

# Generative AI and Firm Values

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# ChatGPT and Generative AI are rapidly changing the economy

ChatGPT is about to revolutionize the economy. We need to decide what that looks like.

AI to boost world economy by over 15 trillion dollars in seven years

## Goldman Sachs: ChatGPT could see the loss of 300 million jobs worldwide

*Tinkering With ChatGPT, Workers Wonder: Will This Take My Job?*

Artificial intelligence is confronting white-collar professionals more directly than ever. It could make them more productive — or obsolete.

Enchanted by ChatGPT, Bill Gates calls AI 2nd revolutionary tech after GPU

AI "will be able to do everything that a human brain can, but without any practical limits on the size of its memory or the speed at which it operates," says Microsoft co-founder.

## Yes, ChatGPT Is Coming for Your Office Job

White-collar workers may soon face the AI disruption everyone's been panicking about. But the news may be better than you think.

## The Robots Have Finally Come for My Job

Could ChatGPT lay waste to millions of professional jobs, including journalists?

- ▶ McKinsey: *"Generative AI could add the equivalent of \$2.6 trillion to \$4.4 trillion annually...to the global economy"*

**This Paper: Which firms are most likely to benefit?**

## 2 channels for GenAI benefits: productivity improvement, product demand

### 1. **This study: productivity improvements from incorporating AI**

- ▶ GPT as a General Purpose Technology
- ▶ Affects a broad range of companies
- ▶ To improve productivity, can either be a substitute for or complementary to labor
- ▶ Evidence of substitutability

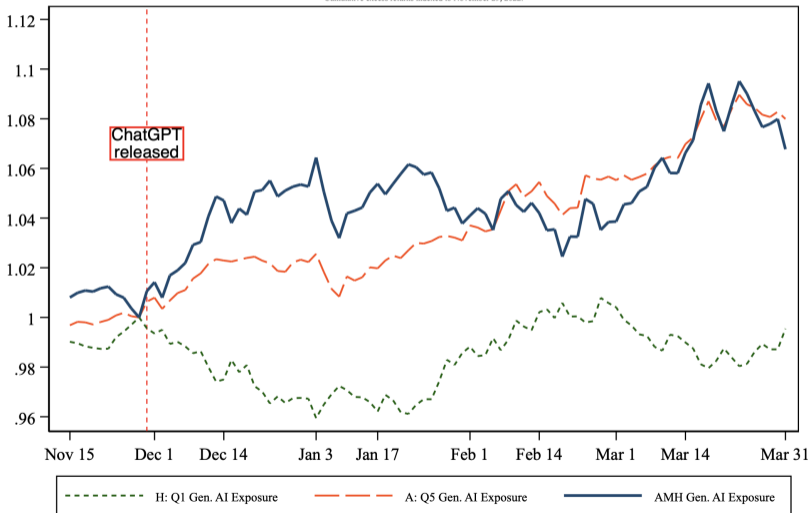
### 2. **Companies selling AI-related products have seen rapid stock price increases**

- ▶ Companies *making or supporting* AI advances benefit directly from booming demand
- ▶ Affects a smaller number of companies/industries

**We show first channel is important, robust to controlling for/excluding second channel.**

## Generative AI Exposure Quintile Portfolios Cumulative Excess Returns, Mkt-factor adj., Nov. 15th 2022 - March 31st 2023

Cumulative excess returns indexed to November 29, 2022.



## Impact of Generative AI on **firm valuations**

1. Measure of Generative AI Exposure at the occupation level: See Eloundou et al. (2023)
2. Firm-level exposure to Generative AI based on firm employment structure ([this paper](#))
3. Stock return effects of Generative AI exposure after Generative AI technology shock
4. Evidence of investor attention to Generative AI technology shock
5. “Horserace” against product market effects
6. Changes in hiring and wages at firms with Generative AI exposure

# Exposure to GenAI: Measurement

tasks → occupations → firms

## Measuring *task* and *occupational* exposure to Generative AI technology

- ▶ **Approach:** Occupations decomposed into *tasks*, tasks scored for exposure to GenAI
- ▶ **Data:** Occupational Information Network (ONET): details 19,265 tasks for 923 occupations

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- ▶ **Approach:** Occupations decomposed into *tasks*, tasks scored for exposure to GenAI
- ▶ **Data:** Occupational Information Network (ONET): details 19,265 tasks for 923 occupations
- ▶ **Rubric:**
  - ▶ *E1 - Direct exposure*
    - ▶ ChatGPT can reduce time it takes to complete the task with equivalent quality by at least half.
  - ▶ *E2 - Exposure to LLM-powered applications*
    - ▶ Additional software on top of the LLM would reduce the time to complete the task by half.



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- ▶ **Scoring:**
  - ▶ Submit rubric, two examples, and an occupation-task statement pair to Open AI's GPT 3.5 Turbo API ⇒ returns a score and an explanation for the scoring (Eloundou et al., 2023)
    - ▶ Highly auditable and replicable (full cost: \$78, two days runtime)
    - ▶ Higher accuracy than other NLP (e.g keywords) and human crowd-workers in text classification (Gilardi et al., 2023; Hansen et al., 2023)

## Example: scoring by GPT of task exposure to Generative AI

Occupation	Task	Score	Explanation
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	Connect heating or air conditioning equipment to fuel, water, or refrigerant source to form complete circuit.	0	The task requires physical interaction with equipment and materials, which cannot be done by the LLM.
Video Game Designers	Provide feedback to designers and other colleagues regarding game design features.	0	The task requires human interaction and feedback, which cannot be replaced by the LLM.
Physician Assistants	Perform therapeutic procedures, such as injections, immunizations, suturing and wound care, and infection management.	0	The task requires physical interaction with patients, which cannot be done by the LLM.
Web Developers	Evaluate code to ensure that it is valid, is properly structured, meets industry standards, and is compatible with browsers, devices, or operating systems.	1	The model can evaluate code and check for validity, structure, industry standards, and compatibility with browsers, devices, or operating systems.
Bioinformatics Scientists	Manipulate publicly accessible, commercial, or proprietary genomic, proteomic, or post-genomic databases.	2	The model can be used to search over publicly accessible genomic, proteomic, or post-genomic databases, but additional software would be needed to manipulate commercial or proprietary databases.

# Occupation Exposure to Generative AI Technology

Occupation exposure score (Eloundou et al., 2023): share of occupation  $o$ 's tasks with *direct* exposure ( $N_1$ ) or half-weighted *LLM+application*-exposure ( $N_2$ ):

$$A_o^{\text{GenAI}} = \sum_{\text{tasks in } o} \frac{N_1 + 0.5 * N_2}{N_0 + N_1 + N_2}.$$

Example: An occupation with 3 tasks, one  $N_1$ , one  $N_2$ , and one  $N_0$ .

$$A_o^{\text{GenAI}} = \sum_{\text{tasks in } o} \frac{1 + 0.5}{1 + 1 + 1} = 0.5.$$

In this example, each type of tasks is  $\frac{1}{3}$  of the total occupation.

Exposure increases as  $N_1$  (and  $N_2$ ) increase, and with fewer  $N_0$ .

## Highest Generative AI exposure score occupations

SOC Code	Occupation Title	Exposure Score
41-9041	Telemarketers	.96
43-9081	Proofreaders and copy markers	.95
43-3031	Bookkeeping, accounting, and auditing clerks	.87
15-2021	Mathematicians	.86
15-1251	Computer programmers	.85
43-9022	Word processors and typists	.85
43-3011	Bill and account collectors	.83
27-3091	Interpreters and translators	.82
43-9111	Statistical assistants	.82
15-1254	Web developers	.81
43-6011	Executive secretaries and executive administrative assistants	.77
43-3051	Payroll and timekeeping clerks	.77
43-6014	Secretaries and administrative assistants, except legal, medical, and executive	.77
43-5061	Production, planning, and expediting clerks	.76
15-1212	Information security analysts	.75
43-6013	Medical secretaries and administrative assistants	.75
27-3043	Writers and authors	.75
43-4021	Correspondence clerks	.74
43-9061	Office clerks, general	.74
41-3091	Sales representatives of services, except advertising, insurance, financial services, and travel	.73

## Lowest Generative AI exposure score occupations

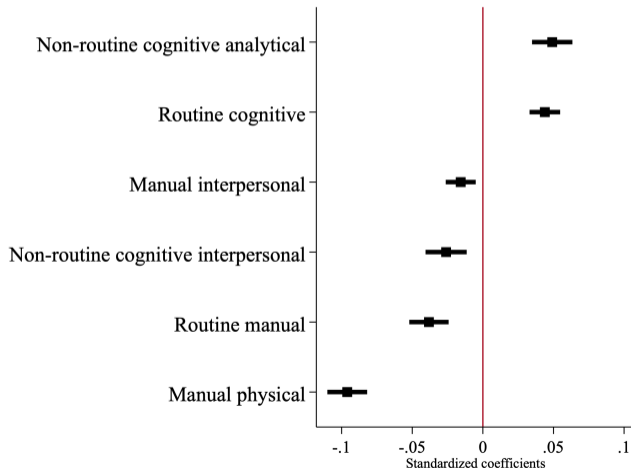
SOC Code	Occupation Title	Exposure Score
39-5093	Shampooers	0
51-6041	Shoe and leather workers and repairers	0
51-6042	Shoe machine operators and tenders	0
51-3023	Slaughterers and meat packers	0
47-2022	Stonemasons	0
47-2221	Structural iron and steel workers	0
51-2041	Structural metal fabricators and fitters	0
29-9093	Surgical assistants	0
51-6052	Tailors, dressmakers, and custom sewers	0
47-2082	Tapers	0
49-9052	Telecommunications line installers and repairers	0
47-2053	Terrazzo workers and finishers	0
51-6064	Textile winding, twisting, and drawing out machine setters, operators, and tenders	0
47-2044	Tile and stone setters	0
51-9197	Tire builders	0
49-3093	Tire repairers and changers	0
51-4194	Tool grinders, filers, and sharpeners	0
39-3031	Ushers, lobby attendants, and ticket takers	0
49-9064	Watch and clock repairers	0
53-7073	Wellhead pumpers	0

17% (132 of 785) BLS occupations have zero exposure - subset shown.

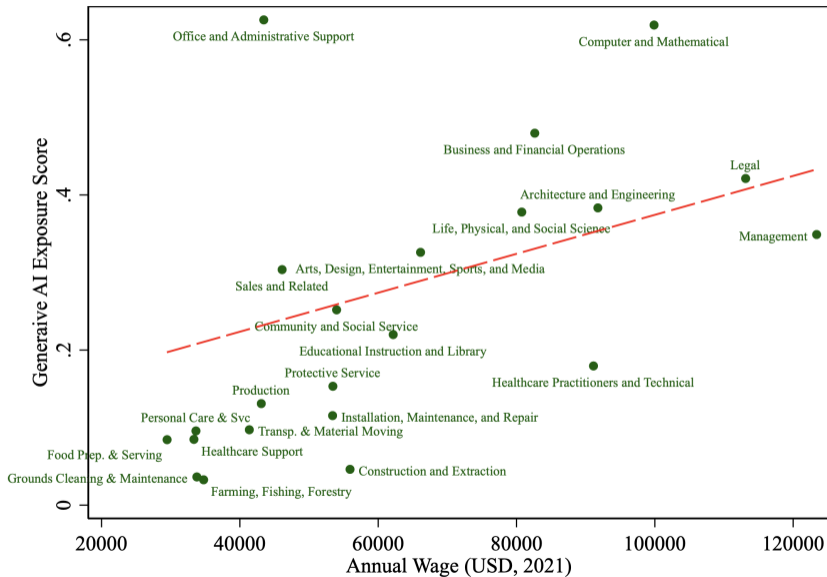
# New Types of Occupations More Exposed to Generative AI vs. Previous IT

Acemoglu & Autor (2011) occupational skill Z-scores and Generative AI exposure:

$$A_o^{\text{GenAI}} = \alpha + \sum_S \beta_S \text{Skill}_o + \varepsilon_o$$



# Occupation Exposure to Generative AI Technology and Wages

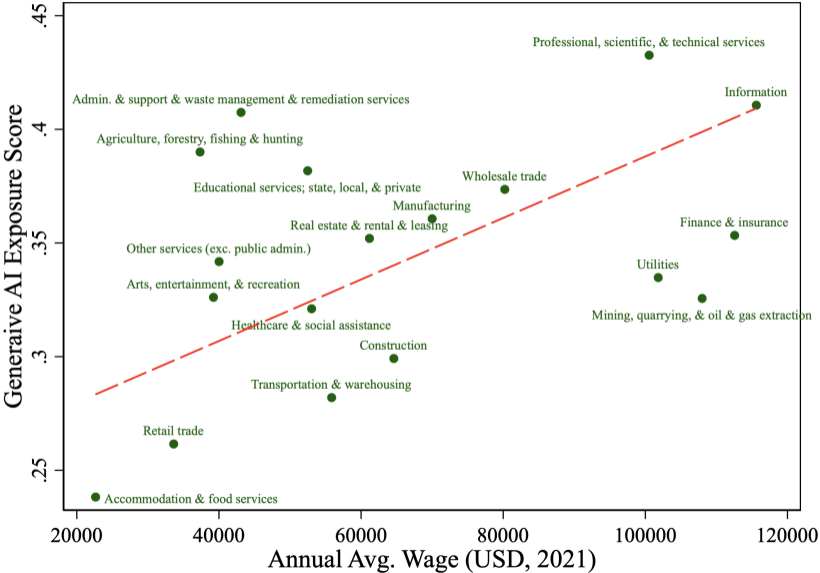


# Industry exposure to Generative AI

NAICS Code	Industry Title	Exposure
54	Professional, Scientific, and Technical Svcs	.43
51	Information	.41
56	Admin. and Support and Waste Mgmt and Remed. Svcs	.4
52	Finance and Insurance	.4
42	Wholesale Trade	.38
61	Educational Svcs	.37
11	Agriculture, Forestry, Fishing and Hunting	.37
33	Manufacturing: Other Products	.36
32	Manufacturing: Textile, Apparel, and Leather	.35
71	Arts, Entertainment, and Recreation	.33
22	Utilities	.33
62	Health Care and Social Assistance	.32
31	Manufacturing: Food, Beverage, and Tobacco	.31
81	Other Svcs (except Public Administration)	.31
21	Mining, Quarrying, and Oil and Gas Extraction	.31
49	Transp. and Warehousing: Warehousing and Storage	.3
23	Construction	.3
53	Real Estate and Rental and Leasing	.27
48	Transp. and Warehousing: Transportation	.27
44	Retail Trade: Motor Vehicle and Parts Dealers	.27
45	Retail Trade: Other Merchandise	.27
72	Accommodation and Food Svcs	.21



# 2-digit NAICS Industry Exposure to Generative AI Technology and Wages



# Firm exposure to Generative AI technology

- ▶ **Data:** LinkedIn profiles from Revelio Labs  $\Rightarrow$  firm employment by occupation
- ▶ **Firm Gen. AI exposure:** computed for 5,907 Compustat firms in March 2022:

$$\text{Exposure}_i^{\text{GenAI}} = \sum_{\text{occupations in } i} \text{EmpShare}_{i,o} * A_o,$$

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**Panel A: Top 15 Large U.S. Companies with Highest Exposure to Generative AI**

Company Name	Generative AI exposure	MktCap	Sector
Int. Business Machines Corp	0.488	125	Information
Intuit Inc.	0.480	111	Information
QUALCOMM Inc.	0.479	132	Manufacturing
Fiserv Inc.	0.475	66	Information
NVIDIA Corporation	0.468	337	Manufacturing
S&P Global Inc	0.452	103	Admin. & Support Services
Broadcom Inc	0.449	195	Manufacturing
Verizon Communications Inc	0.444	157	Information
Microsoft Corp	0.442	1,700	Information
3M Co	0.442	69	Manufacturing
Advanced Micro Devices Inc	0.441	96	Manufacturing
ServiceNow Inc	0.434	85	Information
Adobe Inc	0.427	147	Information
PayPal Holdings Inc	0.418	96	Information
Thermo Fisher Scientific Inc	0.411	203	Manufacturing

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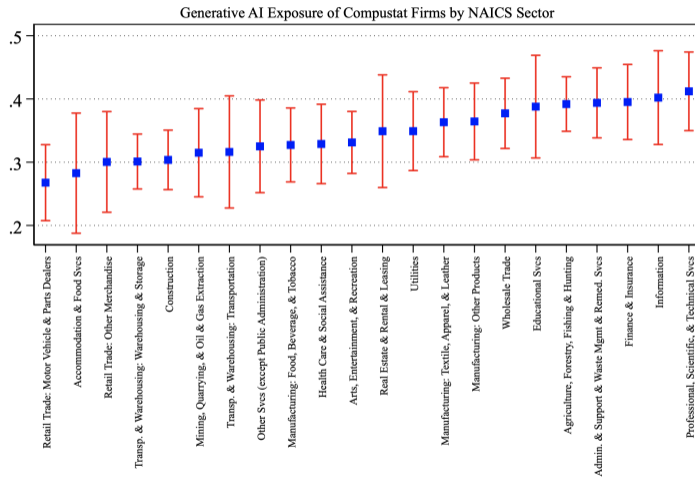
**Panel B: Bottom 15 Large U.S. Companies with **Lowest** Exposure to Generative AI**

Company Name	Generative AI exposure	MktCap	Sector
Starbucks Corp	0.119	100	Accommodation & Food Svcs
McDonald's Corp	0.194	201	Accommodation & Food Svcs
Dollar General Corporation	0.212	57	Retail Trade
Target Corp	0.235	76	Retail Trade
Walmart Inc	0.235	385	Retail Trade
Lowe's Cos Inc	0.238	120	Retail Trade
TJX Companies Inc	0.243	83	Retail Trade
Costco Wholesale Corp	0.252	221	Retail Trade
Union Pacific Corp	0.253	121	Transportation & Warehousing
CSX Corp	0.256	61	Transportation & Warehousing
United Parcel Service Inc	0.256	123	Transportation & Warehousing
Home Depot Inc	0.261	303	Retail Trade
Tesla Inc	0.283	719	Manufacturing
Northrop Grumman Corp	0.291	83	Manufacturing
Mondelez International Inc	0.292	85	Manufacturing

# Firm exposure to Generative AI technology and Firm Characteristics

Panel A: Across All Firms						
	(1)	(2)	(3)	(4)	(5)	(6)
Log Size	-2.653** (1.199)					
Tobin's Q		3.076*** (0.798)				
ROA			-21.516* (11.100)			
Labor Intensity				7.892*** (2.325)		
Org. Capital Ratio					9.139*** (2.506)	
Tangibility						-89.931*** (20.961)
Observations	2517	2380	2513	2387	1571	2515
Adjusted $R^2$	0.006	0.013	0.006	0.038	0.022	0.107

# Generative AI exposure across and within sectors.



Average and standard deviation of firms' Generative AI exposure within NAICS 2-digit sectors.

Note: Industry differences explain only 18% of firm-level variation in Generative AI exposure.

# Exposure to Generative AI: Impact on Firm Values

Public attention to Generative AI technology spiked after ChatGPT release

**Forbes**

FORBES > INNOVATION > ENTERPRISE TECH

# A Short History Of ChatGPT: How We Got To Where We Are Today

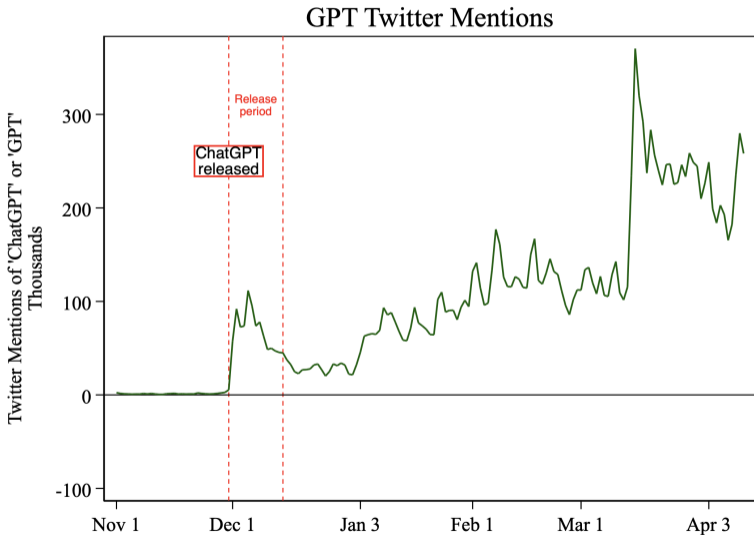
**Bernard Marr** Contributor 

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When GPT-3 launched, it marked a pivotal moment when the world started acknowledging this groundbreaking technology. Although the models had been in existence for a few years, it was with GPT-3 that individuals had the opportunity to interact with ChatGPT directly, ask it questions, and receive comprehensive and practical responses. When people were able to interact directly with the LLM like this, it became clear just how impactful this technology would become.



# Public attention to Generative AI technology spiked after ChatGPT release

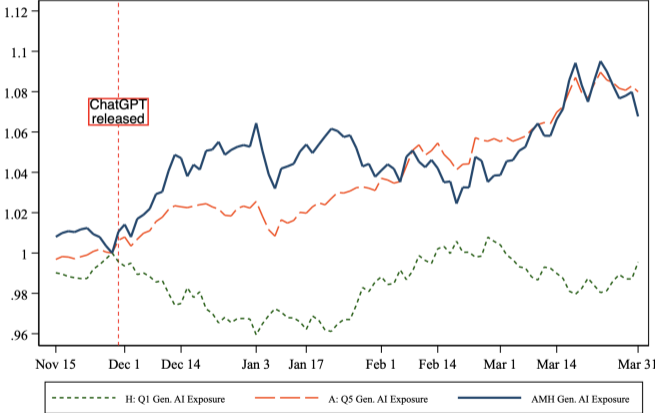


## AMH Portfolio

- ▶ Stocks with high Gen. AI exposure outperformed since ChatGPT release
- ▶ Sort stocks by Gen. AI exposure quintiles.
- ▶ Q5 (Artificial) - Q1 (Human) = AMH
- ▶ **AMH returned 0.4% daily during 2 weeks after Chat GPT3 release**
- ▶ **AMH had 7% cumulative return in 4 months 11/30/22-03/30/23**

# AMH Portfolio

Generative AI Exposure Quintile Portfolios  
Cumulative Excess Returns, Mkt-factor adj., Nov. 15th 2022 - March 31st 2023  
Cumulative excess returns indexed to November 29, 2022.



# AMH outperformance: Concentrated in the ChatGPT release period

- ▶ Define ChatGPT release period as November 30-December 14 2022.
- ▶ Based on ChatGPT 3 release date and Twitter mentions.

	Portfolios					
	Q1	Q2	Q3	Q4	Q5	AMH Q5-Q1
	<i>Market-factor-adjusted alpha (%)</i>					
Not ChatGPT release period	0.047 (1.09)	0.003 (0.09)	0.011 (0.30)	0.018 (0.44)	0.065 (1.90)	0.002 (0.04)
Yes ChatGPT release period	-0.230 (-5.49)	-0.045 (-0.44)	0.075 (1.01)	-0.031 (-0.88)	0.207 (4.86)	<b>0.420</b> <b>(5.65)</b>

FF 5 controls

FF 5 excl. tech sector

# AMH outperformance: Concentrated in the ChatGPT release period

- ▶ Define ChatGPT release period as November 30-December 14 2022.
- ▶ Based on ChatGPT 3 release date and Twitter mentions.
- ▶ Control for FF 5.
- ▶ Exclude Tech Sector to exclude product market effects.

	Portfolios					
	Q1	Q2	Q3	Q4	Q5	AMH Q5-Q1
	<i>FF 5-factor-adjusted alpha ex. tech sector (%)</i>					
Not ChatGPT release period	0.068 (1.56)	0.013 (0.35)	-0.023 (-0.68)	-0.019 (-0.74)	0.073 (2.35)	-0.011 (-0.20)
Yes ChatGPT release period	-0.171 (-2.40)	0.022 (0.22)	0.011 (0.32)	0.048 (1.01)	0.171 (1.94)	<b>0.327</b> <b>(3.51)</b>

## AMH outperformance is robust **within industries**

- ▶ Form portfolios by Gen. AI exposure **within industries** (tercile sorting)

	Portfolios			
	Q1	Q2	Q3	AMH Q3-Q1
<i>Market-factor-adjusted alpha (%)</i>				
Not ChatGPT release period	0.032 (1.13)	0.028 (1.15)	0.036 (1.72)	-0.013 (-0.32)
Yes ChatGPT release period	-0.170 (-3.19)	0.069 (1.41)	0.123 (2.83)	0.277 (3.71)
<i>NAICS3 ind.-neutral market-factor-adjusted alpha (%)</i>				
Not ChatGPT release period	0.035 (1.36)	0.020 (0.59)	0.035 (2.07)	-0.017 (-0.58)
Yes ChatGPT release period	-0.158 (-3.97)	0.035 (0.62)	0.144 (9.96)	<b>0.286</b> <b>(5.77)</b>

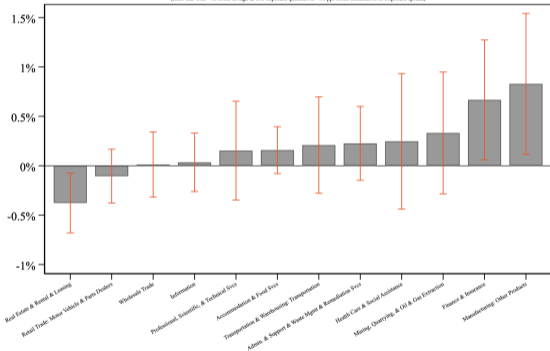
FF 5 controls

FIC 90 industries

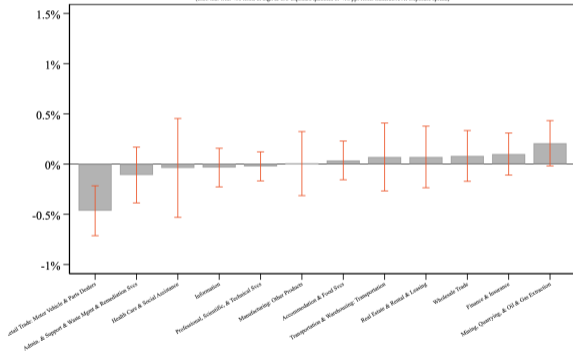
First evidence our results are likely not due to product market effects.

# Within-2-digit NAICS Sector AMH Returns

Within-Ind. 2-digit Sector AMH Quintile Generative AI Exposure Portfolio  
 ChatGPT Release Period Alpha, Mkt-factor adj., Daily Returns Nov. 15, 2022 - March 31, 2023  
(excl. ind. with <10 firms in high & low exposure quintiles or <10 ppt HML Generative AI Exposure spread)



Within-Ind. 2-digit Sector AMH Quintile Generative AI Exposure Portfolio  
 Not ChatGPT Release Period Alpha, Mkt-factor adj., Daily Returns Nov. 15, 2022 - March 31, 2023  
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# Panel regressions of firm returns on Generative AI exposure.

Dep. var.:	Daily Firm-level Excess Returns (ppt)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
$\mathbb{1}[\text{Yes ChatGPT release period}]_t \times \text{GenAI Exp}_i$	2.540*** (2.685)	2.451*** (2.690)	2.528*** (2.693)	2.545*** (2.691)	2.480*** (2.598)	2.276** (2.339)	2.115** (2.391)	
$\mathbb{1}[\text{Not ChatGPT release period}]_t \times \text{GenAI Exp}_i$	0.448 (0.834)	0.406 (0.776)	0.333 (0.759)	0.443 (0.815)	0.566 (1.070)	0.712 (1.347)	0.534 (1.279)	
$\mathbb{1}[\text{Yes ChatGPT release period}]_t \times \text{Log Size}_i$		-0.017 (-1.021)					-0.021 (-1.147)	
$\mathbb{1}[\text{Yes ChatGPT release period}]_t \times \text{Tobin's } Q_i$			0.002 (0.138)				0.003 (0.182)	
$\mathbb{1}[\text{Yes ChatGPT release period}]_t \times \text{ROA}_i$				-0.040 (-0.119)			0.047 (0.110)	
$\mathbb{1}[\text{Yes ChatGPT release period}]_t \times \text{Labor Intensity}_i$					0.023 (0.648)		-0.032 (-0.893)	
$\mathbb{1}[\text{Yes ChatGPT release period}]_t \times \text{Tangibility}_i$						-0.405 (-1.117)	-0.588 (-1.567)	
R-squared	0.52	0.52	0.52	0.52	0.52	0.52	0.52	
Observations	183272	183272	183272	182802	181110	182426	180922	
				Controls & fixed effects				
Three-digit industry $\times$ trading day FEs	X	X	X	X	X	X	X	
Non-release period $\times$ Characteristic	X	X	X	X	X	X	X	



# Product exposure vs. labor exposure to Generative AI.

## 3 Methods:

1. *10K-based Product GenAI Exp*: Ask Chat GPT to read Business Description section of most recent 10-Ks. Does firms' business products involve enabling or scaling new AI technologies or benefit from a direct incorporation of the new AI capabilities?  
1 = yes, 2 = no
2. *10K-based AI Mentions*: Count number of occurrences of AI related keywords in Business Description section of most recent 10-Ks.
3. *Goldman Sachs GenAI Exp*: Use the list of firms that were recently classified as "near-term beneficiaries of AI" by the investment bank Goldman Sachs, Goldman Sachs US Equity Views, August 21, 2023, "The (AI) trade after the trade: Identifying potential long-term EPS beneficiaries of AI adoption".

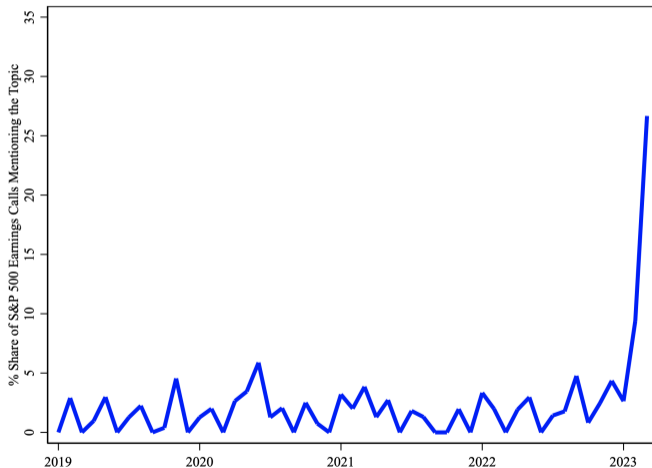
# Product exposure vs. labor exposure to Generative AI.

Dep. var.:	Daily Firm-level Excess Returns (ppt)				
	(1)	(2)	(3)	(4)	(5)
$\mathbb{1}[\text{ChatGPT release period}]_t \times \text{GenAI Exp}_i$	2.540*** (2.685)	2.511*** (2.719)	1.601** (2.132)	2.304*** (3.056)	1.616** (2.136)
$\mathbb{1}[\text{Not ChatGPT release period}]_t \times \text{GenAI Exp}_i$	0.448 (0.834)	0.231 (0.595)	-0.175 (-0.669)	0.198 (0.782)	0.033 (0.149)
$\mathbb{1}[\text{ChatGPT release period}]_t \times \text{10K-based Product GenAI Exp}_i$		0.132 (0.893)			-0.027 (-0.176)
$\mathbb{1}[\text{Not ChatGPT release period}]_t \times \text{10K-based Product GenAI Exp}_i$		0.184*** (3.086)			0.078* (1.927)
$\mathbb{1}[\text{ChatGPT release period}]_t \times \text{10K-based AI Mentions}_i$			0.017*** (6.206)		0.018** (2.423)
$\mathbb{1}[\text{Not ChatGPT release period}]_t \times \text{10K-based AI Mentions}_i$			0.010*** (4.881)		0.002 (0.641)
$\mathbb{1}[\text{ChatGPT release period}]_t \times \text{Goldman Sachs GenAI Exp}_i$				0.368** (2.268)	0.016 (0.063)
$\mathbb{1}[\text{Not ChatGPT release period}]_t \times \text{Goldman Sachs GenAI Exp}_i$				0.335*** (4.481)	0.251*** (2.773)
R-squared	0.52	0.53	0.53	0.52	0.53
Observations	183272	168230	168230	183210	168230
		<u>Controls &amp; fixed effects</u>			
Three-digit industry $\times$ trading day FEs	X	X	X	X	X
Non-release period $\times$ Characteristic	X	X	X	X	X

Reasonable to look for effects of Generative AI  
in the 2-week period following release of Chat GPT3?

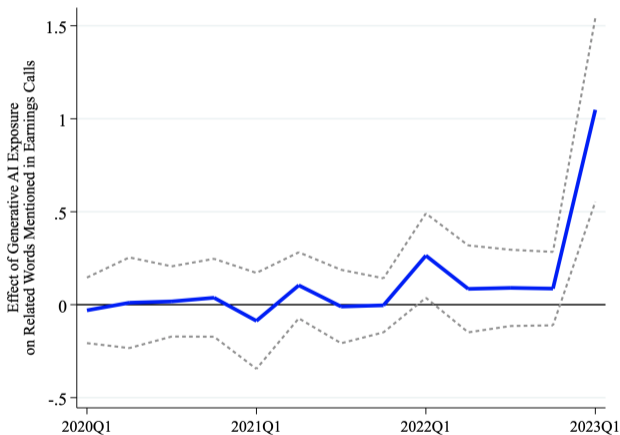
# Firms communicate with investors about Gen. AI in earnings calls

- ▶ Manually collected panel of earnings conference call transcripts for S&P 500 firms
- ▶ Count monthly mentions of: “llm”, “chatgpt”, “gpt”, “generative”, “language model”



# More exposed firms communicate *more* about Gen. AI

$$\mathbb{1}[\text{Mentions Gen. AI}]_{it} = \alpha_t + \beta_t \text{Exposure}_i^{\text{GenAI}} + \gamma \mathbb{1}[\text{Mentions Gen. AI}]_{i,2019} + \varepsilon_{i,t}$$

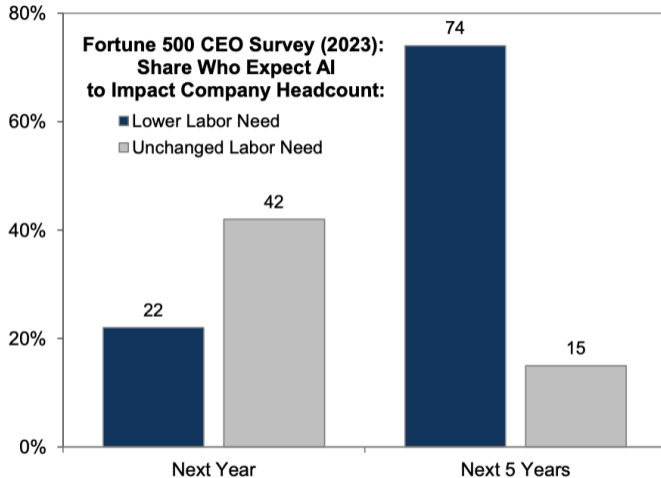


ML mentions

Only non-tech

1 SD  $\Delta$  in firm exposure  $\Rightarrow$  6.7ppt increase in likelihood of mentioning Gen. AI

# CEOs have realized that Generative AI will affect labor needs



Source: Fortune, Goldman Sachs Global Investment Research

Are Productivity Improvements b/c Generative AI is  
Complementary to Labor or a Substitute?

## More exposed firms reduce hiring for exposed roles

$$\text{Job Posting}_{it} = \alpha_i + \alpha_t + \chi \mathbb{1}[\text{Post-ChatGPT}]_t \times [\text{Gen. AI Exposure}]_i + \text{FEs} + \varepsilon_{it},$$

Job category:	All (1)	High-GenAI Exp Occ (2)
<u>Panel A: Number of firm's job postings in the category</u>		
$\mathbb{1}[\text{Post-ChatGPT}]_t \times \text{GenAI Exp}_i$	-599.548** (-2.304)	-297.326*** (-3.635)
<u>Panel B: Percentage of firm's job postings in the category</u>		
$\mathbb{1}[\text{Post-ChatGPT}]_t \times \text{GenAI Exp}_i$		-6.644** (-2.064)
Observations	132,964	132,964
	<u>Addl. controls &amp; fixed effects</u>	
Month-Year FEs	X	X
Firm FEs	X	X



# Wages have declined more for more exposed occupations

Estimate wage diff-in-diff in monthly CPS data Jan. 2019 - July 2023:

$$\ln(\text{wage}_{i,t}) = \alpha_{occ} + \alpha_t + \chi \mathbb{1}[\text{Post-ChatGPT}]_t \times [\text{Gen. AI Exposure}]_{occ} + \gamma' X + \text{FEs} + \varepsilon_{it},$$

Dep. var.:	Log wage	
	(1)	(2)
$\mathbb{1}[\text{Post-ChatGPT}]_t \times \text{GenAI Exp}_{occ}$	-0.027** (-2.046)	
$\mathbb{1}[\text{Post-ChatGPT}]_t \times \text{High-GenAI Exp}_{occ}$		-0.012** (-2.427)
Observations	258,851	258,851
Occupation FE	X	X
Month FE	X	X
MSA FE	X	X
Individual Characteristics	X	X

*Worker-level controls:* age, age squared, experience, experience squared, race, education

## Conclusion

- ▶ Large technological shock with widespread impact  $\Rightarrow$  different from previous automation shocks
    - ▶ Higher impact on white-collar jobs, high-skilled, high-wage occupations
  - ▶ Skill demand in more exposed firms is shifting towards hiring relatively more workers with AI-related skills, relative and absolute decrease in hiring for highly exposed occupations
  - ▶ Large differences in **A** vs. **H** firm returns (42bps daily)
    - ▶ Occupational-mix exposure (vs. product exposure) affects more firms and
    - ▶ leads to large variation both across and *within* industries
    - ▶ Only 18% of variation in firm exposures is explained by industry effects
    - ▶ Can trade an industry neutral portfolio (28bps daily)
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