

The Labor Impact of Generative AI on Firm Value

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Summary

- Question: How does generative AI affect firm value?
 - Super hot topic!
- Methodology: Measure exposure to generative AI based on the occupation composition of firms' workers

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- Methodology: Measure exposure to generative AI based on the occupation composition of firms' workers
- This paper provides evidence on GenAI increasing firm value through replacing labor with AI
 - Elon Musk proclaimed AI to be “the most disruptive force in history,” and noted that “there will come a point where no job is needed.”
 - Last year, AI godfather Geoffrey Hinton advised people to “get a job in plumbing.”

Plan of Discussion

- Is generative AI replacing labor?
 - Measurement of exposure to generative AI
 - What else might be going on?
- Is labor replacement the tip of the iceberg? How does generative AI affect firm value in general?

Measurement of Exposure to Generative AI

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- The effect on firm profitability should depend on the relative cost of labor vs AI:
 - The benefit is larger if the replaced worker is more expensive or if the skills are scarce
 - What is the cost of ChatGPT? Fixed costs vs. variable costs? Can ChatGPT be more cost effective even it takes more time to complete the task?

Measurement of Exposure to Generative AI

- A lot of automation does not improve productivity or save costs even if they are promised to do so
 - E.g., self-checkout kiosks at grocery stores or automated customer service

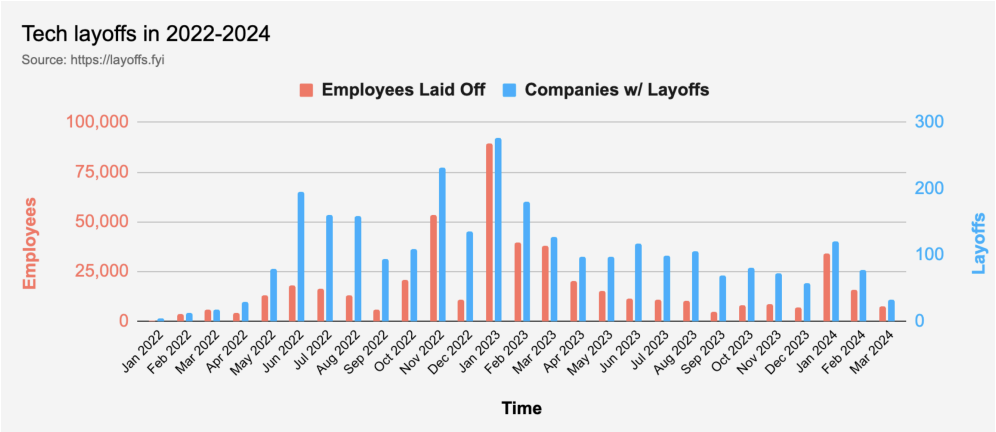
Musk has second thoughts on aggressive automation for Tesla Model 3



Measurement of Exposure to Generative AI

- A task is considered not exposed if using ChatGPT reduces the quality of the task's output.
- But the quality of the task's output is different across workers and across firms
- GitHub Copilot increased productivity of worse programmers (Peng et al., 2023), and GenAI tools improved productivity and quality of novice customer service agents or writers (Brynjolfsson et al., 2023; Noy and Zhang, 2023)
- Generative AI can enable firms to improve quality of work or maintain the same quality with lower-skilled workers
- Firms with worse quality workers or facing talent constraints (Chen, Zhang, and Zhang, 2024) are more exposed

Confounding Factors



The introduction of ChatGPT coincided with the peak of tech layoffs

Confounding Factors

- Are companies with higher GenAI exposure more exposed to tech layoffs?
- It is likely, since GenAI most displaces jobs with cognitive skills like IT workers
- Should be easy to check by looking at layoffs in the Revelio data in the pre-period

Is Labor Replacement the Main Use Case of GenAI?

- Babina, Fedyk, He, and Hodson (2023) show that the main use of AI and ML is product innovation and not cost reduction or labor replacement

HEALTH — NOVEMBER 1, 2023

How AI played an instrumental role in making mRNA vaccines

AI was key to making Moderna's COVID mRNA vaccine. Its role in mRNA therapeutics will rapidly grow in the coming years.



Anadolu Agency / Getty Images

KEY TAKEAWAYS

● Years before Moderna created a highly effective mRNA vaccine against COVID, the company put into place AI systems to accelerate the research process. ● These systems allowed the company to ready its vaccine for human trials in just 42 days. ● AI machine learning models are set to further accelerate the research process, putting mRNA medicine into overdrive to the benefit of all.

- Caveat: the data we used is up to 2018 and before the advent of GenAI

Is Labor Replacement the Main Use Case of GenAI?

- IBM, the company ranked #1 in our exposure to Generative AI measure among the largest U.S. firms, mentioned “generative AI” 15 times in its 2023 annual report:
 - **6 times** related to watsonX:
 - “In 2023, we launched watsonx as our AI platform for business. Built on Red Hat OpenShift, watsonx offers the power of state-of-the-art IBM and open-source models for clients to run AI wherever they need it. The depth and breadth of our consulting expertise in generative AI can make a crucial difference in accelerating time-to-value for clients.”
 - “watsonx Code Assistant leverages generative AI to modernize Z applications.”
 - **3 times** on general strategy and client demand
 - **2 times** related to cloud platform
 - **2 times** related to IBM software
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 - **2 times** related to consulting
 - **0 times** related to labor

Is Labor Replacement the Main Use Case of GenAI?

- Some of the main use cases of GenAI within businesses by Mckinsey:

Example use cases¹ (not exhaustive)

Marketing and sales	Operations	IT/engineering	Risk and legal	HR	Utility/employee optimization
Write marketing and sales copy including text, images, and videos (eg, to create social media content or technical sales content)	Create or improve customer support chatbots to resolve questions about products, including generating relevant cross-sell leads	Write code and documentation to accelerate and scale developments (eg, convert simple JavaScript expressions into Python)	Draft and review legal documents , including contracts and patent applications	Assist in creating interview questions for candidate assessment (eg, targeted to function, company philosophy, and industry)	Optimize communication of employees (eg, automate email responses and text translation or change tone or wording of text)
Create product user guides of industry-dependent offerings (eg, medicines or consumer products)	Identify production errors, anomalies, and defects from images to provide rationale for issues	Automatically generate or auto-complete data tables while providing contextual information	Summarize and highlight changes in large bodies of regulatory documents	Provide self-serve HR functions (eg, automate first-line interactions such as employee onboarding or automate Q&A or strategic advice on employment conditions, law, regulations, etc)	Create business presentations based on text prompts, including visualizations from text
Analyze customer feedback by summarizing and extracting important themes from online text and images	Streamline customer service by automating processes and increasing agent productivity	Generate synthetic data to improve training accuracy of machine learning models with limited unstructured input	Answer questions from large amounts of legal documents , including public and private company information		Synthesize a summary (eg, from text, slide decks, or online video meetings)

Is Labor Replacement the Main Use Case of GenAI?

- Babina, Fedyk, He, and Hodson (2023) find that a one-standard-deviation increase in AI investment increases firms' market value by 22% up to 2018 (mainly through the product innovation channel)
- Generative AI has the potential to have an even larger effect on firm value by improving and expanding firms' products

Labor Complementarity

- The paper measures complementarity using whether GenAI performs the supplemental tasks of of an occupation
- But firms do not benefit from this complementarity

<i>Dep var.:</i>	High-Exp Occ Job Posting		Profitability		CAR[-1,10]	
<i>Panel Unit:</i>	Firm×Month		Firm×Qtr		Firm	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × GenAI Exp	-1.378*** (-3.747)	-3.038*** (-2.991)	0.016** (2.265)	0.056*** (3.189)		
Post × ShareSupp		-2.302** (-2.029)		0.059** (2.007)		
Post × GenAI Exp × ShareSupp		8.100** (2.037)		-0.231*** (-2.946)		
GenAI Exp					0.216*** (2.621)	0.380*** (2.579)
ShareSupp						0.272 (1.447)
GenAI Exp × ShareSupp						-1.937*** (-3.226)

Labor Complementarity

- The distinction between “core” and “supplemental” tasks are not always clear
- For example, the occupation “Business Teachers, Postsecondary” (occupation 25-1011.00) has the following tasks:
 - Evaluate and grade students’ class work, assignments, and papers.
 - Maintain student attendance records, grades, and other required records.
 - Supervise undergraduate or graduate teaching, internship, and research work.

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 - Core
 - Maintain student attendance records, grades, and other required records.
 - Core
 - Supervise undergraduate or graduate teaching, internship, and research work.
 - Supplemental

Labor Complementarity

- **Alternative:** Autor, Chin, Salomons, Seegmiller (2023) measure labor augmenting technologies as those complementing occupation outputs instead of substituting occupation inputs
- For example, innovation in “highly efficient solar power conversion” complements occupation “Electrical and electronics engineers” which includes job “Solar photovoltaic electrician”; “Systems and methods for detecting malware on mobile platforms” complements occupation “Computer programmers”

Some Hopes for Labor in the Age of GenAI?

- Generative AI has the potential to enable a larger set of lower-skilled workers possessing complementary knowledge to perform some of the higher-stakes decision-making tasks currently arrogated to elite experts like doctors, lawyers, coders and educators (Agrawal, Gans, and Goldfarb, 2023; Autor, 2024).
- Generative AI can also create new jobs
 - Autor, Chin, Salomons, Seegmiller (2023): 60% of employment now is in jobs created after 1940