# The Rise of Process Claims: Evidence from a Century of U.S. Patents

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# This Project in a Nutshell

- Classify independent claims using text-analytical methods beyond simple keyword searches (“process” or “method”)
- Focus on process claims and their increasing use (confirming observations by academics and practitioners)
  - Steady increase in process claims since the late 1800s
  - A few ups and downs, especially around WW2 and the late 1990s
  - Decrease in process claiming starting around 2010
- Publish data and code for others to use or adapt; both granted patents and pre-grant publications
- Main data file with patents granted after 1920; historic (less reliable data available going back to 1836)

# Data Construction

# Patent Claims

- Independent patent claims the metes and bounds of the invention protected by a patent
- Patents typically comprise more than an independent claim
- Claims are of different classes and types. Today's focus:
  - process or method claim (claiming a method or a process)
  - product or apparatus claim (claiming a machine, manufacture or product)
  - product-by-process claim (claiming a product by the method used to manufacture the product)
- Others: Means-plus-function claims, Jepson claims, Markush claims, ...

# Approach

- Use information from preamble and body to classify a claim
- Preamble:
  - Look for keywords that indicate a process/method or a product
  - Look for phrase “by …process” as indicator of product-by-process claim
- Body:
  - Parts-of-speech tagging
  - Contain steps of a process or components of a product
  - Steps begin with gerund form of a verb
  - Components begin with determiner, …., and a noun
- Validation using manually classified sample of almost 10,000 claims

# Examples: Apparatus Claim

An apparatus for supporting a camera, comprising:

- a pivotal mounting configured to hold the camera; and
- a plurality of legs arranged to support the pivotal mounting

*WIPO Patent Drafting Manual*

# Examples: Method Claim

A method for making tea, the method comprising:

- boiling water;
- adding sugar to the boiling water;
- adding tea leaves to the boiling water to form a mixture;
- adding milk to the mixture; and
- filtering the mixture.

*WIPO Patent Drafting Manual*

| Preamble | Body | 1920–2020 | Claim |
|---|---|---|---|
| Empty | Product | 37.18% | Product |
| Product | Product | 30.37% | Product |
| Method | Method | 15.03% | Process |
| Method | Mixed | 4.56% | Process |
| Method | Product | 2.83% | Process |
| Product | Mixed | 1.65% | Product |
| Product | Method | 1.21% | Prod-by-Process |
| Empty | Method | 1.21% | Process |
| Others | | 1.49% | |
| Others (no category) | | 4.47% | |
| *Empty preamble* | *Mixed body* | | |
| *Empty preamble* | *Empty body* | | |
| *Empty preamble* | *No body* | | |

# Data Source

- Bulkdata download from USPTO
  - Patents granted 1976 and later
  - Retain the line-by-line (or bullet-point by bullet-point) structure of the body
- Google Patent Public Data
  - Patents granted prior to 1976
  - Reformat from single-line to multi-line structure when possible

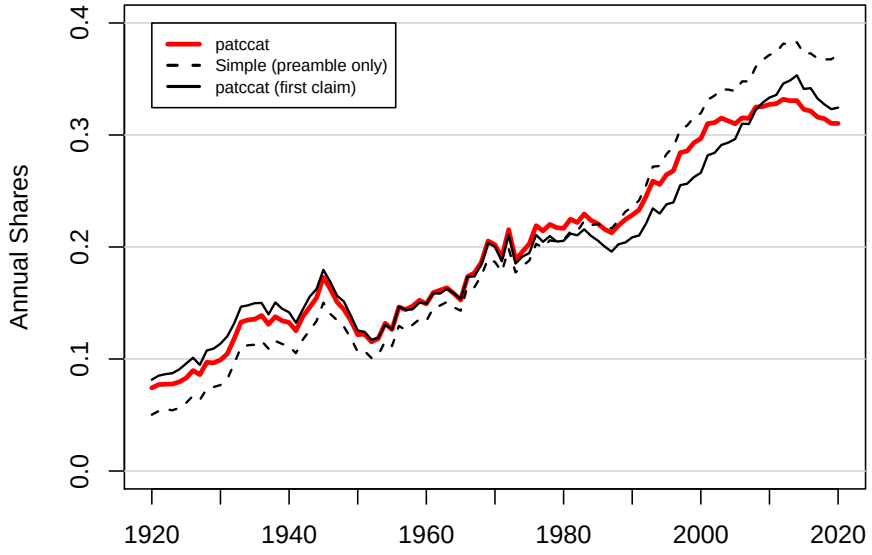
# Validation (Granted Patents 1976 – 2015)

- 10,000 manually classified claims granted between 1976 and 2015
- Classification via Amazon Mechanical Turk (twice + third in case of disagreement)
- 250 claims per year; representative across NBER technology classes

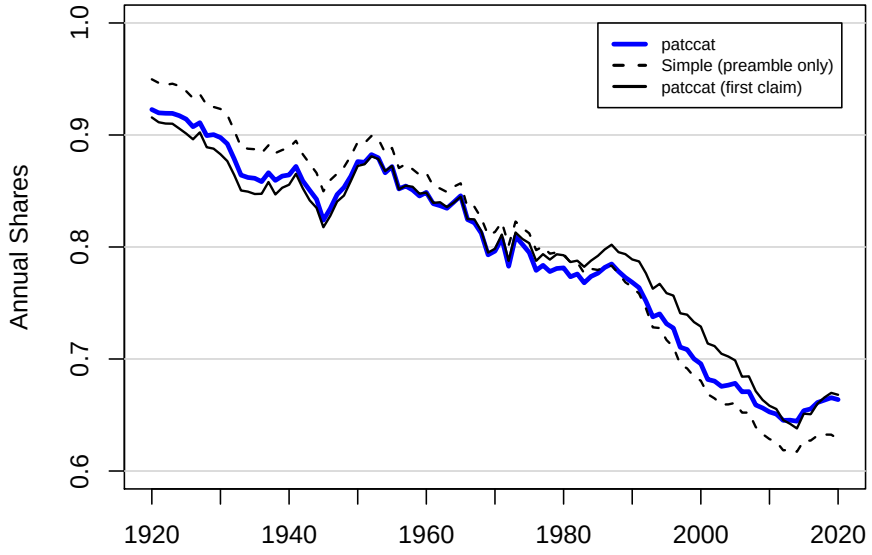
| | Accuracy | Coverage |
|---|---|---|
| Results (our preferred spec) | 0.983 | 0.983 |
| Simple approach (preamble only) | 0.956 | 1 |
| Simple approach (full claim) | 0.907 | 1 |

# A Century of U.S Patents

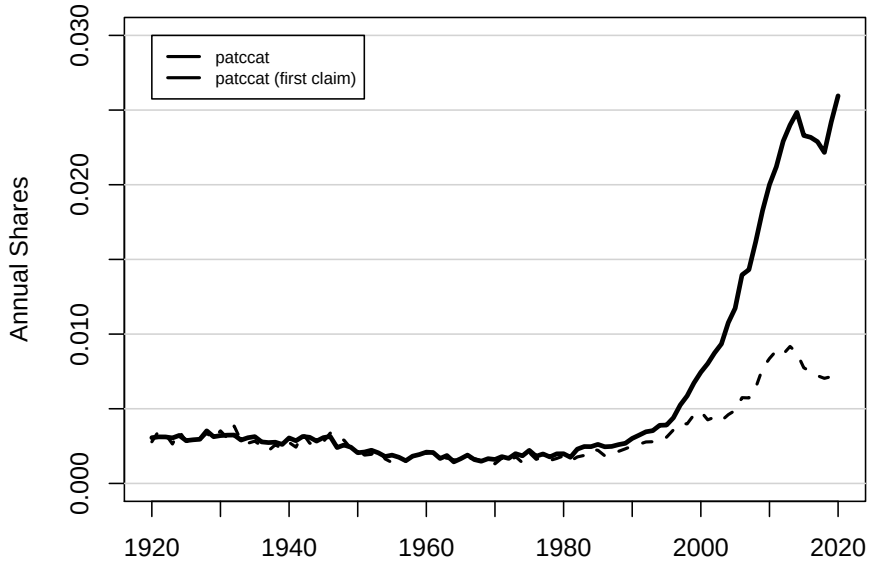
# Process Claims



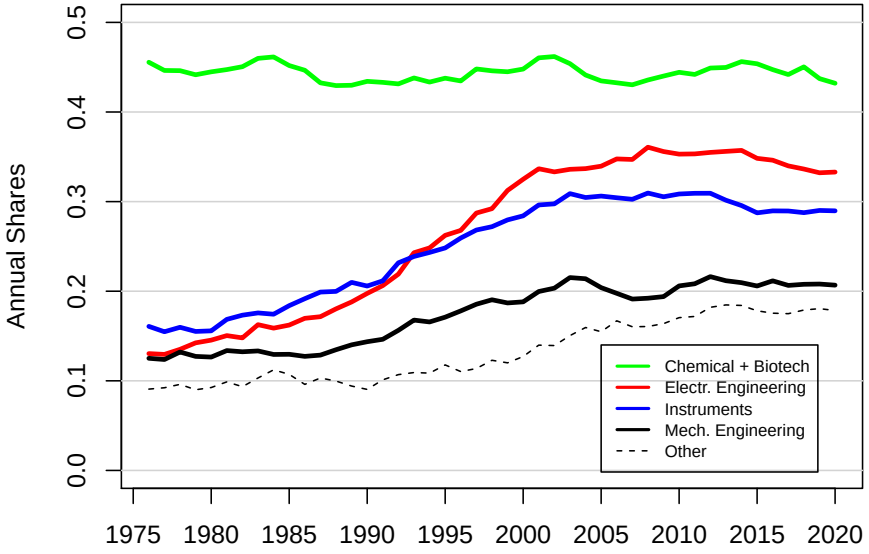
# Product Claims



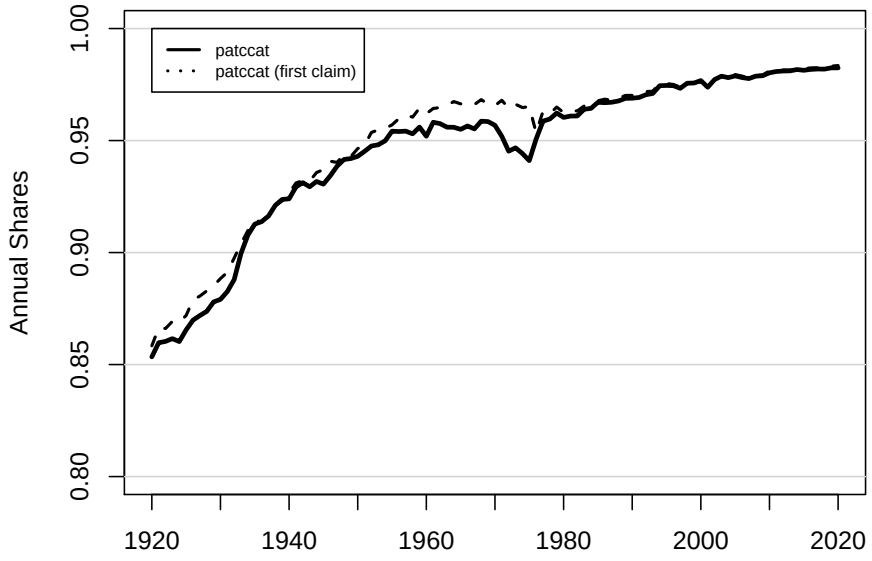
# Product-by-Process Claims



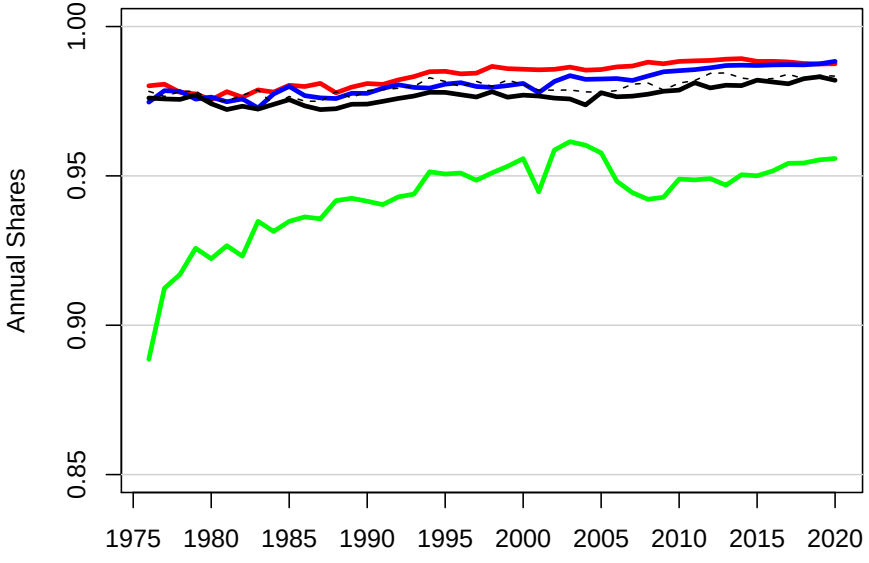
# Process Claims By Technology



# Data Coverage

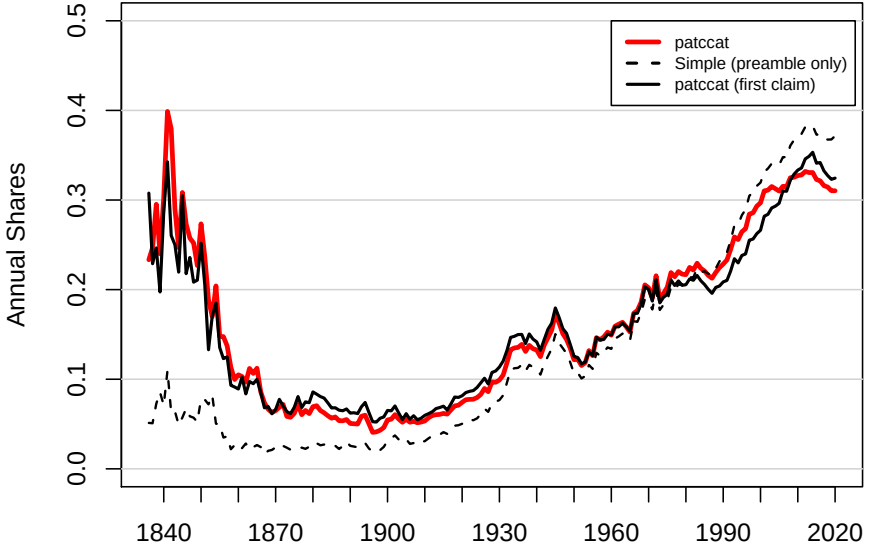


# Data Coverage

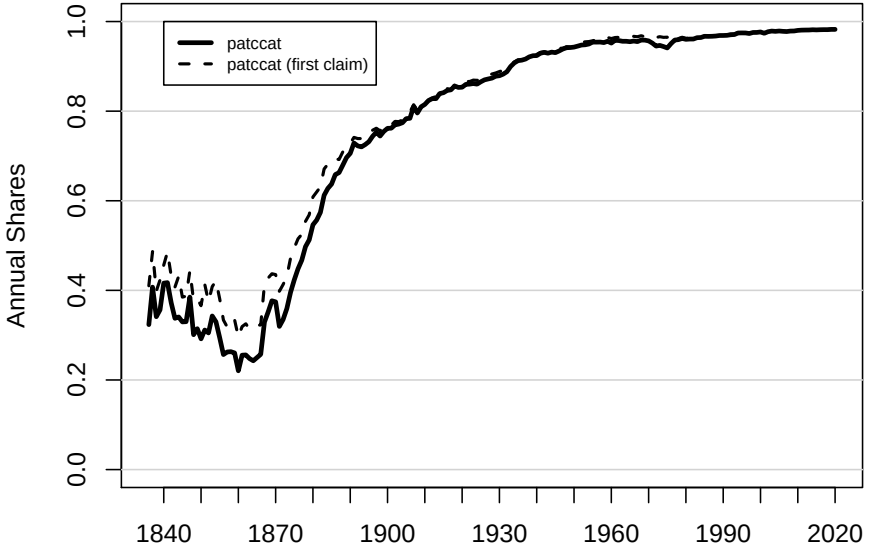


**Well, almost two centuries**

# Process Claims (1836 – 2020)



# Coverage (1836 – 2020)



# The Data in Use

# Data in Use: Ganglmair and Reimers (2021)


- Stronger trade secrets protection laws reduce share of process patents
- *Related results (in progress) with AIPA:*
  more process than product patents are opted out of pre-grant publication

Link: **https://ssrn.com/abstract=3393510**

# Data in Use: Branstetter et al. (2021)

**Does Offshoring Production Reduce Innovation: Firm-Level Evidence from Taiwan**

Lee G. Branstetter, Jong-Rong Chen, Britta Glennon & Nikolas Zolas

- Production offshoring by Taiwanese firms affected by policy that lifted restrictions on investment in mainland China
- Find "a shift away from *product patents* and towards *process patents* in the newly offshored categories"

Link: **https://www.nber.org/papers/w29117**

# Data in Use: Keum (2020)

Firing Costs and the Decoupling of Technological Invention and Post-Invention Investments

*Columbia Business School Research Paper Forthcoming*

64 Pages
Posted: 23 Mar 2021

Daniel Keum
Columbia University - Columbia Business School

Date Written: October 1, 2020

- Innovation used to lead to employment growth but labor market rigidity caused a decoupling between the two
- Process patents lead to a larger increase in CAPEX (vs. non-process patents)
- Process patents do not have a significant positive effect on employment growth (while non-process patents do)

Link: **https://ssrn.com/abstract=3774703**

# Data in Use: Babina et al. (2020)

Artificial Intelligence, Firm Growth, and Product Innovation*

Tania Babina† Anastassia Fedyk‡

Alex He§ James Hodson¶

November 2021

- Product patenting increases in firms that invest more in AI; process patenting does not change
- Conclude that firms use AI mainly for product innovation; no evidence for changes in productivity or process innovation

Link: **https://ssrn.com/abstract=3651052**

# Data in Use: de Rassenfosse et al. (2020)

International Patent Protection and Trade: Transaction-Level Evidence

27 Pages
Posted: 14 Apr 2020
Last revised: 15 Jul 2021

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Ecole Polytechnique Fédérale de Lausanne

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Scuola Superiore Sant'Anna di Pisa

Gabriele Pellegrino
Ecole Polytechnique Fédérale de Lausanne

Date Written: March 27, 2020

- How does trade hinge on patenting?
- Use product patent information to augment their patent-product matching algorithm
- Strong effect of patent protection on trade

Link **https://ssrn.com/abstract=3562618**

# Data in Use: Ma (2021)

**Technological Obsolescence**

Song Ma

- Examines impact of technological obsolescence on firm growth and asset returns
- Effects of product innovation are more pronounced, consistent with theories of destructions of embedded innovation being more costly for firms

Link: **https://www.nber.org/papers/w29504**

# The Dataset

# What's in it?

For **granted patents** (1836 through 2020) and published **patent applications** (2001 through 2020):

- claim-level information and patent-level information (counts of different claim types)
- process, product, product-by-process claims including the preamble-body combination
- simple process claims using keywords-approach in preamble only or entire claim
- Jepson/improvement claims
- means-plus-function claims

Regular updates

# Find it on ...

- Data files:
  - **Zenodo** (coming soon!)
- Code:
  - **Github** (coming soon!)
  - Written in R

# Thank you!

**Find the accompanying paper (coming soon)**

- through the internet search engine of your choice
- on our websites
- certainly in some paper repository (SSRN? RePEc? ZEW DP?)

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