The Aggregate Effects of Incumbent Firms Preventing Disruptive Innovation

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Research Question

- Can firms' resistance to innovation explain a part of technology growth slowdown?
  - Progress is usually the result of investment
  - But: Progress produces losers
  - Historically, these losers often inhibited growth
- Focus on direction of R&D
  - incremental: increases quality, but "curse of knowledge"
  - disruptive: destroys human capital + increases research productivity
- Incumbents poach and bench disruptors

Measure of Disruptiveness (Examples)

Figure: Soybean Variety

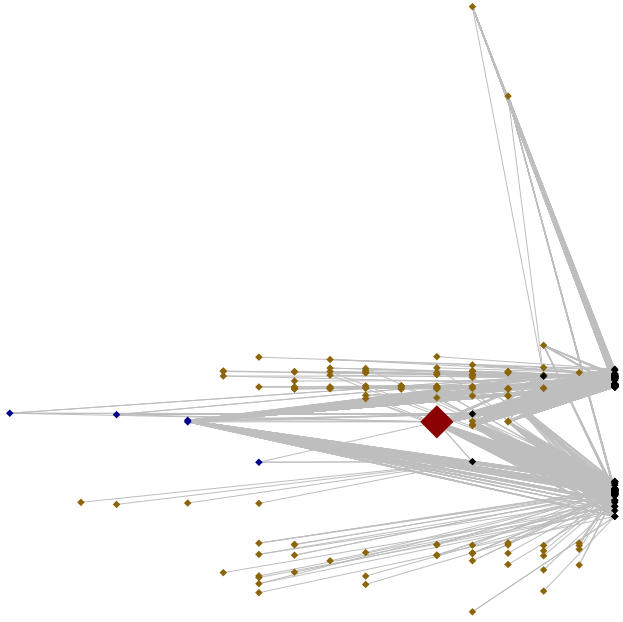
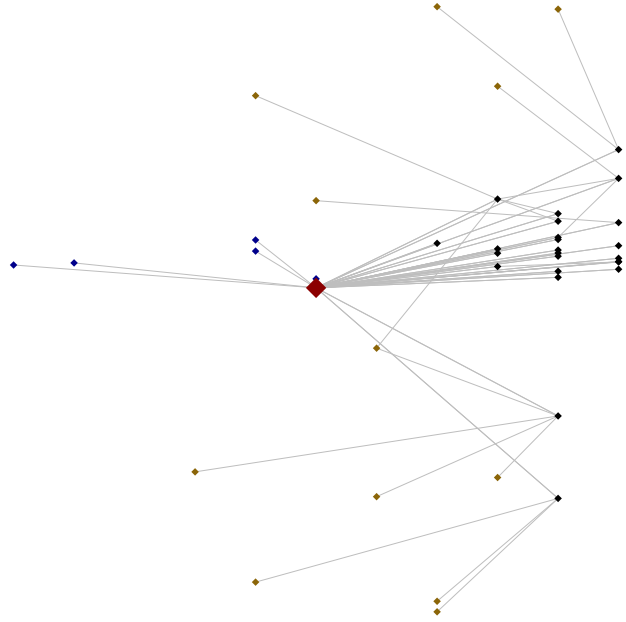
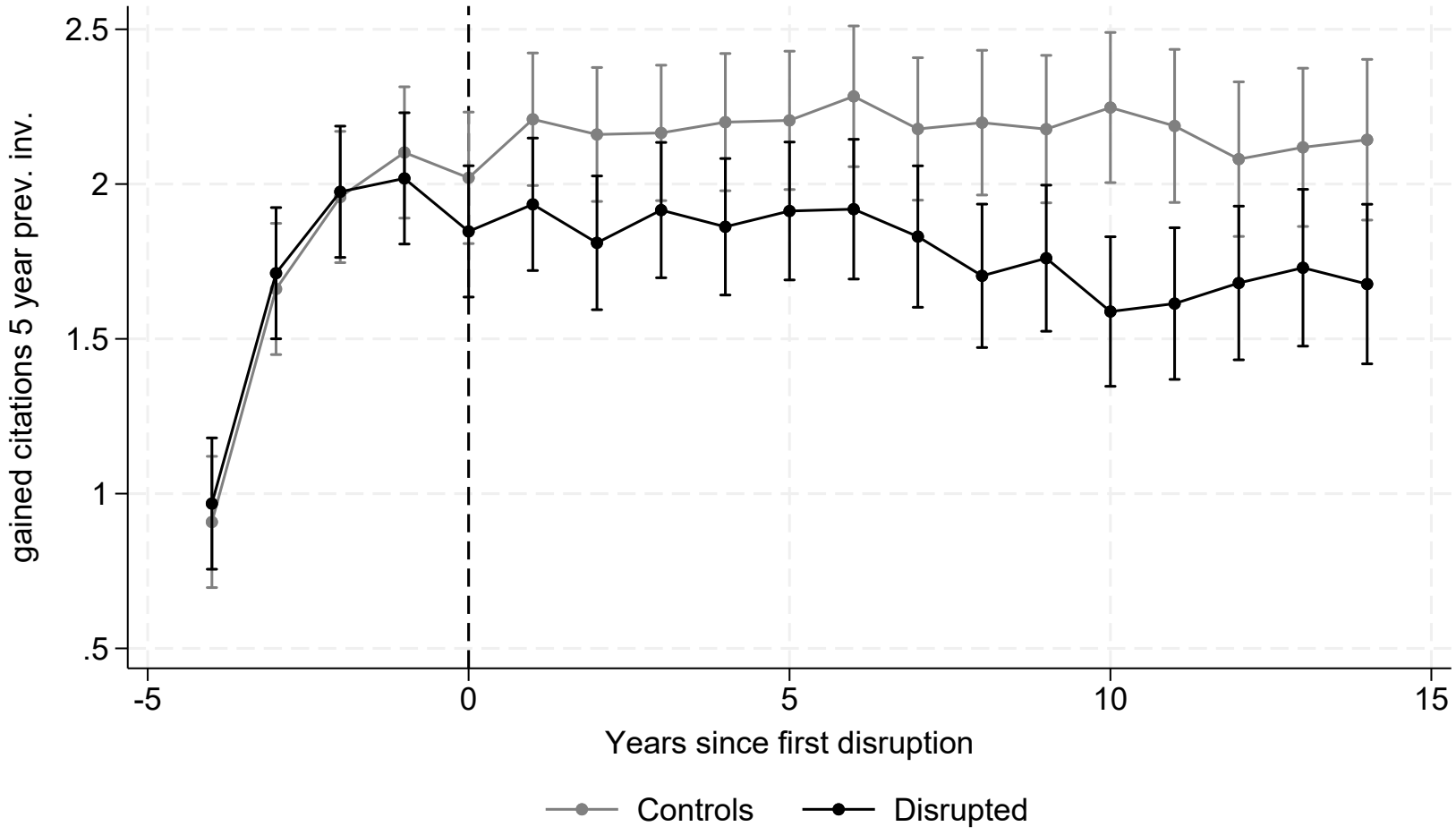


Figure: PCR



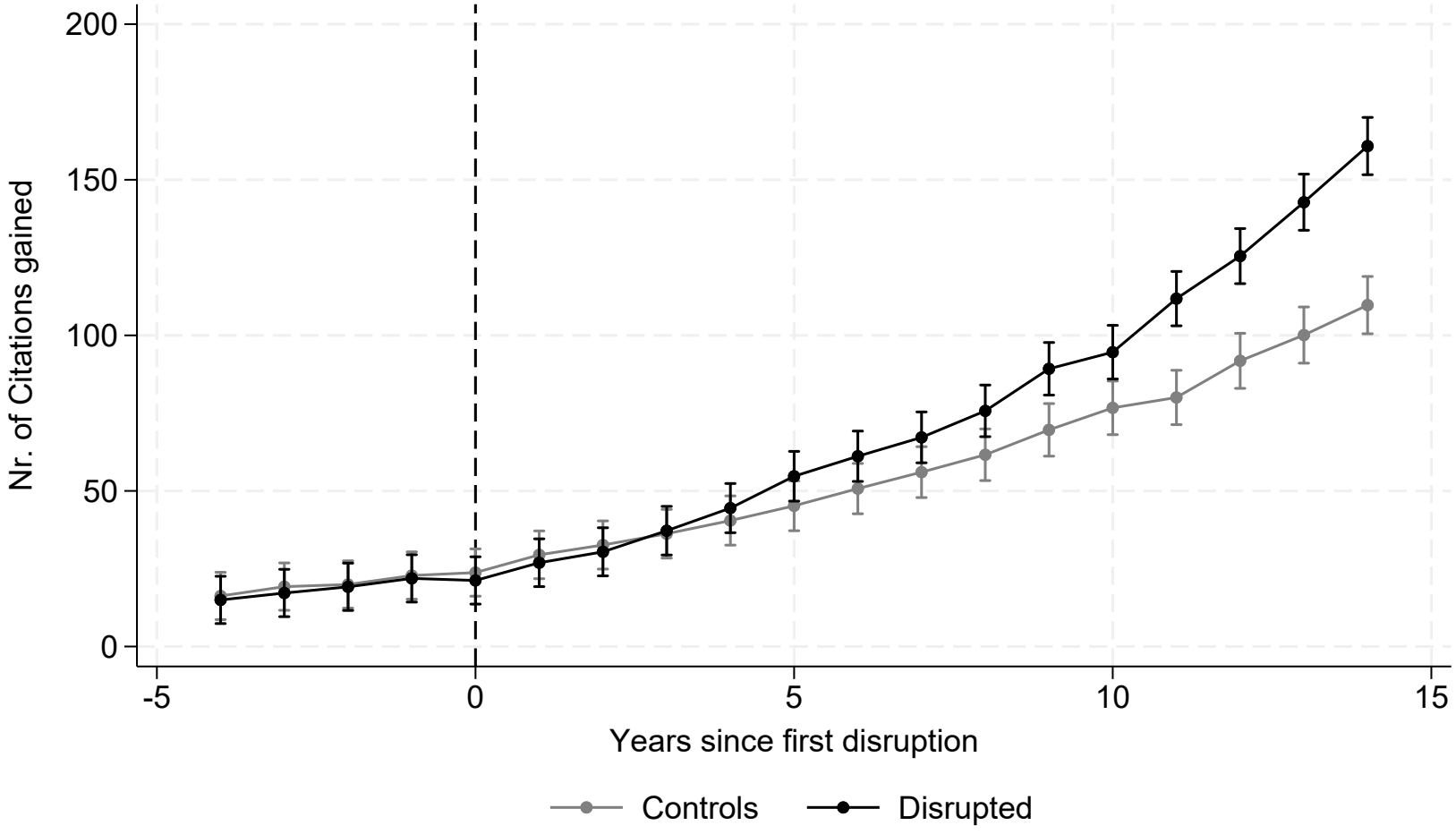
Notes: Citation web of US patents 6958436 (genetically engineered soybean, Monsanto) and 4683202 (polymerase chain reaction, Cetus).

Citations of Established Inventors



Sources: PATSTAT (European Patent Office).

Citations

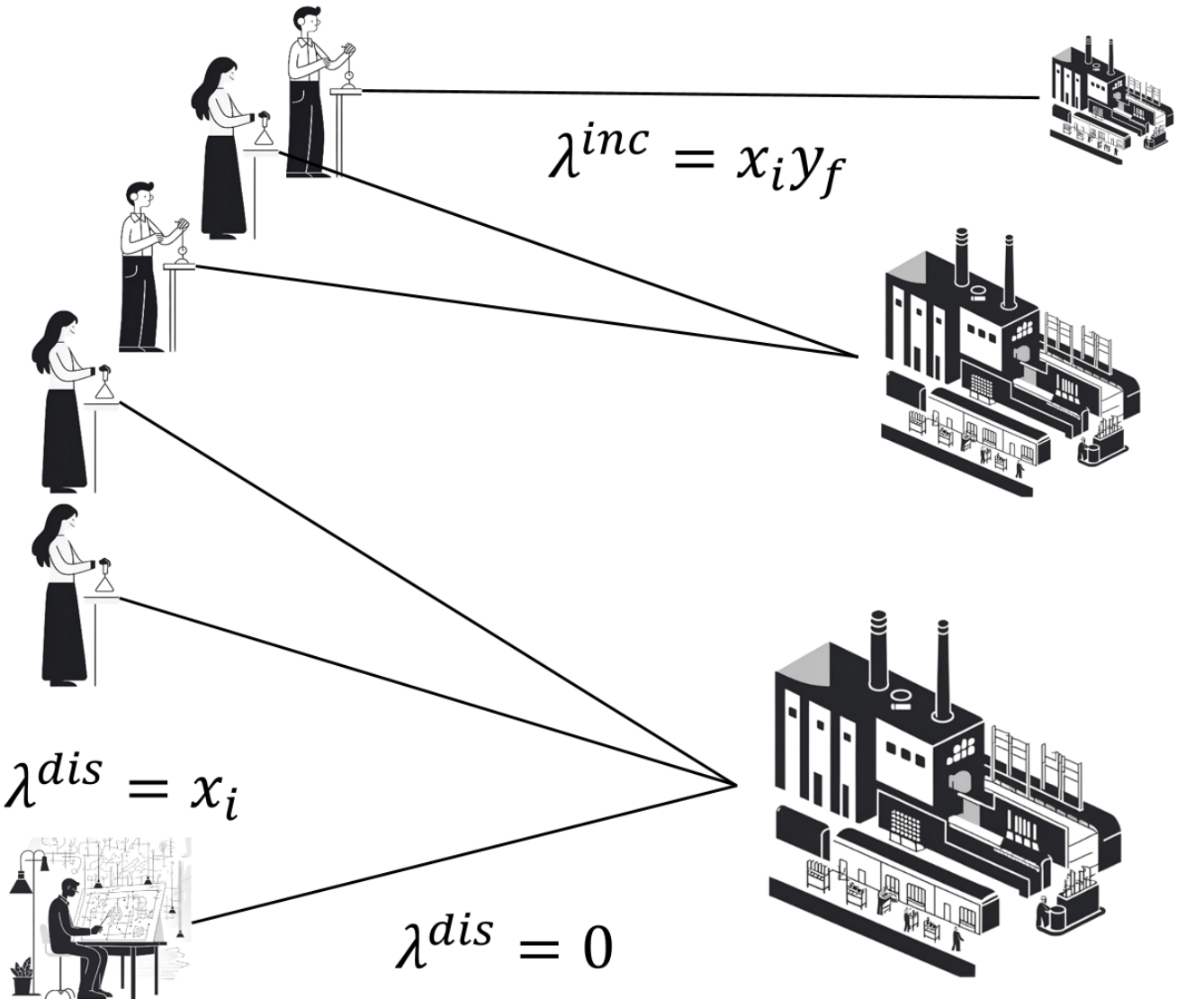


Sources: PATSTAT (European Patent Office).

Assumptions and Predictions

- Assumptions:
  - **Existing inventors lose when others disrupt their field.** ✓
  - **Disruptive inventions increase citations of future research.** ✓
- Predictions:
  - **Disruption increases likelihood for disruption.** ✓
  - Researcher productivity within tasks declines (e.g. Bloom et al. 2020).
  - Larger firms' research is more incremental (e.g. Akcigit & Kerr 2018).
  - Poached Inventors' productivity declines (e.g. Akcigit & Goldschlag 2023).
- Driver of a growth slowdown:
  - Firms' research is becoming more incremental (e.g. Kalyani 2024).

Labor Market



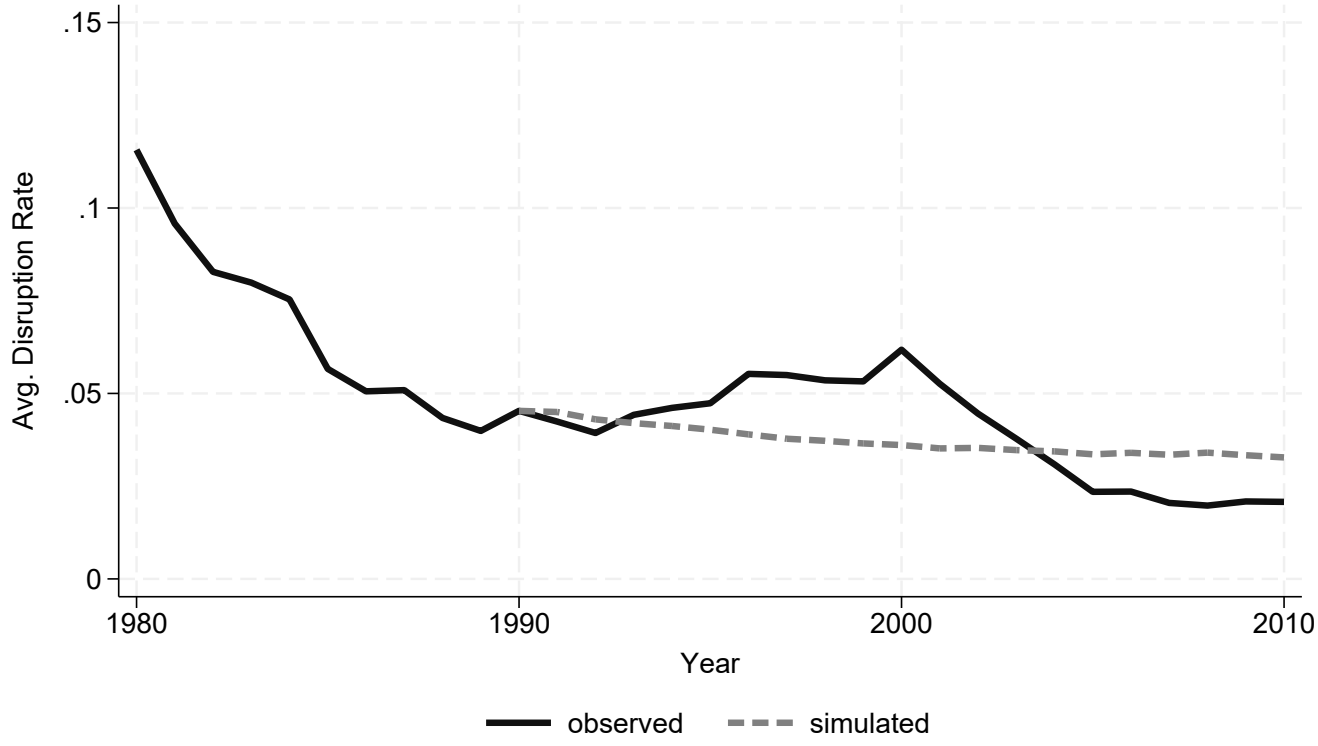
Optimal Strategy on the labor market

- Find marginal firm quality y* for which firms are indifferent about poaching

$$\underbrace{V_f^{inv}(1, \lambda_f^{dis}, \Lambda^{dis}) * X^{inc} * y_f}_{\text{Value of firm's incremental inventors}} * x_i^{dis} \geq \underbrace{\gamma\omega V^{Patent}(c)}_{\text{Value of a disruption}} * x_i^{dis} \quad (1)$$

Behavior of the Economy – Simulation vs. Reality

Figure: *Decline in Disruption predicted by the Model*

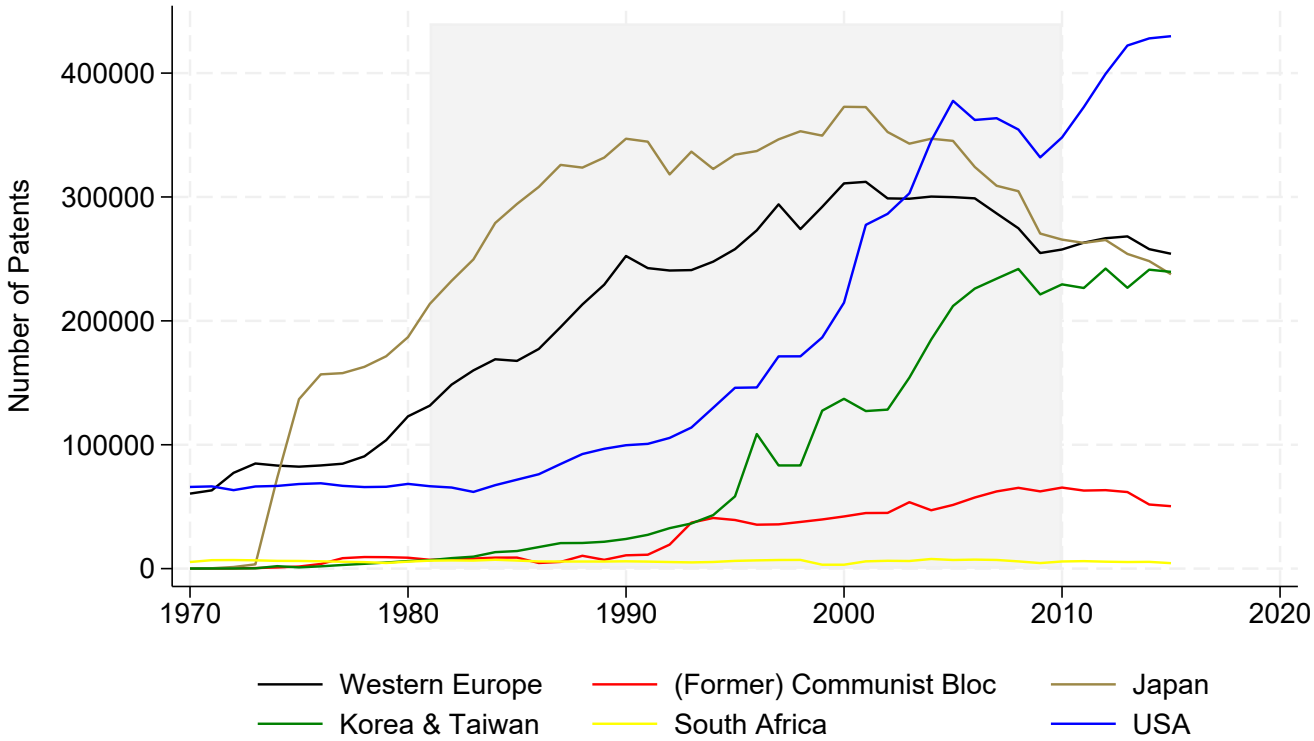


Notes: Graph shows the evolution of the rate of disruptions in IPC classes with more than 50 patents per year – actual vs. predicted rate of disruptions.

Thank you for your attention!

Data Source

Figure: *Overview over PATSTAT*



Notes: Number of patents in PATSTAT per region. The gray region marks the time period of data used in the event study.
Sources: PATSTAT (European Patent Office).

Literature

- Endogenous growth (Romer 1987, 1990, Aghion & Howitt 1992, Grossman & Helpman 1991...)
  - Firms invest in R&D to reap monopoly profits
  - Closest Model: Akcigit & Kerr 2018
- Search and matching labor markets (Rogerson 2005)
  - Increased assortative matching (Abowd, Kramarz & Margolis 1999, Hagedorn, Law & Manovskii 2016,Card, Heining & Kline 2013)
- Dynamic Ineffciencies in Innovation
  - General purpose technologies (Helpman and Trajtenberg 1998, Bresnahan and Trajtenberg 1995, Comin & Mestieri 2010)
  - Firms direct research so they can appropriate benefits (Hopenhayn & Mitchell 2001, Denicoló, 2000, Scotchmer 1991, Bryan & Lemus 2017)

Endogenous growth

- Romer 1987, 1990, Aghion & Howitt 1992, Grossman & Helpman 1991...
  - Firms invest in R&D to reap monopoly profits
  - Steady state growth rate
- Helpman and Trajtenberg 1998, Bresnahan and Trajtenberg 1995, Comin & Mestieri 2010
  - General purpose technologies can lead to waning and waxing growth
  - Cycles of technology invention and adoption
  - Adoption of technologies is as important as invention
- Akcigit & Kerr 2018
  - Technology clusters in an endogenous growth framework
  - Fitting model against firm behavior (Patent data)
- Contribution: Insert a labor market to endogenize key parameters and test vs. data

Inefficiencies in dynamic innovation

- Hopenhayn & Mitchell 2001, Denicoló, 2000, Scotchmer (1991)
  - Firms underinvest in research that spawns new research
- Hopenhayn & Squintani 2016
  - Firms over-invest in high value projects
- Bryan & Lemus 2017
  - Firms direct research so they can appropriate benefits
- Contribution: I insert these insights into an endogenous growth model

Search and matching labor markets

- Abowd, Kramarz & Margolis 1999,..., Hagedorn, Law & Manovskii 2016
  - Separate worker and firm productivity out from wages paid in a match
  - Assume match production is additive
- Mendes et al. 2010; Card, Heining & Kline 2013
  - Document rising assortative matching between workers and firms
- Contribution: Transfer to endogenous growth and loosen the additivity restriction (a bit)