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

Bernhard Ganglmair W. Keith Robinson Michael Seeligson

December 3, 2021

UNIVERSITY OF MANNHEIM
Leibniz Gemeinschaft
ZEW

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

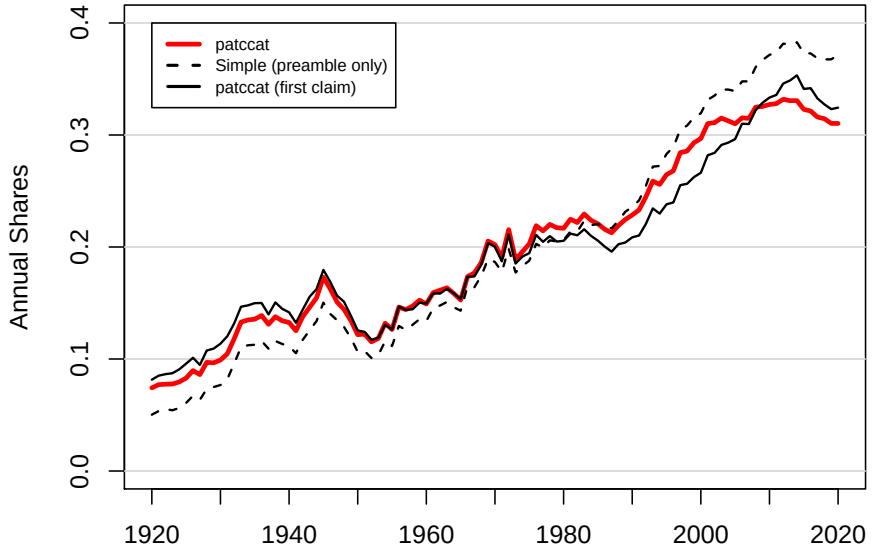
Validation (Granted Patents 1976 – 2015)

- 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

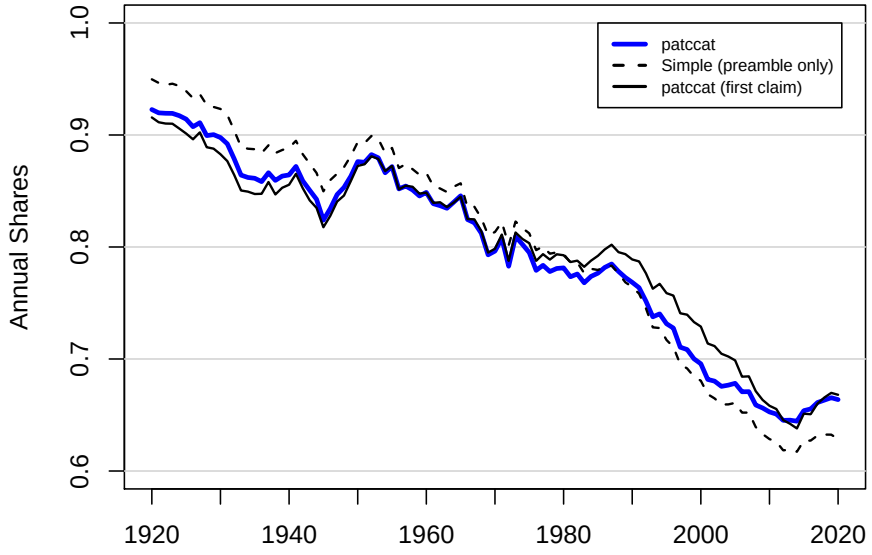
	Accuracy	Coverage
Results (our preferred spec)	0.983	0.983
Simple approach (preamble only)	0.956	1
Simple approach (full claim)	0.907	1

A Century of U.S Patents

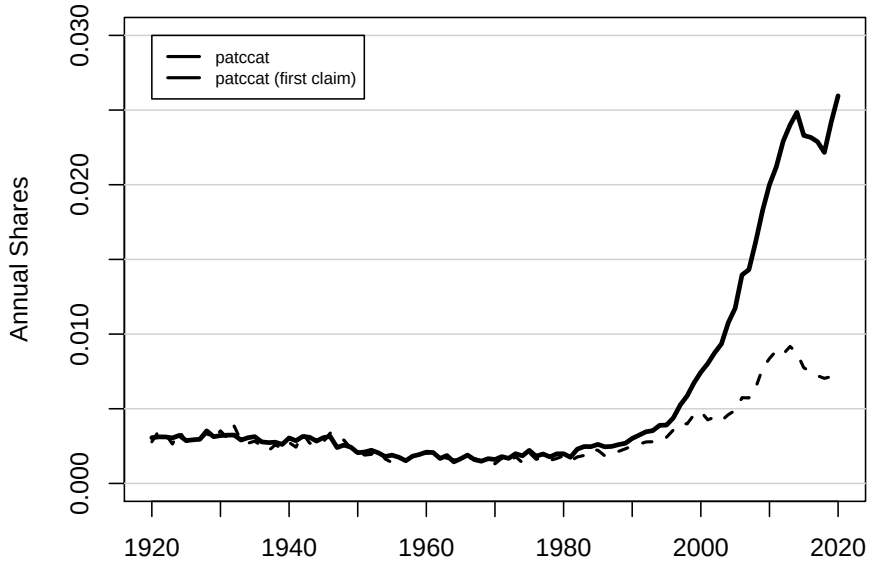
Process Claims



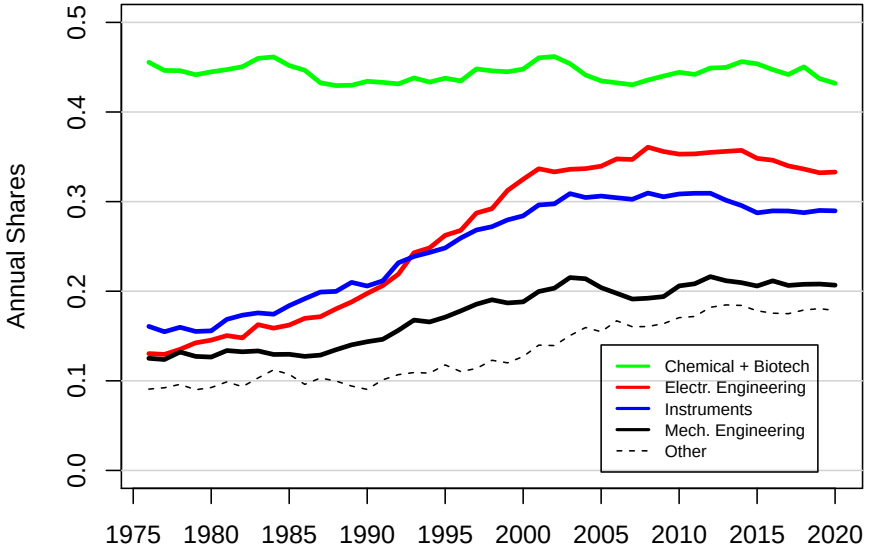
Product Claims



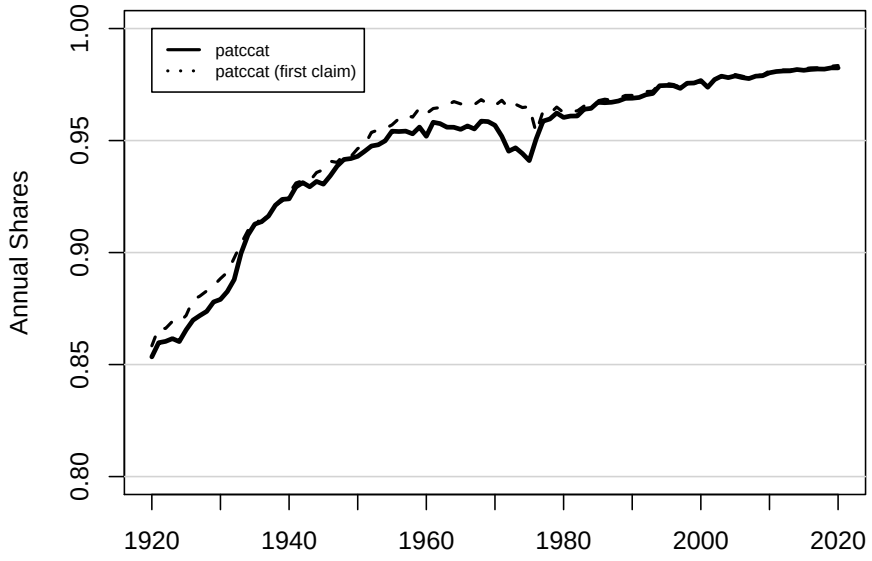
Product-by-Process Claims



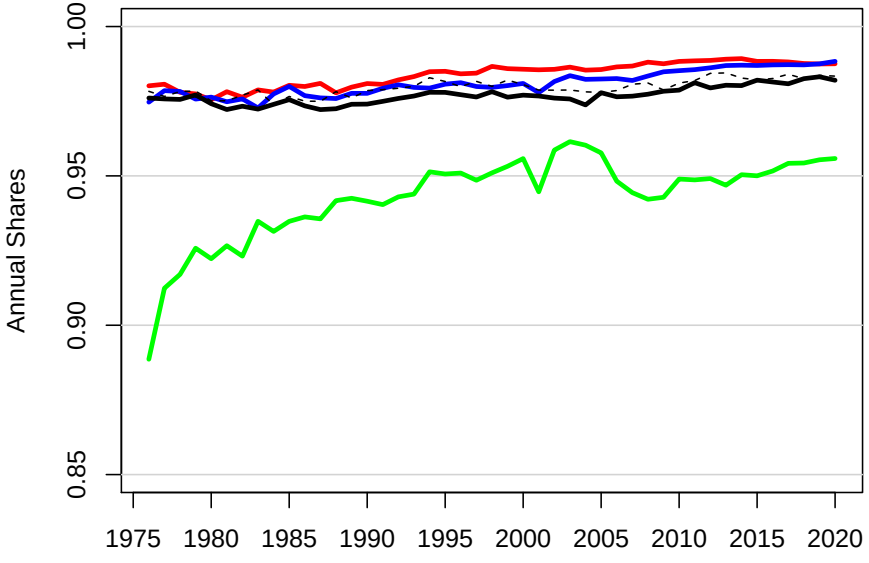
Process Claims By Technology



Data Coverage

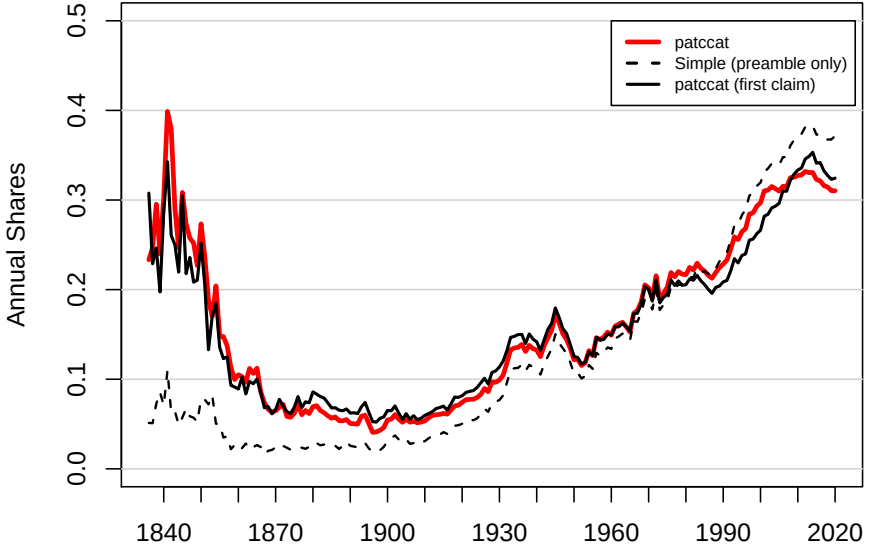


Data Coverage

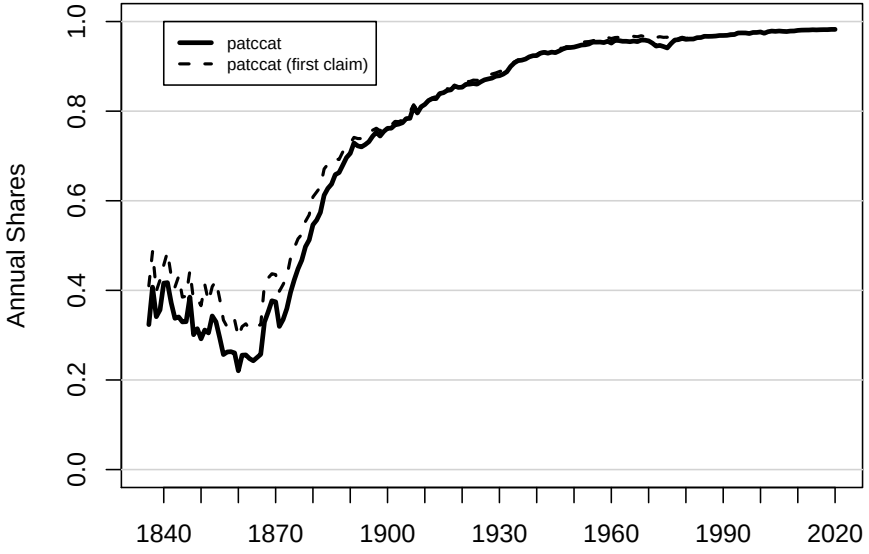


Well, almost two centuries

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

Gaétan de Rassenfosse
Ecole Polytechnique Fédérale de Lausanne

Marco Grazzi
Universita' Cattolica del Sacro Cuore

Daniele Moschella
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: Song (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?)

---

b.ganglmair@gmail.com | @ganglmair
robinswk@wfu.edu | @wkeithrobinson
seeligonson@gmail.com | @hello