The Effects of Foreign IP Theft on U.S. Firms and Innovation

NBER I3 Workshop, December 2021

Britta Glennon (Wharton & NBER)

Daniel P. Gross (Duke & NBER)

Lia Sheer (Tel Aviv University)

NETLOGIC MICROSYSTEMS™

Putting Intelligence in the Network™

Trial to Begin in Economic Espionage Case Involving China

A jury trial is set to begin in a somewhat rare trade-secret theft case in which federal prosecutors are trying to prove that two engineers misappropriated trade secrets from a U.S. technology company to benefit China's government.

By Jaikumar Vijayan

CSO | OCT 20, 2009 7:00 AM PST

2001

Lan Lee and Yuefei Ge start working at NetLogic as engineers

2002

Lee and Ge establish own company (Sico), allegedly using trade secrets from NetLogic, and sought to obtain VC funding from CN govt (863 program)

Ge's wife tips off NetLogic CEO and FBI

2003

Lee and Ge fired from NetLogic

2007

Indicted by the DoJ

2009

Trial, found not guilty

The threat that foreign IP theft poses to U.S. competitiveness is one of the most important innovation policy challenges of recent years

The "most severe counterintelligence threat" facing the U.S. today —FBI Director Wray, 2019

The issue has generated a surge of interest and calls to action across the federal gov't and beyond

White House

U.S. Congress

USTR

USPTO

U.S.-China ESRC

U.S. Judiciary

DOJ

FBI

Commerce

And yet, despite the alleged scale and urgency of the threat, and the public attention it receives, we know very little.

How many firms have been affected?

We don't know!

What strategies are firms using to mitigate exposure? How do they protect themselves?

We don't know!

How is it affecting…

- Private R&D investment?
- The direction of R&D?
- U.S. firms' competitiveness?

We don't know!

Who wants to know? Executives, researchers, policymakers…

Measuring IP theft: it's not easy

1. Trade secrets and their theft are intrinsically hard to observe
   - Economic espionage is secret by nature—hard to observe
   - The property being stolen is itself secret
2. No data source measures the universe of IP theft incidents
   - Some cases are litigated under seal
   - Some cases aren't litigated or disclosed
   - Some incidents aren't even detected

The U.S. federal government itself has had a hard time coaxing firms to share this information, e.g. for USTR's Section 301 China investigation

Our approach

Step 1:

Phone interviews with high-tech companies' boards, former USTR + staff, US/Europe Chambers of Commerce in China, R&D manager(s)

Step 2:

Compile known IP theft cases from public sources

Step 3:

Seek out complementary data sources for analysis

Focus of today's talk

We use four sources to measure IP theft

- DOJ's PRO IP Act (2009) annual reports
- DOJ and FBI press releases
- The work of two industry observers—one is very complete, w/ paper trail
- Manual research into media and court records

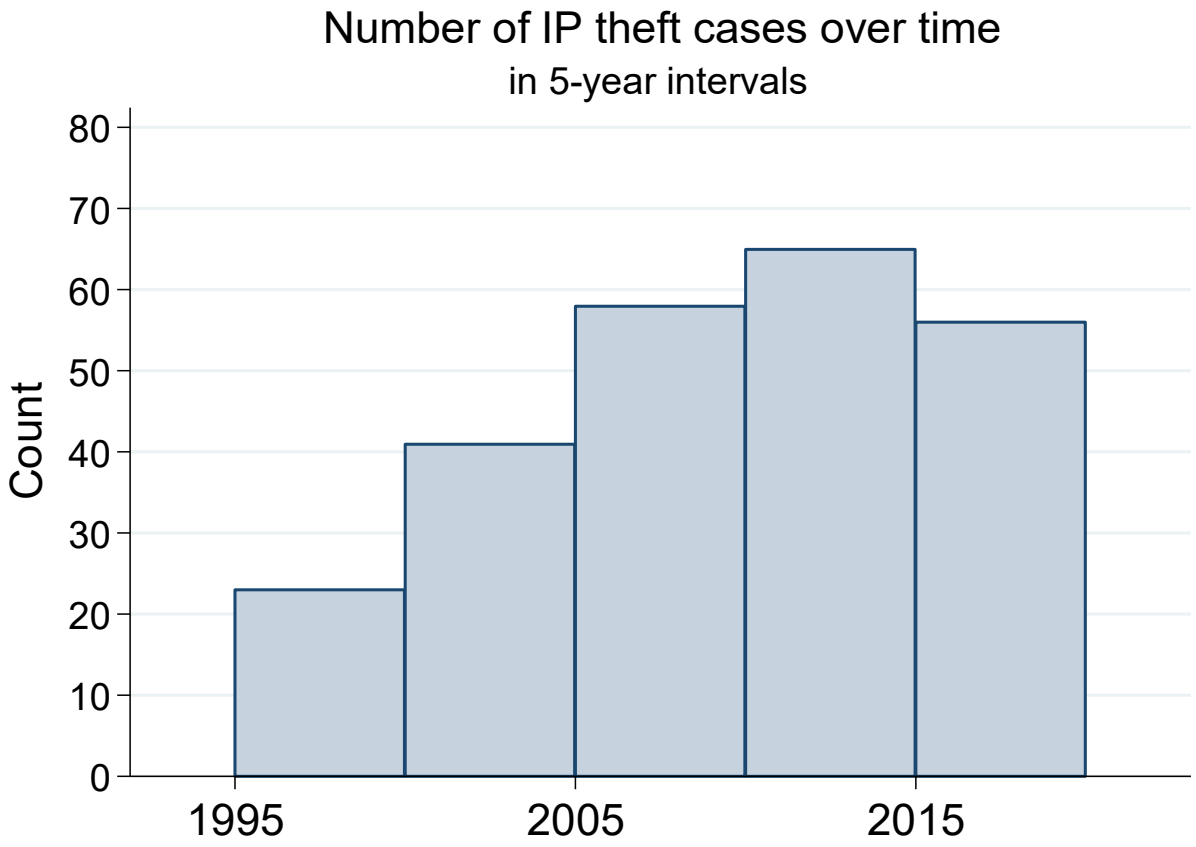
What do these cover?

- Criminal cases that are federally prosecuted (primarily under the Economic Espionage Act of 1996, but also under export control law), and civil lawsuits
- Industry observers pick up on cases not elsewhere seen, from court dockets

What can we observe in these data?

Included in the records	Additional info we are gathering
• Court and docket ID • Victim firm • Defendant(s) • Charges • Case outcome • Dates of key events (arrest, indictment, pleading or conviction/acquittal) • Links to media reports	• Defendant ethnicity, predicted from name • Country of origin • Employment status (insider vs outsider) • Title/role, if employee • Whether nationally-reported • Firm characteristics • Media reports in China

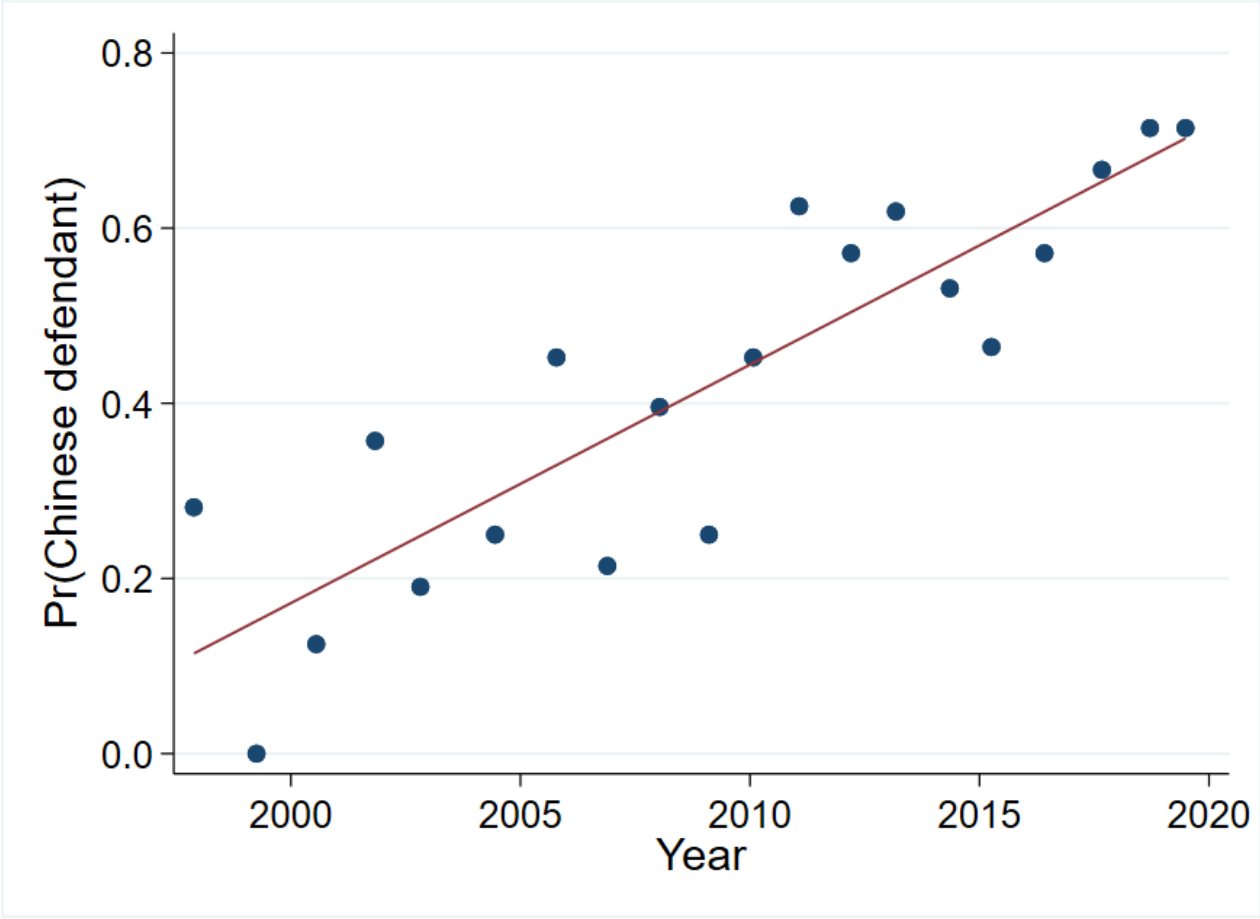
The number of IP theft cases has grown over time



- 1996-2020
- 243 cases
- 205 affected organizations

- Some orgs experienced multiple cases, such as…
  - DuPont (8), GE (5), Boeing (4), Microsoft (4), Intel (3)

The probability that a federal trade secret theft prosecution has >=1 ethnically-Chinese defendant has grown over time



To obtain firm characteristics…

We match to DISCERN (Arora, Belenzon, and Sheer) and Compustat

- Dataset on >4K U.S. publicly traded firms patents, scientific articles, and NPL citations dynamically matched to Compustat firms and their subsidiaries

Reduces our sample to 62 firms who are publicly-traded US firms who patent during our sample period

What are the characteristics of (matched) affected firms?

Table 1: Summary Statistics for Main Variables

VARIABLE	# Obs.	Mean	Std. Dev.	Distribution 10th	50th	90th
Patent count	485	399	626	16	140	952
H1B petitions	267	96	248	3	27	209
LCA applications	336	64	161	0	14	163
Sales ($mm)	485	24,650	40,807	728	8,446	64,306
Assets ($mm)	485	20,247	42,781	230	5,868	44,493
R&D expenditures ($mm)	485	1,354	1,843	32	431	4,475
R&D stock ($mm)	485	6,406	9,548	115	2,057	19,803

Notes: This table provides summary statistics for main variables. The sample is at the firm-year level and includes an unbalanced panel of 62 treated firms linked to Discern data - up to five years pre and three years post-IP theft incidence, over the sample period 1990-2015.

- ~50% of affected firms are in semiconductors

How might one use these data? A preview

We are currently examining how firm strategy changes after exposure…

Do impacted firms:

- Hire fewer (Chinese) immigrants?
- Change the location of innovation?
- Modularize their R&D?

Supplemental data is required to answer these questions…

Possible firm response	Supplemental Data	Detail
Hiring fewer (Chinese) immigrants	USCIS + DOL	• Number of L-1 & H-1B applications • Number of applications for Chinese visa holders
Changing the location of innovation?	DISCERN + USPTO	• Inventor location on patents
Modularizing their R&D?	DISCERN + USPTO	• Number of words in the first claim of a patent (following Jeff Kuhn's work)

Firms responses to IP theft: How to test?

The fundamental challenge of the research exercise is that every firm seems to be doing something different—it's the Wild West right now.

- Why? New problem requiring experimental strategies
- Little information sharing: proprietary
- Multi-dimensional approaches w/ many permutations

We think *there may not be a systematic answer*

- This leads us to ask: what are individual firms doing?

We use Synthetic Control Methods to take a deep dive into one industry…

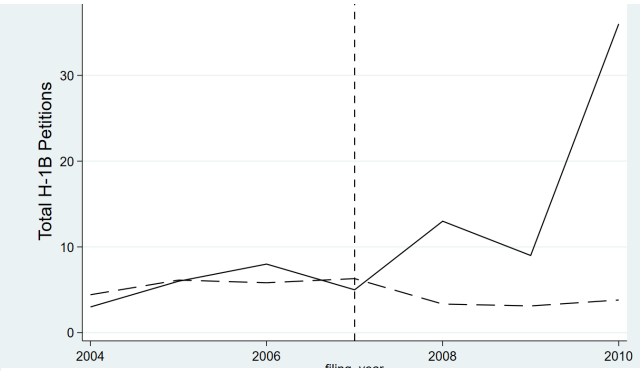
Semiconductor manufacturers

- Relatively homogeneous
- Large number of cases
- Economically important
- Qualitative insight from insiders

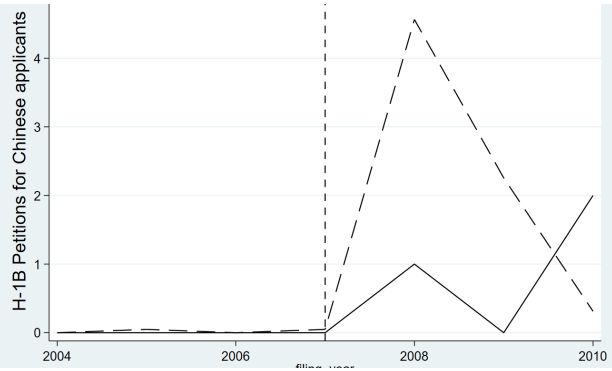
NETLOGIC MICROSYSTEMS™

Putting Intelligence in the Network™

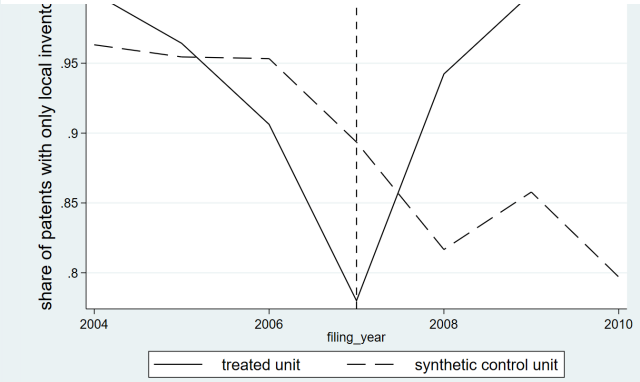
Total H-1B applications



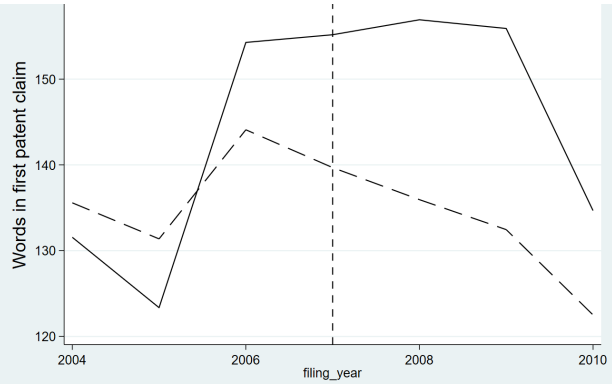
Chinese H-1B applications



% of patents w/ local inventors

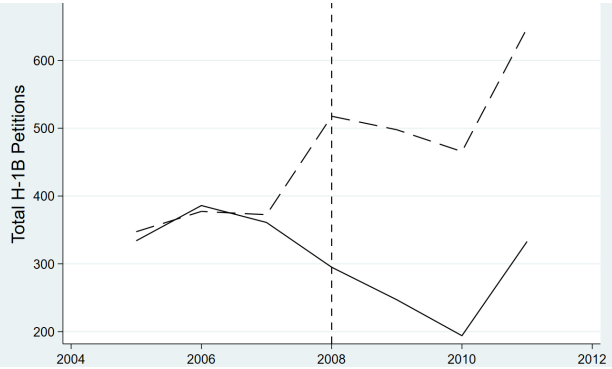


of words in 1st claim

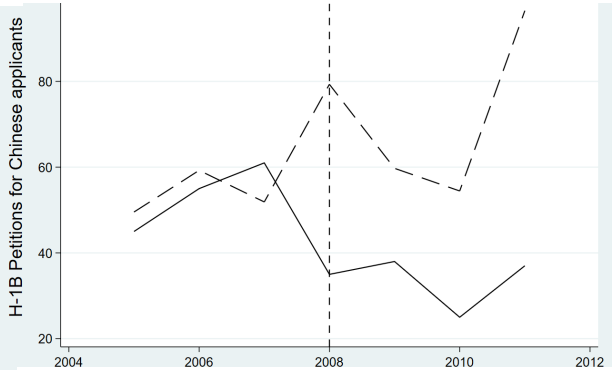


TEXAS INSTRUMENTS

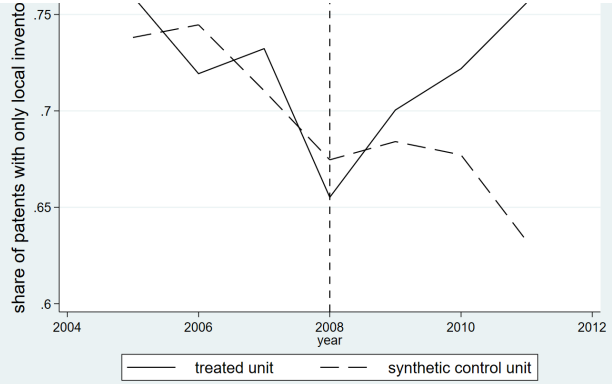
Total H-1B applications



Chinese H-1B applications



% of patents w/ local inventors



of words in 1st claim

Charged in 2007

Charged in 2008

This is still very much a work in progress…

We are still in the data collection process

- Dataset can grow every year as new cases are prosecuted (we stopped in 2020)

Post-data collection, after our first paper using it, we'll begin sharing with a select group. Later, we will post it.

Bottom line: Please email us if you're interested in the data, and we'll put you on our list.

Thank you!

bglennon@wharton.upenn.edu

daniel.gross@duke.edu

liasheer@tauex.tau.ac.il