AI and Jobs: Evidence from Online Vacancies

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MIT IDE, April 29th 2021

Question

- Lots of excitement / hype about Artificial Intelligence
- Lots of speculation about how it will transform labor markets, raise productivity, replace workers, destroy humanity in service of making paperclips (Bostrom ’14), etc.
- It may be that:
  - there is not as much AI as presumed
  - it is replacing some jobs and transforming labor markets
  - it is helping create new products, services, occs & industries
  - it is benefiting some organizations without replacing jobs
  - it is too early to tell
- But little evidence so far; we just don’t know how AI is being deployed and used in commercial applications
- Limited data on AI adoption or investment

This Paper

- **Idea #1:** measure AI from its "footprint" in posted jobs
  - AI adoption requires in-house specialists, and these demands can be observed in job postings
- **Idea #2:** Classify establishments as "AI exposed" if their workers engage in tasks compatible with current capabilities of AI
- Use a comprehensive data set of all online vacancies from BurningGlass Technologies from 2007 to 2018 to study:
  - whether there has been a major increase in AI activities as proxied by vacancies in AI
  - whether establishments with the greatest AI exposure are in fact adopting AI
  - whether establishments adopting AI have started posting fewer non-AI jobs
  - whether AI-exposed establishments have expanded / contracted or changed their demand for skills

Summary of Results: Rising Adoption of AI Technologies

- Steep recent increase in AI vacancy postings across the economy
- Concentrated in sectors that are "producers and suppliers" of AI (Information Technologies and Business Services—sectors 51 and 54)
- But also significant rise in adoption of AI technologies in other sectors
- Outside of sectors 51 and 54, AI exposed establishments have particularly strong increase in AI vacancies

Summary of Results: Effects on Jobs

- Results are consistent with a **task based view** of AI:
  1. AI exposed establishments increase demand for new skills and reduce demand for old skills
  2. AI exposed establishments reduce non-AI vacancies, especially after 2014
  3. **By contrast:** no discernible relationship at the occupation + industry level between AI exposure and employment or wages
- **Summary judgment:** AI is replacing humans in a subset of tasks but not yet having detectable aggregate labor market consequences.

Related Literature

- Literature measuring occupations where AI can be used
  - Felten et al. (2018), Brynjolfsson et al. (2018), and Webb (2019)
  - We use these measures to identify opportunities for AI adoption across US establishments and sectors.
- Literature exploring how AI is being deployed by businesses
  - Survey of AI startups by Bessen et al. (2018)
  - We provide evidence that AI is adopted in occs where tasks are compatible with current capabilities of AI
- Literature on effects of AI on specific occupations and sectors
  - Research on financial analysts by Grennan and Michaely (2019)
  - Babina et al. (2020) find that AI-adopting firms grow rapidly
  - We focus on AI suitability rather than observed AI adoption—may explain why we reach different conclusions
- Burgeoning literature using Burning Glass data (Hazell and Taska 2018; Hershbein and Kahn, 2018; Deming and Noray, 'forth QJE; Dillender and Forsythe, 2019; Steffen, 2019; Modestino, Shoag, and Ballance, 2016, 2019)

Agenda

Data Overview

- Two main empirical ingredients:
  1. Data on vacancy postings, from Burning Glass Technologies (BGT)
  2. Classification of occupations according to their ‘AI exposure’, measured using three indexes

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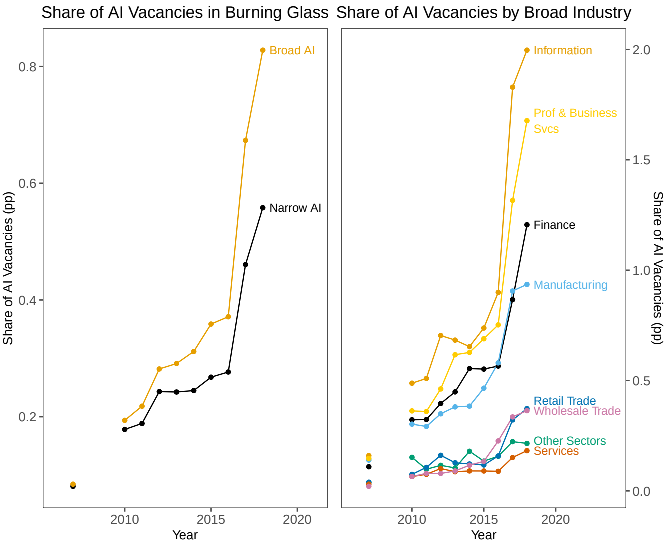
Burning Glass Data

- Burning Glass Technologies: near-universe of online US vacancies
  - Available for years 2007 and 2010-2018
  - Vacancies scraped from 40,000 company websites and online job boards, with de-duplication algorithm
    - Covers 60-80% of all US vacancies, online and offline
  - Detailed information on location, employer, industry, occupation and ‘skill’ requirements of vacancy
    - Skills, scraped from text, are organized according to several thousand standardized fields
    - Groups of related skills collected together into “skill clusters”

Inferring Adoption of AI from Job Postings

- **Narrow AI** vacancies: vacancy posting requires one of these skills
  - machine learning, deep learning, neural networks, natural language processing, virtual agents, machine translation and others ...
- **Broad AI** vacancies: posting associated with skill clusters
  - natural language processing, data science, artificial intelligence, or machine learning

AI Adoption Rising in the US Economy



Narrow AI vacancies up from 0.1% to 0.6%

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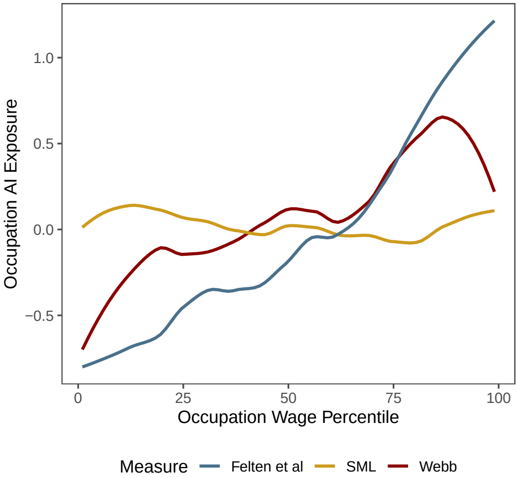
Occupations with Greatest Potential for Adoption of AI

- **Use three occ-level measures–each linked to 6-digit SOC**
  - Designed to capture occupations concentrating in tasks that are compatible with the current capabilities of AI

1) **Felten, Raj, and Seamans '18**:
   - studies tasks where AI has improved in recent years (e.g. image recognition, strategy games, speech recognition)
   - based on AI Progress Measurement project, Electronic Frontier Foundation, starting 2010
   - links tasks to abilities required by detailed occupations in O*NET
2) **Webb '19**:
   - identifies key capabilities of AI from text in patent data
   - matches capabilities to abilities required by O*NET occupations
3) **Brynjolfsson, Mitchell and Rock '19:** Suitability for Machine Learning (**SML**)
   - 21-item rubric of tasks suitable for machine learning/AI
   - Identify AI exposed occupations according to rubric, once again mapped from O*NET data

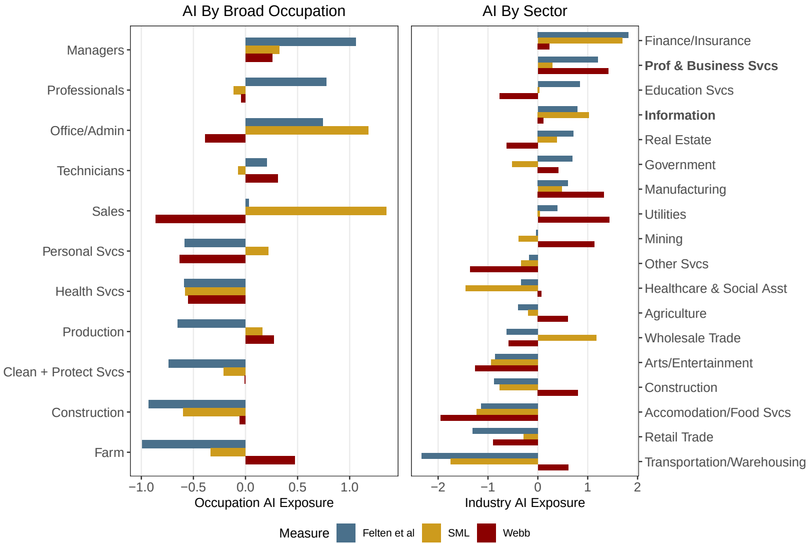
Occupations with Greatest Potential for Adoption of AI



- AI exposure by baseline wage in each occupation, standardized

Occupations with Greatest Potential for Adoption of AI

Meaningful Differences Across Measures, Esp. in Managerial, Office/Admin, Sales



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AI and Tasks

- Focus on one key aspect of AI: advancing capacity of AI to perform specific tasks
- How does the ability to perform these tasks with AI affect establishments and workers engaged in those tasks?
- Complementary AI: use of AI will complement workers in the tasks where it is being deployed, raising relative demand for their skills

  (i.e., assessments of radiologist and AI are complementary)
- Replacing AI: use of AI will displace workers from the tasks where it is being deployed, reducing the relative demand for their skills

  (i.e., financial analysts out-competed by algorithms)

AI and Tasks

- Output of an establishment, y_i, produced by combining services, $y_i(x)$, of a unit measure of tasks $x \in [0,1]$:

$$\ln y_i = \int_0^1 \alpha_i(x) \ln y_i(x) dx, \text{ where } \int_0^1 \alpha_i(x) dx = 1 \tag{1}$$

- $\alpha_i(x)$: intensity of task x in establishment's i production
- Tasks produced by human labor, $\ell(x)$, or by AI algorithms, $a(x)$:

$$y_i(x) = \left[(\gamma_\ell(x)\ell_i(x))^{\frac{\sigma-1}{\sigma}} + (\gamma_a(x)a_i(x))^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \tag{2}$$

- Think of AI as increases in $\gamma_a(x)$ in certain tasks, which will benefit establishments engaged intensively in these tasks

Complementary AI

- Complementary view assumes that $\sigma < 1$, so that algorithms and labor are complements in producing $y(x)$
  - Let workers in occupation o specialize on tasks in $\mathcal{T}_o \subset [0, 1]$
- Following an improvement in $\gamma_a(x)$ for tasks in $\mathcal{T}_o$:
  1. complementary AI will increase *the share* of employment in AI-exposed occupations
  2. establishments engaged in these tasks will adopt more AI and increase their employment

Replacing AI

- Substitution view
  - Take $\sigma = \infty$, so that tasks are performed by labor or algorithms
  - Displacement effects: consider improvements in $\gamma_a(x)$ for tasks in $\mathcal{T}_o \subset [0, 1]$
  - This process has the following implications:
    1. replacing AI will reduce *the share* of employment in AI-exposed occupations
    2. establishments engaged in these tasks will adopt more AI with ambiguous effects on their employment

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Exposure to Opportunities for AI Adoption

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- **AI exposure measure** at the **establishment** level, e:

$$\text{AI exposure}_{et_0} = \sum_{o} \text{Share postings}_{eot_0} \times \text{Occupation AI Score}_{o}$$

- $\text{Share postings}_{eot_0}$ in 2010
- $\text{Occupation AI Score}_{o}$ from Felten et al, Webb, or SML
- Summation runs over 815 detailed occupations, o
- Establishments with a higher $\text{AI exposure}_{st_0}$ have greater opportunities to adopt AI as algorithms improve
- We **standardize** exposure measure across establishments to facilitate interpretation

Empirical Strategy

- Empirical models at the establishment level:

$$\Delta Y_s = \beta \cdot \text{AI exposure}_{st_0} + \theta X_s + \alpha_{f(s)} + \delta_{i(s)} + \eta_{z(s)} + \varepsilon_s$$

- ΔY_s: change in outcome between 2010-2012 and 2016-2018
- X_s : parent firm size deciles
- $\alpha_{f(s)}$: firm fixed effects in some specifications
- $\delta_{i(s)}$: industry fixed effects (at 3-digit for 85% of sample)
- $\eta_{z(s)}$: commuting-zone fixed effects
- Exclude sectors 51 and 54—producers and suppliers of AI
- β : is the differential effect of AI on establishments concentrated in AI suitable tasks

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Establishment Share of AI Vacancies by Quartile of AI Exposure

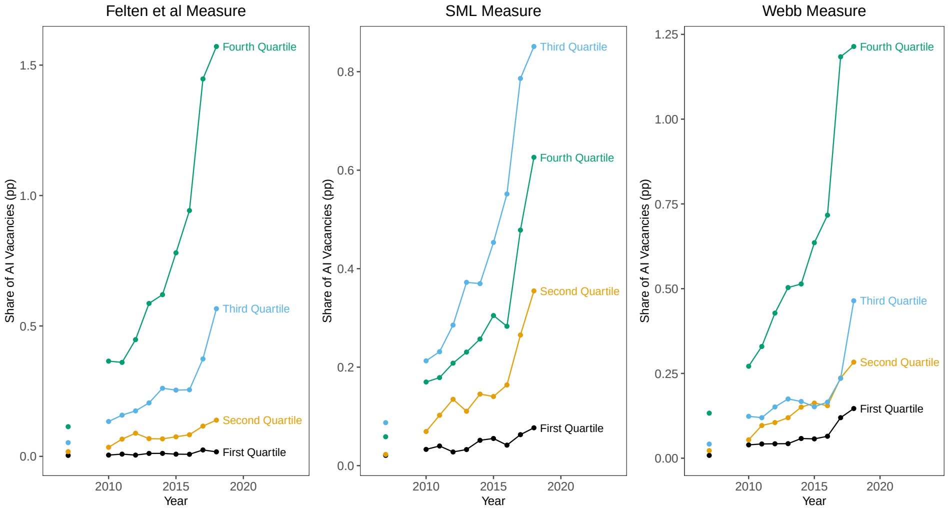
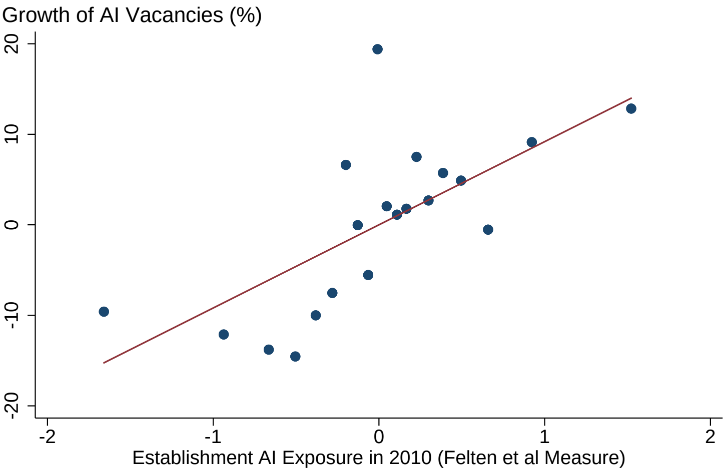


Table 1: Opportunities for Adoption and AI Postings

	Growth of Establishment AI Vacancies, 2010-2018					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Felten et al. Measure of AI Exposure					
Establishment AI	15.96^{***}	13.82^{***}	9.19^{***}	16.53^{***}	9.75^{***}	16.87^{***}
Exposure, 2010	(1.73)	(1.43)	(1.21)	(1.89)	(1.20)	(1.86)
Observations	1,075,474	1,075,474	954,519	770,461	954,518	762,672
Firm Size Decile		✓	✓		✓	
Commuting Zone		✓	✓	✓	✓	✓
3 digit Industry			✓		✓	
Firm				✓		✓
Sales + Admin Share					✓	✓

- One standard deviation in AI exposure → 16% increase in 2010-2018 AI postings

2010-2018 Growth of AI and 2010 Establishment Felten et al Score



Coefficient is 9.19, SE is 1.21, regressor is standardized

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Measuring Effects of AI Exposure on Demand for Skills

- Does AI exposure reduce demand for old skills? Or increase demand for new skills?
  - Build on approach from Deming & Noray (QJE forth.)

Measuring Effects of AI Exposure on Demand for Skills

- Does AI exposure reduce demand for old skills? Or increase demand for new skills?
  - Build on approach from Deming & Noray (QJE forth.)
- We measure changing skill demand within non-AI jobs at establishment level:

$$\text{negative skill change}_{e,t_2,t_1} = -\min\left\{\sum_{s=1}^{S}\left[\left(\frac{\text{skill}^{s}_{e,t_2}}{\text{vacancies}_{e,t_2}}\right)-\left(\frac{\text{skill}^{s}_{e,t_1}}{\text{vacancies}_{e,t_1}}\right)\right],0\right\}$$

  - measures decline in frequency of certain previously posted skills

$$\text{positive skill change}_{e,t_2,t_1} = \max\left\{\sum_{s=1}^{S}\left[\left(\frac{\text{skill}^{s}_{e,t_2}}{\text{vacancies}_{e,t_2}}\right)-\left(\frac{\text{skill}^{s}_{e,t_1}}{\text{vacancies}_{e,t_1}}\right)\right],0\right\}$$

  - measures increase in frequency of other previously posted skills (including new skills)

Table 2a: AI Exposure Predicts Lower Demand for Certain Skills

	Establishment Negative Skill Change, 2010-2018			
	(1)	(2)	(3)	(4)
	Panel A: Felten et al. Measure of AI Exposure			
Establishment AI Exposure, 2010	0.83***	0.83***	0.97***	0.50***
	(0.09)	(0.09)	(0.07)	(0.05)
Observations	339,282	339,282	322,901	339,282
	Panel B: Webb Measure of AI Exposure			
Establishment AI Exposure, 2010	0.62***	0.60***	0.45***	0.20***
	(0.11)	(0.11)	(0.06)	(0.04)
Observations	353,107	353,107	335,589	353,107
	Panel C: SML Measure of AI Exposure			
Establishment AI Exposure, 2010	0.53***	0.52***	0.32***	0.26***
	(0.08)	(0.07)	(0.07)	(0.04)
Observations	353,107	353,107	335,589	353,107
Firm Size Decile		✓	✓	
Commuting Zone		✓	✓	✓
3 digit Industry			✓	
Firm				✓

- Mean Establishment Negative Skill Change is 4.70

Table 2b: AI Exposure Predicts Higher Demand for Certain Skills

	Establishment Positive Skill Change, 2010-2018			
	(1)	(2)	(3)	(4)
	Panel A: Felten et al. Measure of AI Exposure			
Establishment AI	0.95^{***}	0.94^{***}	0.58^{***}	0.02
Exposure, 2010	(0.08)	(0.09)	(0.09)	(0.04)
Observations	339,282	339,282	322,901	339,282
	Panel B: Webb Measure of AI Exposure			
Establishment AI	0.69^{***}	0.66^{***}	0.26^{***}	-0.01
Exposure, 2010	(0.09)	(0.09)	(0.08)	(0.03)
Observations	353,107	353,107	335,589	353,107
	Panel C: SML Measure of AI Exposure			
Establishment AI	0.62^{***}	0.59^{***}	0.19^{**}	0.10^{**}
Exposure, 2010	(0.09)	(0.09)	(0.09)	(0.04)
Observations	353,107	353,107	335,589	353,107
Firm Size Decile		✓	✓	
Commuting Zone		✓	✓	✓
3 digit Industry			✓	
Firm				✓

- Mean Establishment Positive Skill Change is 6.30

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Table 3: AI Exposure Predicts Decline in Non-AI Vacancy Postings

Effects of AI Exposure on Establishment Non-AI Vacancy Growth

	2010-2014 Growth			2014-2018 Growth		
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Felten et al. Measure of AI Exposure			
Establishment AI	-1.86	-1.82	0.39	-11.94***	-10.60***	-5.21***
Exposure, 2010	(4.77)	(3.46)	(1.11)	(3.80)	(2.82)	(1.02)
Observations	1,075,474	954,519	1,075,474	1,075,474	954,519	1,075,474
Firm Size Decile		✓			✓	
Commuting Zone		✓	✓		✓	✓
3 digit Industry		✓			✓	
Firm			✓			✓
Sales + Admin Share		✓			✓	

2010-2018 Results Webb and SML Results

Agenda

Table 4: AI Exposure and Occupational Employment and Wage Growth

Effects of AI Exposure on **Occupation-Level** Outcomes

	2010-2018 Occupation Employment Growth	2010-2018 Occupation Wage Growth
	(1)	(2)
	Panel A: Felten et al. AI Exposure	
Occupation AI Exposure, 2010	0.51	-0.17***
	(0.35)	(0.06)
Observations	680	629
	Panel B: Webb AI Exposure	
Occupation AI Exposure, 2010	-0.17	-0.02
	(0.29)	(0.04)
Observations	717	663
	Panel C: SML AI Exposure	
Occupation AI Exposure, 2010	-0.37	0.04
	(0.25)	(0.05)
Observations	717	663
3 Digit Occupation	✓	✓

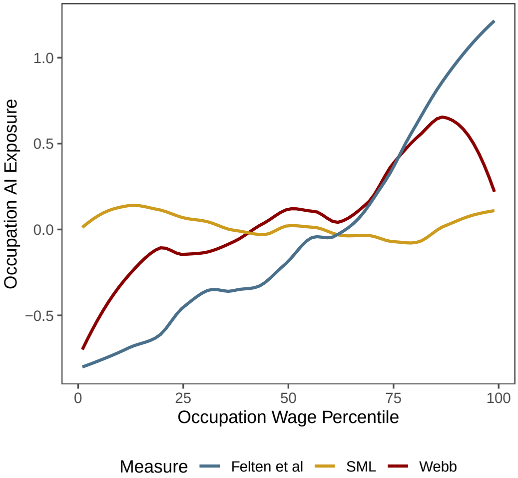
Employment and Wage Growth from Occupational Employment Statistics Industry Results

Agenda

Conclusion

- Much excitement and apprehension about AI and its labor market effects
  - We document a recent surge in AI activity
- Results are consistent with a **task based** view of AI:
  1. AI adoption driven by "AI exposed" establishments
  2. AI exposed establishments increase demand for new skills
  3. AI exposed establishments reduce non-AI vacancies, especially after 2014
  4. **By contrast:** no discernible effect of AI exposure at occupation + industry level
- **Summary judgment:** AI is replacing humans in a subset of tasks but not yet having detectable aggregate labor market consequences.

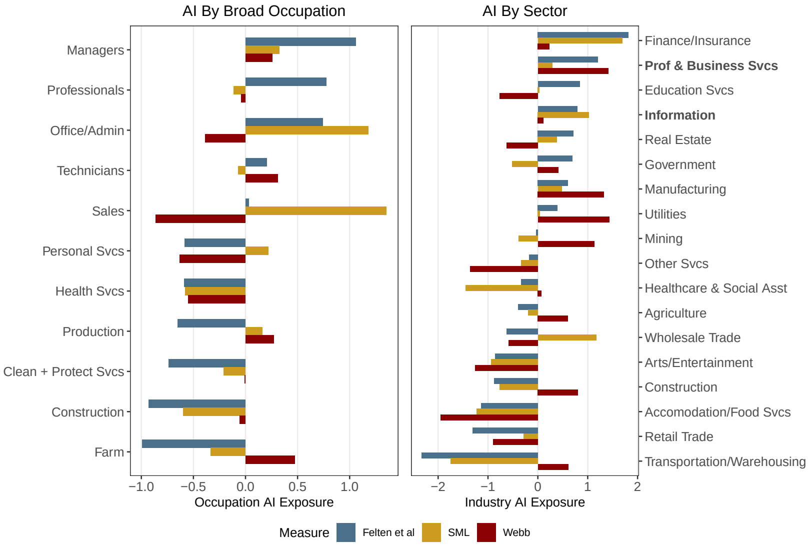
Occupations with Greatest Potential for Adoption of AI Return



- AI exposure by baseline wage in each occupation, standardized

Occupations with Greatest Potential for Adoption of AI

Meaningful Differences Across Measures, Esp. in Managerial, Office/Admin, Sales



Robustness: Webb and SML Scores Predicts AI

Relationship Between AI Exposure and Establishment AI Vacancy Growth

	Growth of Establishment AI Vacancies, 2010-2018					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B: Webb Measure of AI Exposure					
Establishment AI	6.59***	5.08***	3.21***	5.91***	0.42	1.14
Exposure, 2010	(1.13)	(0.96)	(0.81)	(1.27)	(0.82)	(1.08)
Observations	1,159,789	1,159,789	1,021,673	827,340	1,021,673	824,803
	Panel C: SML Measure of AI Exposure					
Establishment AI	3.76***	2.30**	-2.21**	-3.04**	1.95**	4.47***
Exposure, 2010	(1.19)	(1.04)	(0.96)	(1.38)	(0.89)	(1.34)
Observations	1,159,789	1,159,789	1,021,673	827,340	1,021,673	824,803
Firm Size Decile		✓	✓		✓	
Commuting Zone		✓	✓	✓	✓	✓
3 digit Industry			✓		✓	
Firm				✓		✓
Sales + Admin Share					✓	✓

Return

Robustness: **AI Share Change** as Outcome

Relationship Between AI Exposure on Establishment **AI Share Change**

	Change in Share of Establishment AI Vacancies, 2010-2018					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Felten et al Measure of AI Exposure					
Establishment AI	0.29^{***}	0.26^{***}	0.20^{***}	0.18^{***}	0.22^{***}	0.18^{***}
Exposure, 2010	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	341,525	341,525	324,901	299,602	324,901	299,602
	Panel B: Webb Measure of AI Exposure					
Establishment AI	0.25^{***}	0.22^{***}	0.14^{***}	0.11^{***}	0.12^{***}	0.05^{**}
Exposure, 2010	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	355,529	355,529	337,758	311,012	337,758	311,012
	Panel C: SML Measure of AI Exposure					
Establishment AI	0.05^{***}	0.03^{**}	-0.06^{***}	-0.08^{***}	0.04^{**}	0.05^{***}
Exposure, 2010	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	355,529	355,529	337,758	311,012	337,758	311,012
Firm Size Decile		✓	✓		✓	
Commuting Zone		✓	✓	✓	✓	✓
3 digit Industry			✓		✓	
Firm				✓		✓
Sales + Admin Share					✓	✓

Return

Robustness: Establishment AI Exposure **in 2007**

Relationship Between AI Exposure **in 2007** and Establishment AI Growth

	Growth of Establishment AI Vacancies, 2010-2018					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Felten et al Measure of AI Exposure					
Establishment AI	23.32***	20.43***	12.20***	15.24***	12.07***	13.68***
Exposure, 2007	(2.33)	(1.98)	(1.78)	(2.04)	(1.74)	(1.88)
Observations	102,783	102,783	101,553	99,078	101,524	94,866
	Panel B: Webb Measure of AI Exposure					
Establishment AI	8.87***	6.97***	4.49***	5.04***	1.92	2.48**
Exposure, 2007	(1.71)	(1.54)	(1.33)	(1.39)	(1.30)	(1.20)
Observations	106,022	106,022	104,719	102,158	104,688	97,919
	Panel C: SML Measure of AI Exposure					
Establishment AI	7.46***	5.44***	-1.66	-3.39*	1.78	-0.68
Exposure, 2007	(1.99)	(1.78)	(1.57)	(1.82)	(1.44)	(1.64)
Observations	106,022	106,022	104,719	102,158	104,688	97,919
Firm Size Decile		✓	✓		✓	
Commuting Zone		✓	✓	✓	✓	✓
3 digit Industry			✓		✓	
Firm				✓		✓
Sales + Admin Share					✓	✓

Return

Robustness: Effect of of Webb and SML AI Exposure on Non-AI Vacancies

Effects of AI Exposure on Establishment Non-AI Vacancy Growth, 2010-2018

	Growth of Non-AI Establishment Vacancies, 2010-2018					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B: Webb Measure of AI Exposure					
Establishment AI	-17.24***	-18.21***	-6.73**	-2.22**	-8.30**	1.51
Exposure, 2010	(3.72)	(3.63)	(3.01)	(0.93)	(3.70)	(0.98)
Observations	1,159,789	1,159,789	1,021,673	827,340	1,021,673	827,340
	Panel C: SML Measure of AI Exposure					
Establishment AI	7.02**	5.74*	2.05	0.95	2.21	-3.01**
Exposure, 2010	(3.13)	(3.01)	(2.92)	(1.16)	(3.61)	(1.22)
Observations	1,159,789	1,159,789	1,021,673	827,340	1,021,673	827,340
Covariates:						
Share of Vacancies in Sales, Admin. in 2010					✓	✓
Fixed Effects:						
Firm Size Decile		✓	✓		✓	
Commuting Zone		✓	✓	✓	✓	✓
3 digit Industry			✓		✓	
Firm				✓		✓

Return

Non-AI Vacancy Growth over 2010-2018

Effects of AI Exposure on Establishment Non-AI Vacancy Growth, 2010-2018

	Growth of Establishment Non-AI Vacancies, 2010-2018					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Felten et al. Measure of AI Exposure					
Establishment AI	-13.80***	-16.36***	-11.90***	-4.81***	-12.42***	-4.04***
Exposure, 2010	(4.22)	(4.11)	(4.08)	(1.44)	(4.01)	(1.47)
Observations	1,075,474	1,075,474	954,519	1,075,474	954,519	1,075,474
Covariates:						
Share of Vacancies in Sales, Admin. in 2010					✓	✓
Fixed Effects:						
Firm Size Decile		✓	✓		✓	
Commuting Zone		✓	✓	✓	✓	✓
3 digit Industry			✓		✓	
Firm				✓		✓

Return

Robustness: AI Exposure Predicts Lower Demand for Certain Skills

Effects of AI Exposure on Establishment Negative Skill Change, 2010-2018

	Establishment Negative Skill Change, 2010-2018					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B: Webb Measure of AI Exposure					
Establishment AI	0.62***	0.60***	0.45***	0.20***	0.68***	0.34***
Exposure, 2010	(0.11)	(0.11)	(0.06)	(0.04)	(0.11)	(0.04)
Observations	353,107	353,107	335,589	353,107	335,589	353,107
	Panel C: SML Measure of AI Exposure					
Establishment AI	0.53***	0.52***	0.32***	0.26***	0.46***	0.36***
Exposure, 2010	(0.08)	(0.07)	(0.07)	(0.04)	(0.09)	(0.04)
Observations	353,107	353,107	335,589	353,107	335,589	353,107
Firm Size Decile		✓	✓		✓	
Commuting Zone		✓	✓	✓	✓	✓
3 digit Industry			✓		✓	
Firm				✓		✓
Sales + Admin Share					✓	✓

Return

Robustness: AI Exposure Predicts Higher Demand for Certain Skills

Effects of AI Exposure on Establishment Positive Skill Change, 2010-2018

	Establishment Positive Skill Change, 2010-2018					
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel B: Webb Measure of AI Exposure					
Establishment AI	0.69***	0.66***	0.26***	-0.01	0.43***	0.13***
Exposure, 2010	(0.09)	(0.09)	(0.08)	(0.03)	(0.08)	(0.04)
Observations	353,107	353,107	335,589	353,107	335,589	353,107
	Panel C: SML Measure of AI Exposure					
Establishment AI	0.62***	0.59***	0.19**	0.10**	0.26***	0.03
Exposure, 2010	(0.09)	(0.09)	(0.09)	(0.04)	(0.09)	(0.04)
Observations	353,107	353,107	335,589	353,107	335,589	353,107
Firm Size Decile		✓	✓		✓	
Commuting Zone		✓	✓	✓	✓	✓
3 digit Industry			✓		✓	
Firm				✓		✓
Sales + Admin Share					✓	✓

Return

Table 4b: AI Exposure and Industry-by-CZ Employment Growth

Return

	Industry by CZ Employment Growth		
	2003-2007	2007-2010	2010-2016
	(1)	(2)	(3)
	Panel A: Felten et al. AI Exposure		
Market AI Exposure, 2010	0.03	0.10	-0.05
	(0.17)	(0.20)	(0.08)
Observations	10,937	10,926	10,929
	Panel B: Webb AI Exposure		
Market AI Exposure, 2010	0.10	0.18	0.11
	(0.15)	(0.17)	(0.09)
Observations	10,981	10,968	10,968
	Panel C: SML AI Exposure		
Market AI Exposure, 2010	-0.14	0.37**	-0.01
	(0.17)	(0.18)	(0.08)
Observations	10,981	10,968	10,968
Commuting Zone	✓	✓	✓
Sector	✓	✓	✓

Employment Growth is from County Business Patterns