0.028)	(0.039)
Interacted and Control Variables	Yes	Yes	Yes	Yes
Firm FE and Industry × Year FE	Yes	Yes	Yes	Yes
Observations	6,546	6,546	8,619	8,619
Adjusted R^2	0.665	0.665	0.653	0.653

Heterogenous abnormal returns on the Supreme Court's decision day

Dependent variable:	$1\text{-}Day\ Risk\text{-}Adjusted\ Excess\ Announcement\ Return_{[t]}$				
Sample cut:	**N/A**	**Patent High = 1**	**Patent High = 0**	**RQ High = 1**	**RQ High = 0**
$All\ APML_{[t]}$	-0.365** (0.137)	-0.049 (0.160)	-0.630*** (0.160)	-0.339** (0.157)	-0.065 (0.171)
$Boat\ APML_{[t]}$	0.206 (0.200)	0.346 (0.249)	0.109 (0.234)	-0.121 (0.388)	0.075 (0.250)
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	1,299	528	771	223	475
Adjusted R^2	0.007	0.001	0.010	0.008	0.001

Following the approach in Cohen and Wang (2013)

Challenges to identification

- **Limited states problem?**
  - May be that omitted variables that correlate with passage of laws and the outcomes
  - Spuriously drive the main results by influencing post-treatment trends in
    - Patent activity, investment spending, profitability and Tobin's Q

- Two features of my empirical framework **help address** this concern
  - (1) I am able to exploit the Boat-APML states as a placebo
    - Since most firms HQ'd in these states are **non-boat-manufacturers**, they are **not** affected by their states' laws
    - Consistent with All-APMLs being the **actual cause**, estimates on $Boat\ APML$ are **always insignificant**
  - (2) Identification is further enriched by the U.S. Supreme Court's invalidation of the laws
    - Provides a **counter-effect** to the APMLs
    - Thus, a scenario where omitted variables correlate with the laws' adoptions and the outcomes in **one direction**
    - And the Supreme Court's ruling and the outcomes in the **other direction** seems unlikely

- **Within state confounders?**
  - Address this concern using a unique feature of the experiments: The laws only apply to firms with moldable products
  - Placebo test on firms in non-moldable products industries: Controls for within state sources of confounding variation

Ruling out within state confounders

Sample:	Firms operating in "non-moldable products" industries			
Sample period:	1975 – 1992			
Dependent variables:	$Ln(1+Patent)_{[t+2]}$	$R\&D/Sales_{[t+1]}$	$Gross\ Profit_{[t+1]}$	$Tobin's\ Q_{[t]}$
$All\ APML_{[t]}$	-0.002 (0.005)	0.001 (0.001)	-0.004 (0.009)	0.007 (0.054)
$Post88_{[t]} \times All\ APML_{[t]}$	-0.003 (0.003)	-0.000 (0.001)	-0.012 (0.009)	-0.004 (0.055)
$Boat\ APML_{[t]}$	-0.007 (0.005)	0.001 (0.001)	-0.002 (0.009)	0.038 (0.045)
$Post88_{[t]} \times Boat\ APML_{[t]}$	-0.004 (0.005)	0.000 (0.001)	0.010 (0.013)	-0.048 (0.030)
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Observations	25,023	25,023	22,073	25,023
Adjusted R^2	0.945	0.881	0.684	0.703

Conclusion

Thank you!

What do APMLs shock?

- I assume that APMLs shock **product market competition** by
  - Increasing imitation costs for competitors, and thus,
  - Decreasing the competitive cost advantage of being able to plug mold a duplicate, competing product

- A **potential concern** is that:
  - The laws also shock innovation (simultaneity), or that
  - The laws directly shock innovation, and changes in competition come after (spurious relationship)

- To **support** my assumption and **address** this potential concern I rely on **three sources** of evidence
  - Anecdotal evidence from judges
  - Theoretical predictions
  - And other empirical studies that employ shocks to competition via IP protection

Anecdotal evidence from judges

- *Bonito Boats v. Thunder Craft Boats*, 515 So.2d 220 at 222:
  - "When an article is introduced into the public domain, only a patent can eliminate the **inherent risk of competition** and then but for a limited time."

- *Bonito Boats v. Thunder Craft Boats*, 489 U.S. at 160:
  - "The **competitive reality** of reverse engineering **may act as a spur** to the inventor, **creating an incentive** to develop inventions that meet the rigorous requirements of patentability."

Theoretical predictions

- **This is consistent with the ambiguous predictions from prior theoretical work**

- **Schumpeterian growth theory argument:**
- **Stronger** intellectual property (IP) protection and **higher** imitation costs **may** increase
  - The expected duration of rents to successful innovators and thereby increase their incentives to innovate and grow
    - (e.g., Dasgupta and Stiglitz, 1980; Davidson and Segerstrom, 1998)
- But,
- **Arrow's "replacement" effect argument**:
- Suggests that in equilibrium the dominant incumbent **does not** innovate because of
  - Strengthened IP protection and higher imitation costs since this would displace the rents it already earns
    - (e.g., Arrow, 1962; Aghion and Howitt, 1992)

Evidence from other empirical studies

Guernsey, John, and Litov (R&R at JFQA, 2019)

Panel A: UTSA indicator

Dependent variables:	$Ln(Patent)_{[t+1]}$	$Ln(CW\ Patent)_{[t+1]}$	$Ln(SM\ Patent)_{[t+1]}$
Variables:	(1)	(2)	(3)
$UTSA_{[t]}$	-0.009***	-0.064***	-0.061**
	(-2.92)	(-3.17)	(-2.39)
$IDD_{[t]}$	-0.000	-0.000	0.010
	(-0.03)	(-0.03)	(0.44)
Control variables	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes
Region × Year FE	Yes	Yes	Yes
Observations	107,795	107,795	107,795
Adjusted R^2	0.842	0.785	0.830

Change in IP protection (IDD/APML) → **Changes competition (Yes/Yes)** → ? **May or may not change innovation incentives (No/Yes)**

Ultimately, an empirical question

Link back to main slides

Other working papers

- **Shadow Pills, Actual Pill Policy, and Firm Value**
  - with Martijn Cremers, Lubo Litov, and Simone Sepe
  - Analyzes how the *right to adopt* a poison pill affects actual pill usage and firm value
    - R&R at RFS

- **Keeping Secrets from Creditors: The Uniform Trade Secrets Act and Financial Leverage**
  - with Kose John and Lubo Litov
  - Examines how an increase in intangibility in the form of trade secrets impacts financing decisions
    - R&R at JFQA

- **Stakeholder Orientation and Firm Value**
  - with Martijn Cremers and Simone Sepe
  - Investigates the effect of enhanced director discretion to consider stakeholders on firm value
    - Submitting to a top-3 finance journal soon