How Would AI Regulation Change Firms' Behavior?
Evidence from Thousands of Managers

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Motivation

- As the application of AI continues to expand, AI will likely have important consequences for jobs, inequality, competition, privacy, etc.
    - Potentially important role for regulation to address these consequences.

- However, AI regulation is at a very nascent stage and we know little of how different AI regulation might affect firm behavior.

- Currently, there are different approaches and proposals for AI regulation
    - Broad proposals of general AI regulation – Algorithm Accountability Act
    - Existing common law and statutory regulation
    - Domain-specific regulations by gov't agencies (e.g., FDA, NHTSA, FTC)
    - Data privacy regulation

- **How would AI related regulation affect firm behavior?**

What we do

- We conduct a randomized online survey experiment of managers in the US

- We randomly expose managers to information of AI-related regulations

- Ask managers about

  - Adoption of AI and innovative activities

  - Budget allocation of AI-related activities

  - Perception of ethical issues related to AI

  - Adjustment of labor

Outline of today

- Background on AI Regulation

- Empirical Strategy

- Data and sample

- Results

- Discussion

Characteristics of AI-related Regulation

- AI describes a broad set of technologies and applications.
    - Hard to generalize the rules for application and interactions
    - Hard to regulate a "tool"

- AI technology evolving and implemented across new scenarios
    - Hard for regulators to stay current
    - Adaptive regulation exemplifies the responsive approach to regulation – receive feedback from industry, a dynamic approach to regulation
    - Industries and the relevant agencies could differ in how they introduce and implement regulation

- Transformative technologies require new regulatory approaches
    - A new general guideline and a new governing agency

- Existing regulation can also be applied to various issues related to AI
    - Current tort law, civil rights law, labor law, etc. can regulate many of the issues that arise with AI in businesses

Online Survey Experiment

- We conduct a randomized online survey experiment on three broad industries
    - healthcare/pharmaceutical/bio-tech (healthcare), transportation/auto/distribution (automotive), and retail and wholesale.

- Expose managers in each of these industries to one of the following treatments
    - a **general AI regulation** treatment that invokes the proposed Algorithmic Accountability Act (T1);
    - **industry-specific regulation** treatments that invoke the relevant agencies, i.e., the FDA (for healthcare, pharmaceutical, and bio-tech), NHTSA (for automotive, transportation, and distribution), and the FTC (for retail and wholesale) (T2);
    - a treatment that reminds managers that AI adoption in businesses are subject to **existing common law and statutory requirements** such as tort law, labor law, and civil rights law (T3);
    - a **data privacy regulation** treatment based on the incoming (January 2020) California Consumer Privacy Act (T4)

- The three treatments in T2 mirror the actual content and current approach and considerations taken by industry-specific regulators, i.e., the FDA, NHTSA, and FTC.

- The other treatments (T1, T3, and T4) are industry-agnostic and all managers in the treatment group receive the same treatment regardless of industry.

Online Survey Experiment

Figure 1. Research design

Control group	Treatment group						Sample
	Treatment group 1	Treatment group 2			Treatment group 3	Treatment group 4	
Control treatment	General AI regulation treatment	FDA specific AI Regulation treatment			Existing AI-related regulation treatment	Data privacy regulation treatment	*Managers in healthcare, pharmaceutical, and bio-tech*
			NHTSA specific AI Regulation treatment				*Managers in transportation, auto, and distribution*
				FTC specific AI Regulation treatment			*Managers in retail and wholesale*

Survey: online, pdf

Control and treatment 1 texts

Control group	Recent research has found that early adopters of AI have started to reap the benefits of their investments in this technology. First-movers have already deployed and marketed AI-related solutions across healthcare, autonomous driving, retail and so on. Forty-seven percent of companies say they have embedded at least one AI capability in their business processes. While the potential for AI is vast, most organizations still have a long way to go in developing the core practices that enable them to realize the potential value of AI at scale. Business executives and managers will need to think about how to incorporate AI into their business strategy, as well as the transparency and "explainability" of AI algorithms, biases in data, and concerns about safety and privacy.
Treatment 1 – General AI Regulation	Recent research has found that early adopters of AI have started to reap the benefits of their investments in this technology. First-movers have already deployed and marketed AI-related solutions across healthcare, autonomous driving, retail and so on. Forty-seven percent of companies say they have embedded at least one AI capability in their business processes. Until now, states and the federal government have enacted little oversight and regulation specific to AI. But a new Algorithmic Accountability Act is expected to change that. Under this Act, firms that are using or selling AI-related products are subject to a variety of requirements governing their use of AI systems. Requirements include disclosure of firm usage of AI systems, including their development process or contractor of origin, AI system design, model training, and data gathered and in use. The Act also requires firms to disclose to a government agency the impact of their AI systems on safety, accuracy, fairness, bias, discrimination, and privacy. The regulation is expected to go into effect in 2020.

Treatment 2 texts

Treatment 2A – Agency-specific AI Regulation (FDA for Healthcare)	... The healthcare and drug sectors have been actively developing AI technologies for various purposes including patient diagnosis, treatment, drug development, and patient monitoring and care. The Food and Drug Administration (FDA) currently regulates the industry and has proposed a new regulatory framework for AI/Machine Learning-based software. This framework aims to examine and pre-approve the underlying performance of the firm's AI products before they are marketed, and post-approve any algorithmic modifications. In this process, the FDA will assess the firm's ability to manage risks associated with various issues such as, transparency and explainability (e.g., diagnosis recommendation algorithms), and security (e.g., use and protection of patient private information) of the AI/Machine Learning based software. FDA's proposed framework is expected to go into effect in 2020.
Treatment 2B – Agency-specific AI Regulation (NHTSA for Transportation)	… Autonomous vehicle capabilities have developed rapidly over the last decade and several large companies are currently using cities as testing grounds for unmanned vehicles. The National Highway Traffic and Safety Administration (NHTSA) regulates the autonomous vehicle and logistics industry. NHTSA has specified that its current safety standards constitute an unintended regulatory barrier to innovation of autonomous driving vehicles. For automated driving technologies, NHTSA has emphasized the importance of removing unnecessary barriers and is issuing voluntary guidance rather than regulations that could stifle innovation. NHTSA's existing regulations and vehicle safety standards remain in effect until a revised framework for automated driving systems is established.
Treatment 2C – Agency-specific AI Regulation (FTC for Retail and Wholesale)	… The retail sector has been especially fast at deploying and monetizing a range of AI technologies on online and e-commerce platforms. As a result, the Federal Trade Commission (FTC) has engaged in hearings to safeguard consumers from unfair and deceptive practices. For retailers deploying AI technologies, revamped oversight by the FTC will likely require these firms to assess and disclose the impact of their AI systems on various issues. Potential issues include algorithmic discrimination and bias (e.g. in online adds / micro-targeting of consumer groups), transparency (e.g. product recommendation engines) and security (e.g. use and protection of consumers private information). Based on past hearings, new guidelines are expected to be released in 2020.

Treatment 3 & 4 texts

Treatment 3 – Existing AI-related Regulation	… Although some observers believe little oversight and regulation has been attached to the area of AI training and product deployment, firms using AI technology in the United States generally are subject to common law and statutory requirements. ==Existing law (e.g., tort law) may require that a company avoid any negligent use of AI to make decisions or provide information that could result in harm to the public. Current employment, labor, and civil rights laws create the risk that a company using AI to make hiring or termination decisions could face liability for its decisions involving human resources.== These legal requirements apply now, and will likely continue applying to future products, services, and company practices.
Treatment 4 – Data Privacy Regulation	… As the development of AI-related products requires more data, policymakers and the public are increasingly concerned about data privacy. For example, California's recently-enacted digital privacy initiative, the California Consumer Privacy Act of 2018 (CCPA), will affect all businesses buying, selling or otherwise trading the "personal information" of California residents — including companies using online-generated data from residents across their products. ==In order to stay compliant with the regulation, firms must disclose how they use and store personal data, and how they conform with data privacy rules.== California's regulation goes into effect in 2020. Other states are expected to enact similar data privacy regulations in the near future.

Sample and data

- We recruit managers in the US using SurveyMonkey Audience.
  - Focus on managers in businesses of at least 50 employees, since they are likely to be well-aware of the types of technologies being used at their businesses and be involved in the decisions surrounding adoption.
  - The managers we recruited include owners and partners of businesses, C-level executives, and senior and middle managers in the three broad industries discussed above.

- Launched the survey in August 2019.

- Sample size 1,245 managers.
  - Collected 2,610 responses. Of these, about 20.9% of the responses were from non-managers and about 33.8% were from businesses with less than 50 employees. We exclude those as well as those who indicated that they did not devote full attention to answering the questions (about 9.9%). We also dropped responses from those who finished the survey in an unreasonably short time, i.e., the first percentile of response time.

- The average response time in this sample was about 7.3 minutes.

Key outcome variables – AI adoption

14. **To what extent would you adopt AI?** Please respond in terms of the **total number of business processes** in which you would adopt any AI technology. If your business is currently adopting AI please include those processes in the total number.

- ( ) 0 – No adoption
- ( ) 1 business process
- ( ) 2 business processes
- ( ) 3 business processes
- ( ) 4 business processes
- ( ) 5 business processes
- ( ) 6 business processes
- ( ) 7 business processes
- ( ) 8 business processes
- ( ) 9 business processes
- ( ) 10 or more business processes

Key outcome variables – AI budget allocation

16. Adopting AI technology could entail a variety of costs. For example, there could be costs related to hiring technical workers, purchasing AI packages, computers and data centers, purchasing or gathering data, research and development, developing AI strategies for your business, consulting fees, assessing the impact of AI product and services.

How much would you budget for AI adoption at your company in the following year? Please consider all potential costs and write in the dollar amount in whole numbers.

[ ]

17. **What percentage** of the above total AI budget would you allocate to **each of the below 6 expense categories?** Please write down the percentages in integers without the % sign. The **percentages should add up to 100.** Write down 0 for any category that you would not allocate any expenses to.

AI-related research and development (e.g., R&D costs related to creating new AI products or processes)

[ ]

Hiring the workforce to manage, operate, and maintain AI systems at your company (e.g., managers, technicians, programmers, etc. but excluding R&D workers)

[ ]

AI training for existing employees (e.g., coding, how to use AI technology, etc.)

[ ]

Purchase of AI packages from external vendors (e.g., AI software, analysis fees, etc.)

[ ]

Computing resources and data related costs for AI systems at your company (e.g., computers, cloud computing, data collection and purchase costs, etc.)

[ ]

Developing AI strategy that is compatible with your company's overall business strategy (e.g., consulting and marketing costs, internal strategy development, assess ethical impact, etc.)

[ ]

Key outcome variables – AI innovation activities/ ethical issues

18. How would you adjust each of below AI related innovation activities at your workplace next year?

	Decrease greatly	Decrease slightly	The same	Increase slightly	Increase greatly	Not relevant for this workplace
Co-operation on AI related R&D activities with other institutions (universities, research institutes, other businesses, etc.)	○	○	○	○	○	○
Filing of AI related patents	○	○	○	○	○	○
Introduction of an AI related good, service, or production/delivery method that is new or significantly improved	○	○	○	○	○	○

19. AI-related technologies can introduce various ethical issues in businesses. How important would you consider each of the following ethical issue when adopting AI at your business?

	Not important	Slightly important	Moderately important	Important	Very important
Layoffs or labor related issues due to AI adoption	○	○	○	○	○
Racial and gender bias/discrimination from AI algorithms	○	○	○	○	○
Safety and accidents related AI technologies	○	○	○	○	○
Privacy and data security issues related to AI adoption	○	○	○	○	○
Transparency and explainability of AI algorithms	○	○	○	○	○

Key outcome variables – AI ethics / labor

21. What would you do to the below employees at your workplace in response to AI adoption next year? **Please respond how you would adjust the number of each worker type because of AI adoption at your workplace next year.**

	Decrease greatly	Decrease slightly	The same	Increase slightly	Increase greatly	Not relevant for this workplace
Managers	○	○	○	○	○	○
Technical workers (R&D workers, IT technicians, programmers, etc.)	○	○	○	○	○	○
Office workers (e.g., HR, accounting, secretarial workers, etc. but not in managerial positions)	○	○	○	○	○	○
Service workers (e.g., customer service, client service, care workers etc.)	○	○	○	○	○	○
Sales workers	○	○	○	○	○	○
Production workers	○	○	○	○	○	○

Randomization

	Control group		General AI regulation		Agency-specific AI regulation		Existing AI-related regulation		Data privacy regulation		Total	
					Treatment group							

Panel A. Individual characteristics

	Control group		General AI regulation		Agency-specific AI regulation		Existing AI-related regulation		Data privacy regulation		Total	
Owner or partner	0.166	(0.024)	0.172	(0.024)	0.187	(0.024)	0.118	(0.020)	0.134	(0.022)	0.156	(0.010)
CEO or C-level executive	0.145	(0.023)	0.143	(0.022)	0.135	(0.021)	0.169	(0.024)	0.155	(0.023)	0.149	(0.010)
Managers	0.689	(0.030)	0.684	(0.030)	0.678	(0.029)	0.713	(0.028)	0.711	(0.029)	0.695	(0.013)
Bachelor's degree or above	0.593	(0.032)	0.566	(0.032)	0.547	(0.031)	0.591	(0.031)	0.573	(0.032)	0.573	(0.014)
White	0.664	(0.030)	0.574	(0.032)**	0.622	(0.030)	0.626	(0.030)	0.640	(0.031)	0.625	(0.014)
Black	0.149	(0.023)	0.221	(0.027)**	0.191	(0.024)	0.197	(0.025)	0.163	(0.024)	0.185	(0.011)
Asian	0.054	(0.015)	0.041	(0.013)	0.064	(0.015)	0.043	(0.013)	0.050	(0.014)	0.051	(0.006)
Hispanic	0.075	(0.017)	0.078	(0.017)	0.096	(0.019)	0.098	(0.019)	0.075	(0.016)	0.084	(0.008)
Other	0.021	(0.009)	0.016	(0.008)	0.007	(0.005)	0.008	(0.006)	0.025	(0.010)	0.015	(0.003)
Female	0.656	(0.031)	0.689	(0.030)	0.629	(0.030)	0.650	(0.030)	0.715	(0.029)	0.667	(0.013)
Age less than 30	0.349	(0.031)	0.381	(0.031)	0.348	(0.029)	0.315	(0.029)	0.364	(0.031)	0.351	(0.014)
Age 30 to 45	0.402	(0.032)	0.365	(0.031)	0.419	(0.030)	0.417	(0.031)	0.377	(0.031)	0.397	(0.014)
Age above 45	0.249	(0.028)	0.254	(0.028)	0.232	(0.026)	0.268	(0.028)	0.259	(0.028)	0.252	(0.012)

Panel B. Workplace characteristics

	Control group		General AI regulation		Agency-specific AI regulation		Existing AI-related regulation		Data privacy regulation		Total	
Small business (less than 500 emp.)	0.456	(0.032)	0.467	(0.032)	0.509	(0.031)	0.433	(0.031)	0.435	(0.032)	0.461	(0.014)
Large business (500 or more emp.)	0.544	(0.032)	0.533	(0.032)	0.491	(0.031)	0.567	(0.031)	0.565	(0.032)	0.539	(0.014)
Revenue less than 1M	0.203	(0.026)	0.262	(0.028)	0.228	(0.026)	0.224	(0.026)	0.201	(0.026)	0.224	(0.012)
Revenue 1M to 9.9M	0.253	(0.028)	0.275	(0.029)	0.281	(0.028)	0.240	(0.027)	0.318	(0.030)	0.273	(0.013)
Revenue 10M to 99M	0.253	(0.028)	0.189	(0.025)*	0.199	(0.024)	0.244	(0.027)	0.234	(0.027)	0.223	(0.012)
Revenue 100M or more	0.290	(0.029)	0.275	(0.029)	0.292	(0.028)	0.291	(0.029)	0.247	(0.028)	0.280	(0.013)
Low management practices	0.481	(0.032)	0.426	(0.032)	0.442	(0.030)	0.437	(0.031)	0.444	(0.032)	0.446	(0.014)
High management practices	0.519	(0.032)	0.574	(0.032)	0.558	(0.030)	0.563	(0.031)	0.556	(0.032)	0.554	(0.014)
Previous budget less than 100K	0.257	(0.028)	0.287	(0.029)	0.262	(0.027)	0.252	(0.027)	0.276	(0.029)	0.267	(0.013)
Previous budget 100K to 999K	0.539	(0.032)	0.500	(0.032)	0.472	(0.031)	0.465	(0.031)	0.464	(0.032)	0.488	(0.014)
Previous budget 1M or more	0.614	(0.031)	0.570	(0.032)	0.607	(0.030)	0.614	(0.031)	0.598	(0.032)	0.601	(0.014)
Natural language processing in use	0.739	(0.028)	0.738	(0.028)	0.734	(0.027)	0.752	(0.027)	0.736	(0.029)	0.740	(0.012)
Computer vision processing in use	0.693	(0.030)	0.717	(0.029)	0.719	(0.028)	0.709	(0.029)	0.745	(0.028)	0.716	(0.013)
Machine learning processing in use	0.763	(0.027)	0.758	(0.027)	0.775	(0.026)	0.752	(0.027)	0.791	(0.026)	0.768	(0.012)
No. of observations	241		244		239		254		267		1245	

Results - Adoption

Coefficient plot of the treatment effects of AI regulation on adoption
– Censored Poisson regressions
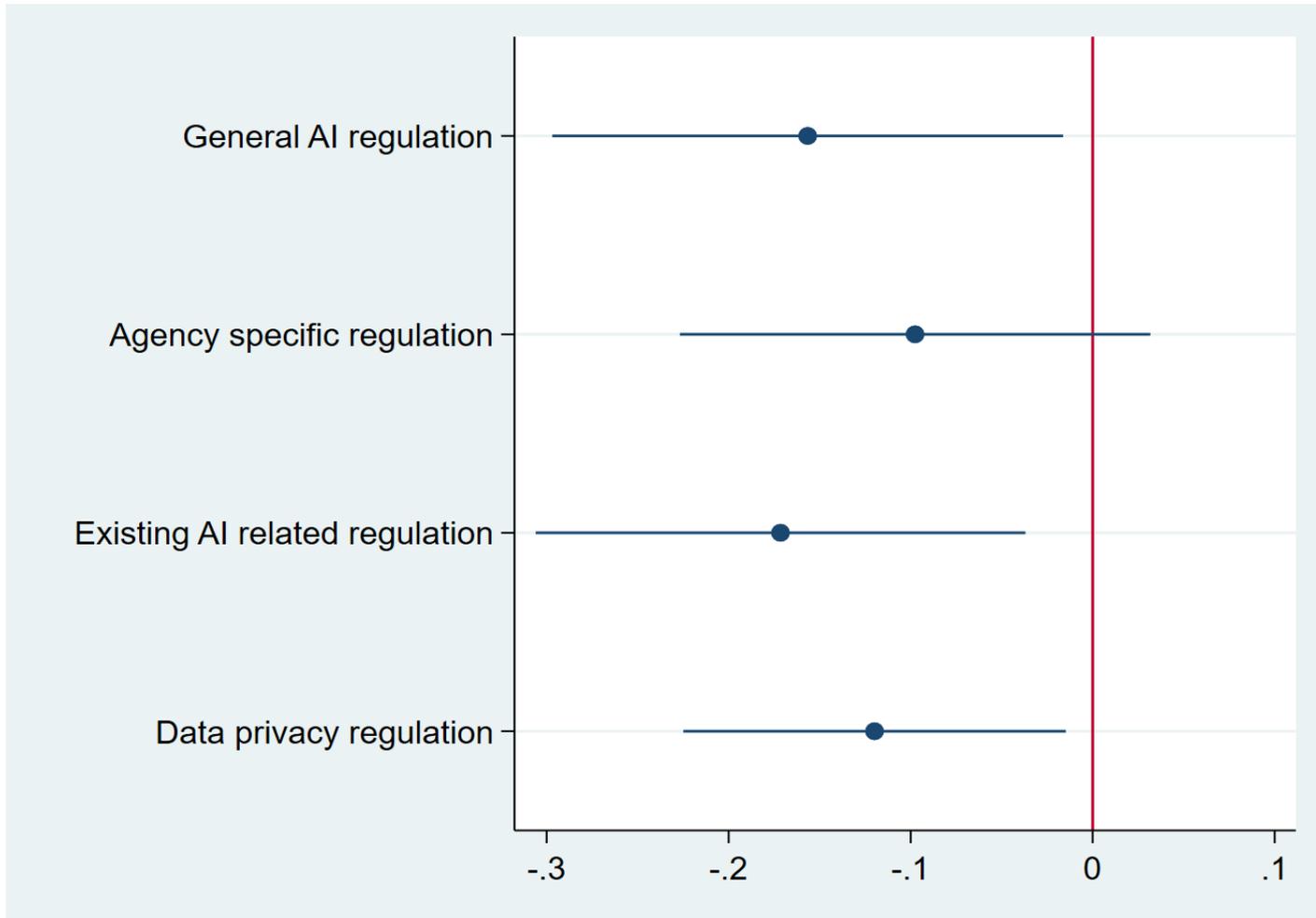
Notes: The dots represent the coefficient estimates from the regression and the bar represents the 95% confidence interval. Each coefficient estimate represents the difference between each treatment group and the control group.

Adoption of AI

	(1)	(2)	(3)	(4)	(5)	(6)
			Number of business processes to adopt AI			
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A. OLS regression results			
General AI regulation	-0.579**	-0.524**	-0.515**	-0.474*	-0.513**	-0.553**
	(0.235)	(0.245)	(0.252)	(0.254)	(0.258)	(0.260)
Agency-specific AI regulation	-0.374	-0.298	-0.296	-0.272	-0.325	-0.385
	(0.244)	(0.251)	(0.246)	(0.243)	(0.258)	(0.245)
Existing AI-related regulation	-0.511**	-0.513**	-0.498**	-0.489*	-0.575**	-0.622**
	(0.253)	(0.250)	(0.250)	(0.248)	(0.250)	(0.246)
Data privacy regulation	-0.295	-0.289	-0.312	-0.308	-0.368*	-0.443**
	(0.205)	(0.206)	(0.196)	(0.191)	(0.197)	(0.196)
Observations	1,245	1,245	1,245	1,245	1,245	1,245
R-squared	0.005	0.061	0.099	0.113	0.157	0.232
			Panel B. Censored Poisson regression results			
General AI regulation	-0.167**	-0.150**	-0.147**	-0.136*	-0.152**	-0.157**
	(0.0679)	(0.0689)	(0.0704)	(0.0706)	(0.0709)	(0.0716)
Agency-specific AI regulation	-0.105	-0.0827	-0.0804	-0.0770	-0.0923	-0.0975
	(0.0682)	(0.0685)	(0.0666)	(0.0654)	(0.0692)	(0.0659)
Existing AI-related regulation	-0.146**	-0.148**	-0.138*	-0.137*	-0.166**	-0.171**
	(0.0731)	(0.0708)	(0.0707)	(0.0703)	(0.0694)	(0.0687)
Data privacy regulation	-0.0817	-0.0816	-0.0867*	-0.0844*	-0.101*	-0.120**
	(0.0568)	(0.0563)	(0.0526)	(0.0512)	(0.0526)	(0.0536)
Observations	1,245	1,245	1,245	1,245	1,245	1,245
Firm level controls	No	Yes	Yes	Yes	Yes	Yes
Individual controls	No	No	Yes	Yes	Yes	Yes
Management controls	No	No	No	Yes	Yes	Yes
Budget experience	No	No	No	No	Yes	Yes
Current AI adoption	No	No	No	No	No	Yes

Notes: Firm level controls include state, industry, firm size, and firm revenue fixed effects. Individual controls include gender, race, education, and age fixed effects. Management controls include management practice variables related to promotion and firing, and organizational role fixed effects. Budget experience includes dummy variables that control for the largest budget previously managed. Current AI adoption includes dummy variables indicating whether the business currently uses natural language processing, computer vision, or machine learning. Standard errors clustered at the state-industry level are presented in parentheses. ***, **, and * denote statistical significant at 1%, 5%, and 10% level.

Results – Budget allocation

Coefficient plot of the treatment effects of AI regulation on budget allocation

Notes: The dots represent the coefficient estimates from the regression and the bar represents the 95% confidence interval. Each coefficient estimate represents the difference between each treatment group and the control group.

AI budget and allocation

	Log(AI budget)		Budget allocation					
			Developing AI strategy	AI-related R&D	Hiring workers related to business' AI system	AI training for existing employees	Purchase AI package from vendors	Computing resource and data for AI system
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
General AI regulation	-0.0139	0.190	2.966**	0.102	2.237*	-2.349*	-1.749	-1.208
	(0.421)	(0.294)	(1.229)	(2.076)	(1.333)	(1.333)	(1.360)	(0.893)
Agency-specific AI regulation	0.506	0.383*	2.221*	-0.307	0.466	-1.493	-1.880*	0.993
	(0.391)	(0.197)	(1.206)	(1.754)	(1.126)	(1.168)	(1.098)	(1.049)
Existing AI-related regulation	-0.254	-0.00226	2.735*	0.307	-0.221	-1.956	-1.977	1.113
	(0.384)	(0.223)	(1.395)	(2.279)	(1.148)	(1.328)	(1.214)	(0.986)
Data privacy regulation	0.198	0.0580	0.410	0.636	0.871	-1.684	-1.083	0.850
	(0.419)	(0.224)	(1.207)	(1.899)	(1.350)	(1.025)	(1.212)	(0.971)
Observations	1,245	813	1,245	1,245	1,245	1,245	1,245	1,245
R-squared	0.262	0.347	0.094	0.094	0.084	0.074	0.102	0.080
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Management controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Budget experience	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Current AI adoption	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Firm level controls include state, industry, firm size, and firm revenue fixed effects. Individual controls include gender, race, education, and age fixed effects. Management controls include management practice variables related to promotion and firing, and organizational role fixed effects. Budget experience includes dummy variables that control for the largest budget previously managed. Current AI adoption includes dummy variables indicating whether the business currently uses natural language processing, computer vision, or machine learning. Standard errors clustered at the state-industry level are presented in parentheses. ***, **, and * denote statistical significant at 1%, 5%, and 10% level.

Results – Innovation activities

Coefficient plot of the treatment effects of AI regulation on innovation activities
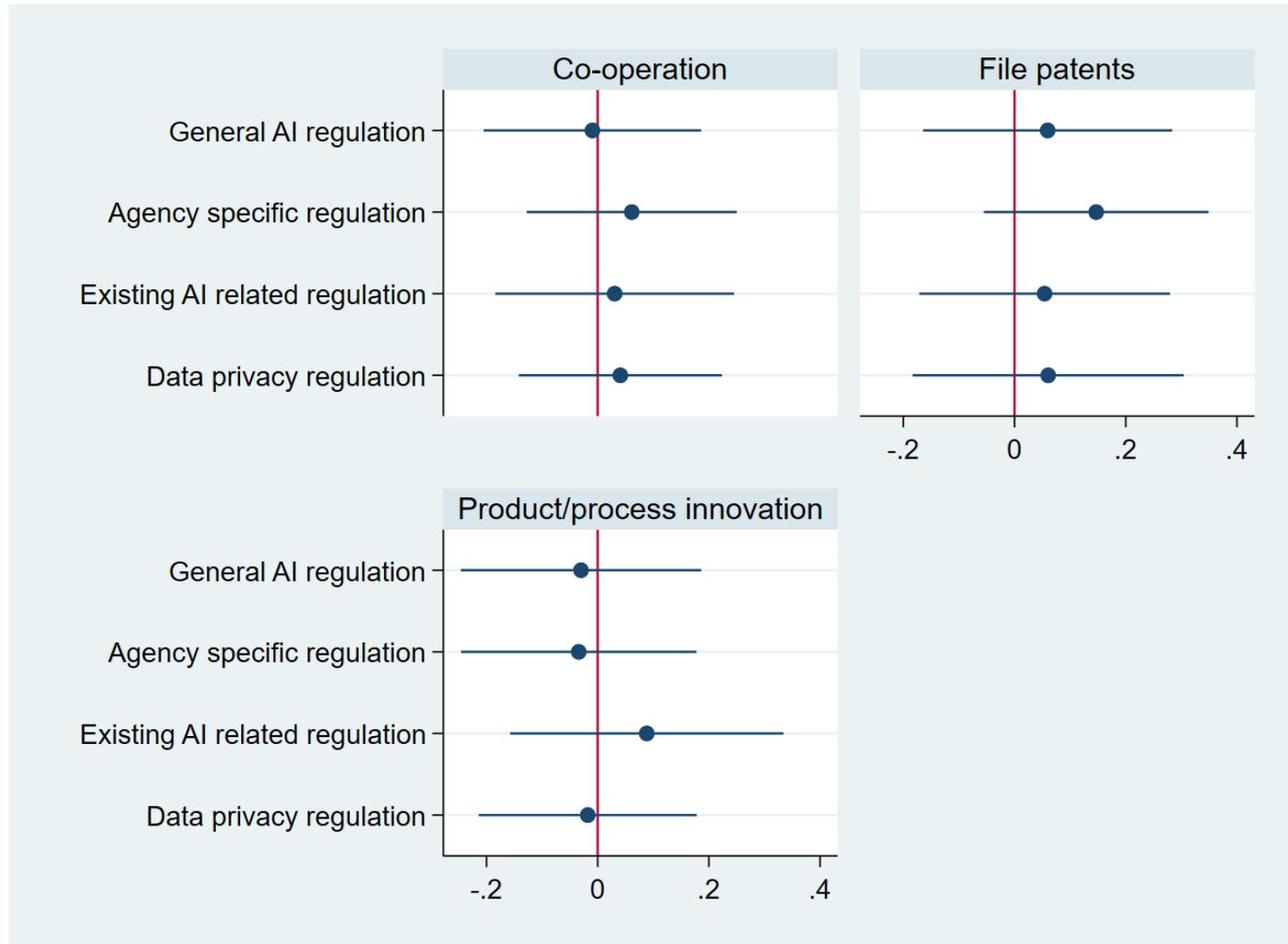
Notes: The dots represent the coefficient estimates from the regression and the bar represents the 95% confidence interval. Each coefficient estimate represents the difference between each treatment group and the control group.

AI-related innovation activity

	Ordered probit regression results		
	Co-operation on AI-related R&D	AI-related patenting	AI-related product or process innovation
	(1)	(2)	(3)
General AI regulation	-0.00666	0.0550	-0.0307
	(0.0919)	(0.102)	(0.109)
Agency-specific AI regulation	0.0555	0.144	-0.0355
	(0.0894)	(0.0922)	(0.107)
Existing AI-related regulation	0.0276	0.0510	0.0921
	(0.101)	(0.104)	(0.125)
Data privacy regulation	0.0407	0.0563	-0.0178
	(0.0866)	(0.112)	(0.0988)
Observations	1,245	1,245	1,245
R-squared			
Firm level controls	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes
Management controls	Yes	Yes	Yes
Budget experience	Yes	Yes	Yes
Current AI adoption	Yes	Yes	Yes

Notes: Firm level controls include state, industry, firm size, and firm revenue fixed effects. Individual controls include gender, race, education, and age fixed effects. Management controls include management practice variables related to promotion and firing, and organizational role fixed effects. Budget experience includes dummy variables that control for the largest budget previously managed. Current AI adoption includes dummy variables indicating whether the business currently uses natural language processing, computer vision, or machine learning. Standard errors clustered at the state-industry level are presented in parentheses. ***, **, and * denote statistical significant at 1%, 5%, and 10% level.

Results – Importance of ethical issues

Coefficient plot of the treatment effects of AI regulation on ethical issues
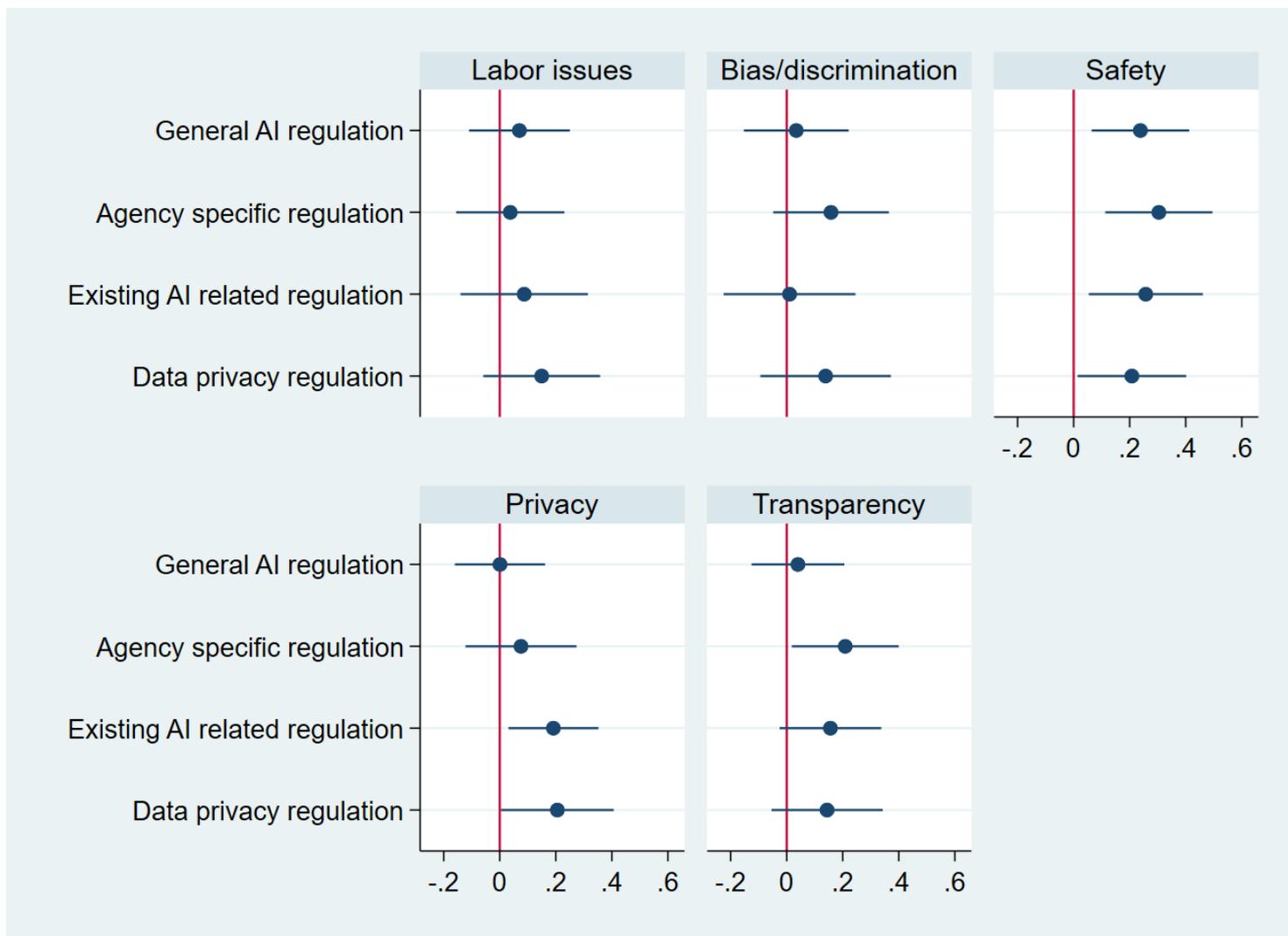
Notes: The dots represent the coefficient estimates from the regression and the bar represents the 95% confidence interval. Each coefficient estimate represents the difference between each treatment group and the control group.

Importance of ethical issues related to AI

	Ordered probit regression results				
	Labor issues	Bias and discrimination	Safety and accidents	Privacy and data security	Transparency and explainability
	(1)	(2)	(3)	(4)	(5)
General AI regulation	0.0697	0.0411	0.237***	0.00648	0.0426
	(0.0870)	(0.0848)	(0.0877)	(0.0834)	(0.0842)
Agency-specific AI regulation	0.0382	0.154*	0.300***	0.0896	0.215**
	(0.0937)	(0.0914)	(0.0962)	(0.103)	(0.0978)
Existing AI-related regulation	0.0843	0.0112	0.248**	0.217**	0.157*
	(0.111)	(0.106)	(0.102)	(0.0869)	(0.0948)
Data privacy regulation	0.146	0.131	0.194**	0.229**	0.157
	(0.101)	(0.105)	(0.0964)	(0.109)	(0.104)
Observations	1,245	1,245	1,245	1,245	1,245
Firm level controls	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes
Management controls	Yes	Yes	Yes	Yes	Yes
Budget experience	Yes	Yes	Yes	Yes	Yes
Current AI adoption	Yes	Yes	Yes	Yes	Yes

Notes: Firm level controls include state, industry, firm size, and firm revenue fixed effects. Individual controls include gender, race, education, and age fixed effects. Management controls include management practice variables related to promotion and firing, and organizational role fixed effects. Budget experience includes dummy variables that control for the largest budget previously managed. Current AI adoption includes dummy variables indicating whether the business currently uses natural language processing, computer vision, or machine learning. Standard errors clustered at the state-industry level are presented in parentheses. ***, **, and * denote statistical significant at 1%, 5%, and 10% level.

Results – Adjustment of labor

Coefficient plot of the treatment effects of AI regulation on labor
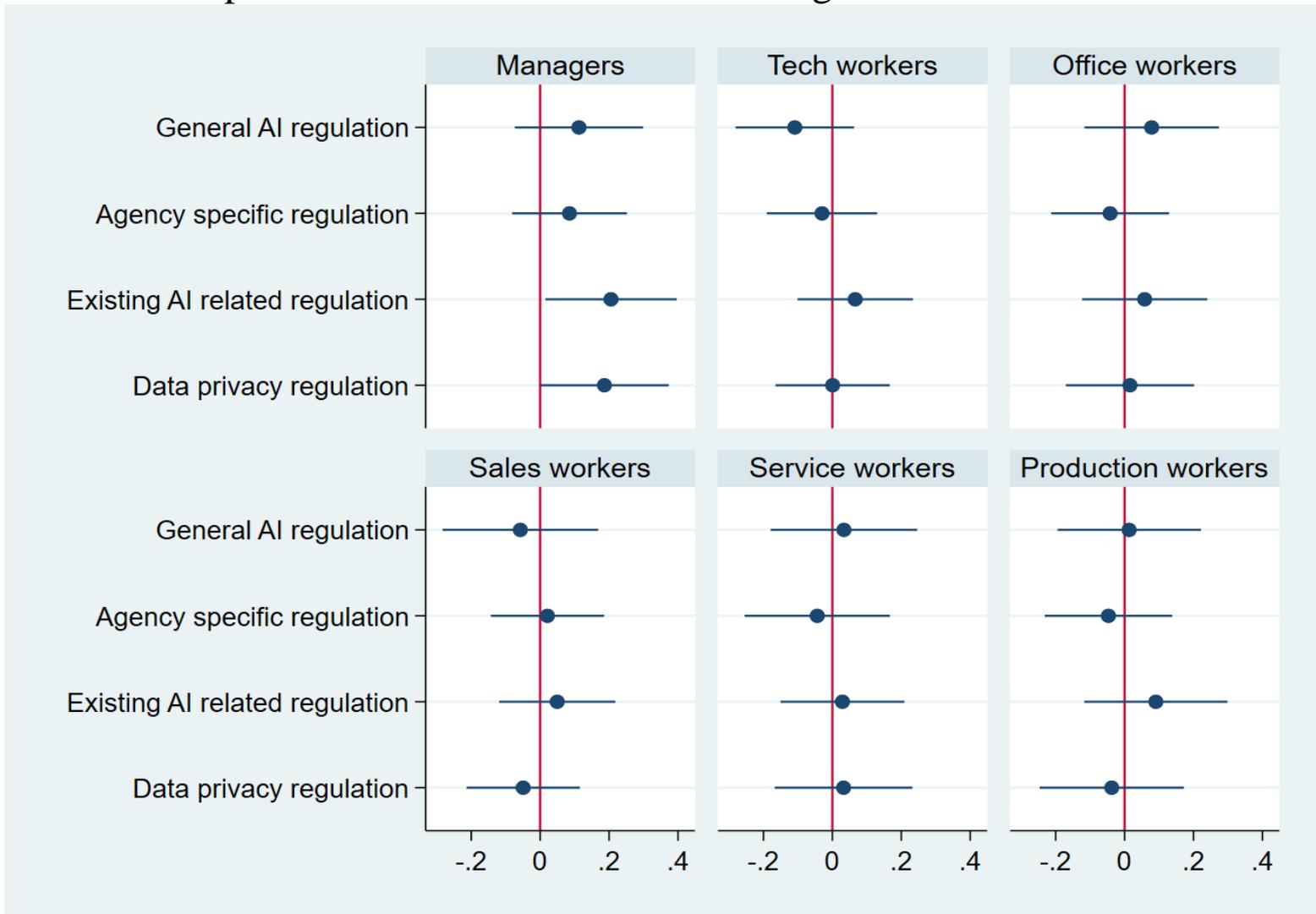
Notes: The dots represent the coefficient estimates from the regression and the bar represents the 95% confidence interval. Each coefficient estimate represents the difference between each treatment group and the control group.

Labor adjustment due to AI adoption

	Managers	Technical workers	Office workers	Sales workers	Service workers	Production workers
	Ordered probit regression results					
	(1)	(2)	(3)	(4)	(5)	(6)
General AI regulation	0.134	-0.125	0.0875	-0.0671	0.0342	0.0180
	(0.102)	(0.0948)	(0.109)	(0.120)	(0.112)	(0.115)
Agency-specific AI regulation	0.0982	-0.0474	-0.0487	0.0223	-0.0470	-0.0532
	(0.0925)	(0.0907)	(0.0946)	(0.0875)	(0.111)	(0.101)
Existing AI-related regulation	0.238**	0.0791	0.0646	0.0577	0.0270	0.101
	(0.103)	(0.0927)	(0.100)	(0.0896)	(0.0956)	(0.114)
Data privacy regulation	0.209**	-0.00362	0.0153	-0.0569	0.0315	-0.0455
	(0.104)	(0.0923)	(0.103)	(0.0862)	(0.105)	(0.114)
Observations	1,201	1,195	1,201	1,172	1,185	1,152
Firm level controls	Yes	Yes	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Management controls	Yes	Yes	Yes	Yes	Yes	Yes
Budget experience	Yes	Yes	Yes	Yes	Yes	Yes
Current AI adoption	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Firm level controls include state, industry, firm size, and firm revenue fixed effects. Individual controls include gender, race, education, and age fixed effects. Management controls include management practice variables related to promotion and firing, and organizational role fixed effects. Budget experience includes dummy variables that control for the largest budget previously managed. Current AI adoption includes dummy variables indicating whether the business currently uses natural language processing, computer vision, or machine learning. Standard errors clustered at the state-industry level are presented in parentheses. ***, **, and * denote statistical significant at 1%, 5%, and 10% level.

Summary up to now

- AI regulation generally reduces the rate of adoption of AI technologies
  - However, industry and agency-specific AI regulation has a less negative impact on firms rate of AI adoption than does general AI regulation. The industry- and agency-specific focus seems to lower the cost of regulation to firms.

- AI regulation induces firms to "think."
  - AI regulation increases spending on developing AI strategy
    - At the cost of training existing employees
  - AI regulation increases hiring more managers.

- AI regulation increases firms' perceptions of the importance of safety, privacy, and transparency issues related to AI.

Results by industry

	A. Adoption	B. Budget allocation							C. Innovation activity		
	No. of business processes to adopt AI	Log(AI budget)	Developing AI strategy	AI-related R&D	Hiring related to business' AI system	AI training for existing employees	Purchase AI package from vendors	Computing resource and data	Co-operation on R&D	AI-related patenting	AI-related product or process innovation
	Censored Poisson	OLS	OLS	OLS	OLS	OLS	OLS	OLS	Ordered Probit	Ordered Probit	Ordered Probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
General AI regulation											
x Healthcare	-0.178*	0.0520	1.785	-1.003	3.102	-1.470	-1.570	-0.844	0.0199	0.416***	0.260
	(0.107)	(0.664)	(1.857)	(3.295)	(2.016)	(1.943)	(2.177)	(1.401)	(0.127)	(0.152)	(0.163)
x Automotive	0.0631	0.371	7.739***	2.883	1.904	-6.873**	-1.716	-3.937**	-0.213	-0.233	-0.136
	(0.141)	(0.774)	(2.437)	(3.737)	(3.108)	(3.091)	(3.087)	(1.756)	(0.211)	(0.219)	(0.230)
x Retail and wholesale	-0.233*	-0.358	2.042	0.564	1.354	-1.339	-2.046	-0.575	0.0679	-0.259**	-0.365**
	(0.122)	(0.686)	(2.016)	(3.268)	(2.189)	(1.680)	(1.845)	(1.449)	(0.158)	(0.123)	(0.148)
Agency-specific AI regulation											
x Healthcare	-0.0336	1.287**	-1.051	-0.453	1.762	-2.157	-2.106	4.005**	0.131	0.357***	0.106
	(0.0947)	(0.569)	(1.758)	(2.647)	(2.003)	(1.516)	(1.346)	(1.666)	(0.146)	(0.128)	(0.154)
x Automotive	0.0508	0.647	6.838***	0.650	-0.571	-2.472	-2.409	-2.036	-0.0310	-0.0593	0.0887
	(0.155)	(0.730)	(2.501)	(2.512)	(2.290)	(3.059)	(3.147)	(1.834)	(0.176)	(0.152)	(0.207)
x Retail and wholesale	-0.240**	-0.515	3.648**	-0.408	-0.433	-0.464	-1.282	-1.061	0.0193	-0.0320	-0.303*
	(0.119)	(0.597)	(1.735)	(3.321)	(1.660)	(1.704)	(1.761)	(1.642)	(0.149)	(0.169)	(0.172)
Existing AI-related regulation											
x Healthcare	-0.163	-0.231	1.054	0.284	0.559	-1.990	-2.526*	2.618*	0.0292	0.288*	0.230
	(0.102)	(0.715)	(2.045)	(3.598)	(1.612)	(2.226)	(1.522)	(1.495)	(0.130)	(0.165)	(0.170)
x Automotive	0.0494	0.399	7.360*	-2.642	-1.483	-2.237	-1.061	0.0643	-0.190	-0.0768	0.278
	(0.184)	(0.747)	(3.838)	(4.219)	(2.491)	(3.292)	(3.207)	(2.618)	(0.205)	(0.155)	(0.209)
x Retail and wholesale	-0.282**	-0.695	2.441	1.975	-0.539	-1.807	-1.872	-0.198	0.130	-0.176	-0.184
	(0.111)	(0.568)	(1.930)	(3.958)	(2.070)	(1.690)	(2.128)	(1.250)	(0.196)	(0.152)	(0.211)
Data privacy regulation											
x Healthcare	-0.0941	0.449	-1.738	0.158	0.245	0.00918	-1.394	2.719*	0.0225	0.229	-0.0188
	(0.0826)	(0.676)	(1.924)	(2.741)	(2.121)	(1.437)	(1.481)	(1.383)	(0.137)	(0.173)	(0.157)
x Automotive	0.139	0.426	6.707*	-2.284	1.806	-5.989**	0.923	-1.163	-0.166	-0.218	0.119
	(0.121)	(0.725)	(3.786)	(3.207)	(3.239)	(2.839)	(3.550)	(2.068)	(0.202)	(0.269)	(0.180)
x Retail and wholesale	-0.263***	-0.275	-0.123	2.708	0.915	-1.438	-1.657	-0.405	0.155	-0.0530	-0.147
	(0.0857)	(0.709)	(1.166)	(3.643)	(2.023)	(1.596)	(2.133)	(1.584)	(0.126)	(0.167)	(0.152)
Observations		1,245	1,245	1,245	1,245	1,245	1,245	1,245	1,245	1,245	1,245
R-squared		0.266	0.101	0.097	0.086	0.079	0.103	0.088			

Results by industry - continued

	D. Importance of ethical issues					E. Adjustment to labor					
	Labor issues	Bias and discrimination	Safety and accidents	Privacy and data security	Transparency and explainability	Managers	Technical workers	Office workers	Sales workers	Service workers	Production workers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
General AI regulation					\						
x Healthcare	0.0956	0.183	0.326***	0.226	0.0690	0.191	-0.0701	0.0990	-0.228	0.0705	-0.130
	(0.105)	(0.127)	(0.115)	(0.146)	(0.137)	(0.155)	(0.150)	(0.160)	(0.191)	(0.136)	(0.164)
x Automotive	0.208	-0.00237	0.343	-0.0222	0.146	0.0799	-0.0718	0.185	-0.123	0.206	0.407
	(0.235)	(0.241)	(0.255)	(0.210)	(0.182)	(0.213)	(0.213)	(0.172)	(0.229)	(0.305)	(0.253)
x Retail and wholesale	-0.0199	-0.114	0.0756	-0.246**	-0.0250	0.0767	-0.205	0.0159	0.143	-0.0966	0.0286
	(0.161)	(0.127)	(0.165)	(0.122)	(0.145)	(0.161)	(0.165)	(0.198)	(0.191)	(0.210)	(0.192)
Agency-specific AI regulation											
x Healthcare	0.0917	0.249*	0.307***	0.154	0.175	0.109	-0.0576	-0.0772	-0.0531	-0.0265	-0.152
	(0.145)	(0.138)	(0.111)	(0.160)	(0.167)	(0.139)	(0.136)	(0.139)	(0.126)	(0.155)	(0.154)
x Automotive	0.114	0.245	0.568**	0.189	0.228	0.185	-0.251*	0.117	0.0776	0.0801	0.161
	(0.186)	(0.222)	(0.221)	(0.238)	(0.202)	(0.257)	(0.145)	(0.219)	(0.233)	(0.218)	(0.210)
x Retail and wholesale	-0.0533	-0.00882	0.141	-0.0471	0.270**	0.0323	0.0939	-0.106	0.0923	-0.140	-0.0288
	(0.160)	(0.130)	(0.187)	(0.155)	(0.118)	(0.126)	(0.171)	(0.142)	(0.127)	(0.223)	(0.173)
Existing AI-related regulation											
x Healthcare	-0.0797	0.0156	0.158	0.178	0.0134	0.266*	-0.0115	0.0307	-0.101	0.0352	-0.0512
	(0.175)	(0.172)	(0.156)	(0.127)	(0.156)	(0.154)	(0.127)	(0.132)	(0.137)	(0.124)	(0.192)
x Transportation	0.124	0.0860	0.450*	0.455*	0.351*	0.360	0.263	0.382**	0.235	0.332*	0.348*
	(0.258)	(0.253)	(0.252)	(0.240)	(0.207)	(0.277)	(0.207)	(0.188)	(0.263)	(0.184)	(0.208)
x Retail and wholesale	0.221	-0.0475	0.224	0.121	0.221	0.139	0.0926	-0.0558	0.151	-0.131	0.167
	(0.164)	(0.152)	(0.155)	(0.121)	(0.135)	(0.166)	(0.175)	(0.202)	(0.144)	(0.190)	(0.185)
Data privacy regulation											
x Healthcare	0.151	0.0348	0.188	0.155	0.0705	0.112	-0.00270	-0.101	-0.164	-0.0189	-0.200
	(0.148)	(0.173)	(0.138)	(0.155)	(0.174)	(0.174)	(0.132)	(0.153)	(0.141)	(0.179)	(0.138)
x Automotive	0.145	0.213	0.195	0.391	0.227	0.442*	0.0683	0.276	0.0956	0.196	0.0158
	(0.254)	(0.296)	(0.222)	(0.307)	(0.265)	(0.230)	(0.207)	(0.227)	(0.181)	(0.208)	(0.183)
x Retail and wholesale	0.144	0.164	0.178	0.199	0.222	0.185	-0.0228	0.000343	0.00298	-0.00873	0.104
	(0.166)	(0.132)	(0.170)	(0.179)	(0.141)	(0.146)	(0.164)	(0.165)	(0.148)	(0.161)	(0.220)
Observations	1,245	1,245	1,245	1,245	1,245	1,201	1,195	1,201	1,172	1,185	1,152

Summary of the heterogeneous impacts by industry

- The impact of AI regulation varies considerably across industry
- The negative impact of AI regulation on AI adoption is pronounced in the retail sector and to a lesser degree the healthcare sector. However, no negative impact on the automotive sector.
  - Automotive sector has a more positive outlook on AI, and this sentiment is consistent with NHTSA's current regulatory approach
- AI regulation strongly induces the automotive sector to spend more on AI strategy. Retail sector spends more on AI strategy to some degree as well.
  - The healthcare sector spends more on data and computing resources
  - Underscores the different priorities of different industries.
- AI-related regulation increases managers' plans to file patents in the healthcare sector
  - Retail on the other hand, responds negatively to regulation. Managers in retail decrease their intent to file for AI-related patents, and engage in AI-related product or process innovation.
- On ethical issues, AI regulation generally has a positive impact on managers' perceptions in all industries
- AI regulation induces firms to hire managers across all industries

Results by firm size (revenue cutoff of 10M)

	A. Adoption	B. Budget allocation						C. Innovation activity		
	Number of business processes to adopt AI	Developing AI strategy	AI-related R&D	Hiring workers related to business' AI system	AI training for existing employees	Purchase AI package from vendors	Computing resource and data for AI system	Co-operation on AI-related R&D	AI-related patenting	AI-related product or process innovation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
General AI regulation										
x Small firm	-0.207**	5.768***	1.144	-1.246	-4.559***	-0.807	-0.301	0.00592	0.159	-0.0280
	(0.0921)	(2.083)	(2.480)	(1.664)	(1.496)	(2.067)	(1.404)	(0.150)	(0.131)	(0.164)
x Large firm	-0.117	-0.0249	-0.220	5.379***	-0.0123	-2.818	-2.304*	-0.0232	-0.0483	-0.0306
	(0.0971)	(1.701)	(3.108)	(2.050)	(2.066)	(1.862)	(1.327)	(0.134)	(0.143)	(0.156)
Agency-specific AI regulation										
x Small firm	-0.174**	2.608	4.030	-2.332	-2.136	-2.600	0.431	-0.0337	0.165	-0.0597
	(0.0849)	(2.200)	(2.629)	(1.634)	(1.551)	(2.250)	(1.608)	(0.155)	(0.143)	(0.148)
x Large firm	-0.0329	2.047	-4.247	2.735	-0.989	-1.135	1.588	0.149	0.132	-0.0121
	(0.103)	(1.615)	(2.656)	(1.694)	(1.679)	(1.676)	(1.412)	(0.131)	(0.147)	(0.140)
Existing AI-related regulation										
x Small firm	-0.242**	2.008	1.927	-1.265	-1.698	-1.164	0.192	0.0658	0.0543	-0.0245
	(0.0951)	(1.884)	(2.461)	(1.675)	(1.722)	(2.071)	(1.474)	(0.151)	(0.140)	(0.168)
x Large firm	-0.109	3.375*	-0.978	0.529	-2.116	-2.703	1.892	-0.00665	0.0447	0.190
	(0.0935)	(1.918)	(3.011)	(1.521)	(1.798)	(1.758)	(1.426)	(0.140)	(0.142)	(0.144)
Data privacy regulation										
x Small firm	-0.237***	0.525	6.394**	-2.049	-3.024*	-2.259	0.413	0.0244	0.170	-0.0262
	(0.0785)	(2.018)	(2.733)	(1.698)	(1.760)	(2.012)	(1.531)	(0.137)	(0.152)	(0.151)
x Large firm	-0.0237	0.391	-4.817**	3.327	-0.355	0.207	1.247	0.0596	-0.0515	-0.01000
	(0.0846)	(1.444)	(2.257)	(2.087)	(1.682)	(1.887)	(1.431)	(0.122)	(0.135)	(0.130)
Observations	1,245	1,245	1,245	1,245	1,245	1,245	1,245	1,245	1,245	1,245
R-squared		0.101	0.105	0.115	0.080	0.108	0.084			

Results by firm size (revenue cutoff of 10M)- continued

	D. Importance of ethical issues					E. Adjustment to labor					
	Labor issues	Bias and discrimination	Safety and accidents	Privacy and data security	Transparency and explainability	Managers	Technical workers	Office workers	Sales workers	Service workers	Production workers
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
General AI regulation											
x Small firm	0.165	0.0810	0.226*	-0.0219	-0.0685	0.265*	-0.170	0.298**	0.164	0.166	0.108
	(0.132)	(0.107)	(0.126)	(0.115)	(0.104)	(0.146)	(0.144)	(0.148)	(0.177)	(0.161)	(0.169)
x Large firm	-0.0263	0.00239	0.255*	0.0162	0.162	0.0214	-0.0653	-0.105	-0.266*	-0.0884	-0.0502
	(0.140)	(0.153)	(0.150)	(0.146)	(0.145)	(0.136)	(0.137)	(0.144)	(0.144)	(0.155)	(0.158)
Agency-specific AI regulation											
x Small firm	0.158	0.229*	0.385***	-0.00596	0.223*	0.252	-0.0144	0.0206	0.268*	0.0379	0.0852
	(0.144)	(0.123)	(0.123)	(0.150)	(0.114)	(0.154)	(0.149)	(0.158)	(0.140)	(0.155)	(0.137)
x Large firm	-0.0758	0.0762	0.214	0.179	0.201	-0.0409	-0.0787	-0.0796	-0.186	-0.113	-0.176
	(0.132)	(0.152)	(0.134)	(0.131)	(0.150)	(0.154)	(0.132)	(0.150)	(0.125)	(0.167)	(0.143)
Existing AI-related regulation											
x Small firm	0.0699	0.0921	0.233	0.136	0.239*	0.198	-0.0209	0.180	0.233	-0.0281	0.195
	(0.138)	(0.132)	(0.155)	(0.143)	(0.140)	(0.154)	(0.130)	(0.154)	(0.151)	(0.167)	(0.159)
x Large firm	0.0982	-0.0575	0.260*	0.285**	0.0862	0.283**	0.171	-0.0195	-0.0803	0.0836	0.0358
	(0.149)	(0.147)	(0.151)	(0.127)	(0.145)	(0.142)	(0.162)	(0.143)	(0.143)	(0.133)	(0.160)
Data privacy regulation											
x Small firm	0.190	0.0671	0.273**	0.200	0.228	0.320*	0.0115	0.204	0.0663	0.104	-0.0482
	(0.141)	(0.141)	(0.127)	(0.147)	(0.141)	(0.170)	(0.127)	(0.143)	(0.147)	(0.152)	(0.165)
x Large firm	0.112	0.211	0.118	0.250	0.0751	0.122	-0.0161	-0.142	-0.131	-0.0188	-0.0103
	(0.144)	(0.155)	(0.142)	(0.154)	(0.151)	(0.142)	(0.152)	(0.145)	(0.130)	(0.156)	(0.150)
Observations	1,245	1,245	1,245	1,245	1,245	1,201	1,195	1,201	1,172	1,185	1,152
R-squared											

Summary of the heterogeneous impacts by firm size

- The impact of AI regulation varies considerably by firm size as well

- The negative impact of AI regulation on AI adoption is primarily found for small firms

  - Large firms generally are better situated to internalize the costs of regulation, while small firms are faced with hard trade-offs that consistently imply a general reduction in the number of AI processes across all treatments.

  - This potentially suggests that AI regulation is more likely to reduce innovative activity in small firms.

- For small firms, general AI regulation results in an increase in developing AI strategy, which is offset by decreasing AI training for existing employees.

  - For large businesses on the other hand, this means hiring more workers related to business' AI systems, which in turn is offset by investments in computing resources and data for AI systems.

- In relation to data privacy, we find that small firms increase their AI-related R&D, while large firms decrease their AI-related R&D, when faced with regulation.

- AI regulation increases firms' perceptions of the importance of safety and transparency issues in small firms. AI regulation also induces small firms to hire more managers and office workers.

- Large firms, when reminded of existing AI-related regulation, increase their perception of privacy and data security issues, and intend to hire more managers.

Conclusion

- **Information about AI-related regulation reduces AI adoption**
  - However, industry and agency-specific AI regulation has a less negative impact on firms' rate of AI adoption than does general AI regulation. Firms maintain the level of AI adoption under industry-specific regulation but reduce adoption under more general regulation. The industry- and agency-specific focus seems to lower the cost of regulation to firms.
- **Information about AI-related regulation induces firms to "think,"** which we see as an **increase in spending on developing AI strategy and hiring more managers.**
  - This comes at the cost of hiring other workers such as technicians, service, sales, and production workers.
- AI-related regulation **increases firms' perceptions of the importance of safety, privacy, and transparency issues related to AI.**
- **AI regulation especially diminishes AI adoption**, and potentially innovative activities **in smaller firms**, while larger firms are better able to respond to regulatory requirements and develop business strategies.
- **Industries** across healthcare, automotive, and retail **respond differently to AI regulation.**

Implications for AI Regulation

- Regulators should do their best to adapt regulations to the needs and concerns arising in particular industries

  - The proposal of a broad-based general AI regulation, such as the Algorithmic Accountability Act, makes it harder to take industrial characteristics into account.

- Policymakers will do a better job designing and communicating regulatory requirements if they retain a clear focus on regulatory goals

  - While the importance of certain legal requirements and policy goals — such as reducing impermissible bias in algorithms, and enhancing data privacy and security — may apply across sectors, specific features of particular sectors may nonetheless require distinctive responses.

- Policymakers should bear in mind the full range of regulatory tools available in the AI context.

  - Continued reliance on existing legal requirements with relevance to AI such as tort law and employment discrimination that can be gradually elaborated by courts or administrators.

  - Soft-law governance of AI, such as AI industry standards.

Thank you!

Summary statistics of key variables

Variable	Mean	Std. Dev.	Min	Max	Obs
Control group	0.194	0.395	0	1	1,245
General AI regulation	0.196	0.397	0	1	1,245
Agency-specific AI regulation	0.214	0.411	0	1	1,245
Existing AI-related regulation	0.204	0.403	0	1	1,245
Data privacy regulation	0.192	0.394	0	1	1,245
Healthcare/pharmaceutical/bio-tech	0.425	0.495	0	1	1,245
Auto/transportation/distribution	0.186	0.390	0	1	1,245
Retail and wholesale	0.389	0.488	0	1	1,245
Number of business processes to adopt AI	3.405	2.777	0	10	1,245
Ln(AI budget)	9.456	4.511	0	23	1,245
Budget share- AI-related research and development	22.393	20.270	0	100	1,245
Budget share-hiring workforce to manage, operate, maintain AI	18.776	14.199	0	100	1,245
Budget share-AI training for existing employees	16.382	12.737	0	100	1,245
Budget share- purchase AI packages from external vendors	14.989	12.260	0	100	1,245
Budget share-computing and data related costs	12.881	11.097	0	100	1,245
Budget share-developing company's AI strategy	14.579	14.948	0	100	1,245
AI innovation activities - co-operation with other institutions	3.714	1.133	1	6	1,245
AI innovation activities - filing patents	3.742	1.170	1	6	1,245
AI innovation activities - produce or process innovation	3.806	1.064	1	6	1,245
Ethical concerns related to AI-layoffs or labor related issues	3.437	1.117	1	5	1,245
Ethical concerns related to AI-racial and gender bias/discrimination	3.461	1.203	1	5	1,245
Ethical concerns related to AI-safety and accidents	3.740	1.103	1	5	1,245
Ethical concerns related to AI-privacy and data security	3.933	1.082	1	5	1,245
Ethical concerns related to AI-transparency and explainability	3.645	1.073	1	5	1,245
Labor adjust from AI adoption-managers	3.370	0.995	1	5	1,201
Labor adjust from AI adoption-technical workers	3.638	0.991	1	5	1,195
Labor adjust from AI adoption-office workers	3.360	1.010	1	5	1,201
Labor adjust from AI adoption-sales workers	3.453	1.037	1	5	1,172
Labor adjust from AI adoption-service workers	3.434	1.041	1	5	1,185
Labor adjust from AI adoption-production workers	3.405	1.013	1	5	1,152

Related literature

- Effects of technology related regulation, especially privacy regulation
  - Generally finds that privacy regulation reduces technology adoption and innovation (Goldfarb and Tucker 2012, Miller and Tucker 2011, Kim and Wagman 2015)

- Bias and liability risk of AI/ Ethics of AI
  - Hoffman, Kahn, and Li (2018), Agrawal, Gans, & Goldfarb, 2018b

- Technology/AI regulation
  - Cuéllar 2019, Barfield & Pagollo 2018, Fenwick et. al. 2018, Cuéllar & Huq, 2019, Kalra & Paddock 2016, Weaver 2018, Clark and Hadfield 2019

- Labor market consequences of automation from AI and robotics
  - Aghion, Jones, and Jones 2017; Brynjolfsson et al. 2018; Acemoglu and Restrepo 2019a, 2019b; Lee and Chung 2019; Webb 2019; Dixen et al. 2019