

The Effect of Regulation on Inventor Mobility and Productivity

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Summary

- I study how regulatory burden affects the corporate innovation process using novel administrative data and machine learning.
- The government requires paperwork about innovation activities, to satisfy concerns about consumer safety, market competition, etc.
- From the text of these paperwork regulations:
 - Inventors' input is required for relevant paperwork regulations
 - Considerable heterogeneity in Time Burden across regulations
- Findings:** Inventors facing high levels of regulatory burden will experience decreased productivity, and reallocate from higher burden to lower burden positions.
- Important:** Regulation measures typically vary at the firm, industry, or country-level. To best answer this question, I construct a novel individual-specific measure.

Machine Learning

Train Structural Topic Model on Regulation Text:

- >25,000 regulations active between 1993 and 2020
- $K = 150$ Topics (lowest residuals and high perplexity)
- Include regulation-level covariates, such as issuing agency, issuing sub-agency, and implementation year
- Construct Topic Burden from Regulations' Burden and Topic Distributions

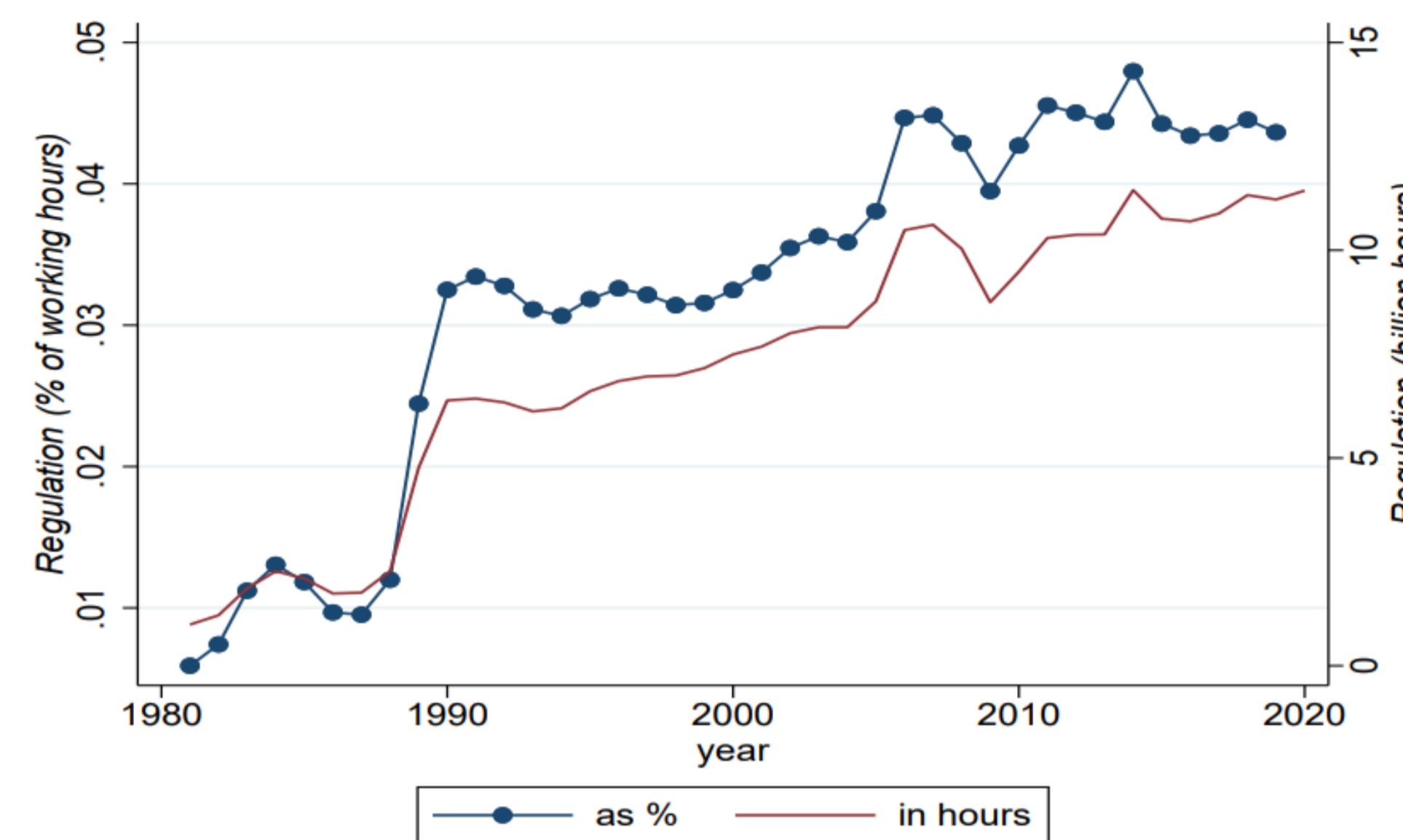
Apply Topic Model to Patent Corpus

- Generate topic distribution for each patent, e.g. Patent 1 is X% Topic 1, Y% Topic 2, and so on

Aggregate Patent Burdens to the Inventor-level

- Utility patents belong to technology classes
- Calculate Technology Class Burden as median (average) of individual patent burden each year
- Inventors work on multiple technology classes; use median (average) class burden for each inventor-year

Regulatory Burden over Time



*Excerpted from Kalmenovitz (2023)

Empirical Specification

$$\log(\mathbb{E}[y_{i,t} | \mathbf{x}]) = \beta_1 \text{RegB}_{i,t-1} + \beta \mathbf{X}_{i,t-1} + \alpha_i + \alpha_{ft}$$

- y = Inventor-level Innovation Outcomes
- RegB is the Regulatory Burden an inventor faces in the previous year
- $\mathbf{X}_{i,t-1}$ contains inventor-level controls, like experience (logged)
- $\alpha_i + \alpha_{ft}$ represent inventor and firm-by-year FE
- Results are identified within-inventor over time, net of firm trends

Main Results

Outcome:	Pr(Change Jobs)		Patent Output	
	(1)	(2)	(3)	(4)
Time Burden	0.001*** (2.67)		-0.018*** (-4.72)	
Time Burden × Star		0.006*** (8.08)		-0.109*** (-16.13)
Time Burden × Non-Star		0.0005 (1.23)		0.030*** (8.31)
Controls	Yes	Yes	Yes	Yes
Inventor FE	Yes	Yes	Yes	Yes
Firm × Year FE	Yes	Yes	Yes	Yes
Number of Observations	2.5M	2.5M	2.5M	2.5M

Economic Magnitude

- A 1 standard deviation increase in Time Burden is associated with a 17% increase in Pr(Changing Jobs) for Star Inventors. This is less than, but comparable to, firm bankruptcy's effect (67% for Top Talent (Baghai et al (2021)) and bank deregulation's effect (30-35% (Hombert and Matray (2017))).
- A 1 standard deviation increase in Time Burden is associated with an 11% decrease in productivity for Star Inventors, and a 3% increase for Non-Stars.

Additional Tests

- Find that quality of patents (citations) declines on average, driven by Non-Star patents
- Find similar results using firm-specific regulatory burden measures (Kalmenovitz (2023))
- Find similar results in US-based private inventors; currently working to expand sample to all inventors filing with the US Patent and Trademark Office

Contribution

- My findings quantify a cost of the US Federal Government's administrative burden on inventors. Inventors are more likely to switch jobs when faced with higher burden, and increases in burden are associated with decreased innovation output.



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