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
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
<table>
<thead>
<tr>
<th>Preamble</th>
<th>Body</th>
<th>1920–2020</th>
<th>Claim</th>
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<tbody>
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<td>Prod-by-Process</td>
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<tr>
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<td>Method</td>
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<td>Process</td>
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</tr>
<tr>
<td>Empty preamble</td>
<td></td>
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</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results (our preferred spec)</td>
<td>0.983</td>
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<tr>
<td>Simple approach (preamble only)</td>
<td>0.956</td>
</tr>
<tr>
<td>Simple approach (full claim)</td>
<td>0.907</td>
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</tbody>
</table>
A Century of U.S Patents
Process Claims

![Graph showing annual shares of process claims from 1920 to 2020. The graph compares two categories: patccat and Simple (preamble only). The patccat (first claim) category shows a steady increase over the years, reaching a peak in the late 20th century before declining slightly in the early 21st century. The Simple (preamble only) category shows a similar trend but with more fluctuations.]
Product Claims

![Graph showing Product Claims over time from 1920 to 2020. The x-axis represents the years, and the y-axis represents the annual shares. The graph compares simple product claims (preamble only), simple product claims with preamble, and patent claims (first claim).]
Process Claims By Technology

Annual Shares

Chemical + Biotech
Electr. Engineering
Instruments
Mech. Engineering
Other

Data Coverage

- patccat
- patccat (first claim)
Data Coverage

![Data Coverage Chart]

- Annual Shares from 1975 to 2020.
- The chart shows the data coverage percentage for each year, with lines representing different categories or groups.
- The y-axis represents the annual shares, ranging from 0.85 to 1.00.
- The x-axis shows the years from 1975 to 2020.
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](https://ssrn.com/abstract=3774703)
Data in Use: Babina et al. (2020)

- 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

- 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?)

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