Tehisaru mõju tootlikkusele

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Strongly optimistic, pessimistic and cautiously optimistic views on productivity effects of AI

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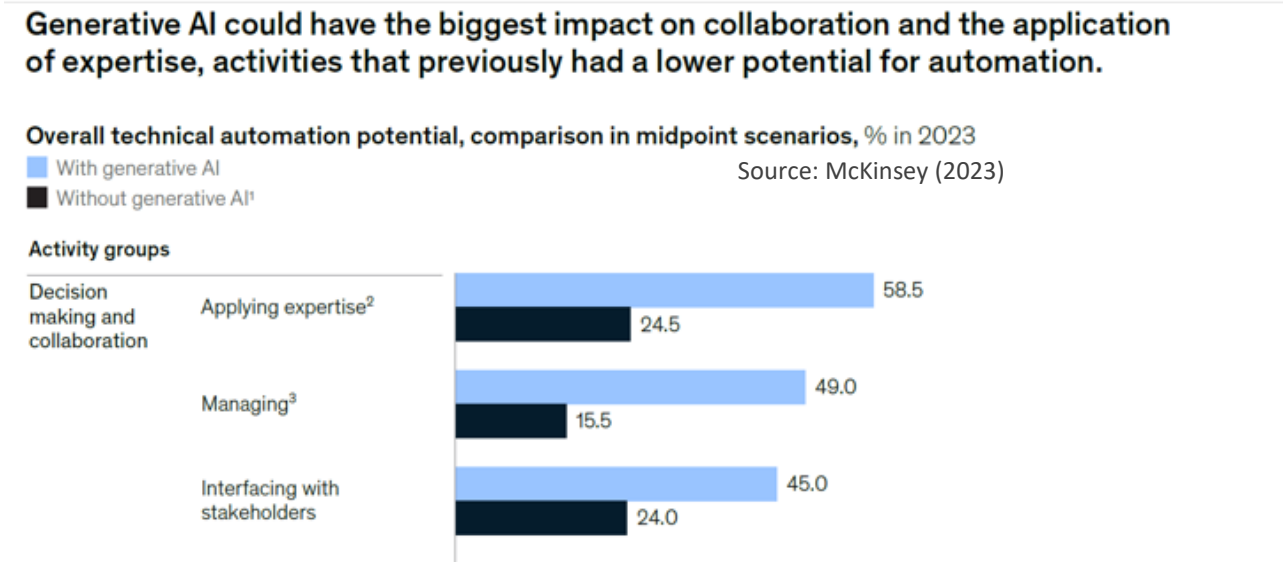
Acemoglu (2025) assesses based on the 'task-based approach' that AI would add **only 0.07** percentage point each year in next 10 years to the annual total factor productivity (TFP) growth. This means in total not more than **0.66**% increase in TFP over 10 years. Corresponding effect on GDP: GDP is estimated in this case to grow by around **1.1%** over the next 10 years.

Strongly optimistic, pessimistic and cautiously optimistic views on productivity effects of AI

- **Aghion and Bunel (2024**): AI could add **0.68** percentage points annually to TFP growth. This is roughly equivalent to the past IT revolution's annual effects.
- **Mokyr** (in his Nobel prize speech in 2025) on effects of AI as a general purpose technology (GPT): „You ain't seen nothing yet"

AI and Productivity Growth

- **AI affects productivity to large extent through these effects:**
  - **Automates production of goods and services** (automating a share of current tasks of labour, replacing thus labour)
  - Can create **fully new tasks** for employees (note: also potential for complementarities with labour)
  - **Automates production of ideas** (AI as *„invention of method of invention“*, see works by Philippe Aghion)



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Artificial intelligence tools expand scientists' impact but contract science's focus

Qianyue Hao, Fengli Xu ✉, Yong Li ✉ & James Evans ✉

Nature (2026)

Abstract

/.../

Using a dataset of **41.3 million research papers across the natural sciences** and covering distinct eras of AI, here we show an accelerated adoption of AI tools among scientists and consistent professional advantages associated with AI usage, but a collective narrowing of scientific focus. **Scientists who engage in AI-augmented research publish 3.02 times more papers, receive 4.84 times more citations and become research project leaders 1.37 years earlier than those who do not.** By contrast, **AI adoption shrinks the collective volume of scientific topics studied by 4.63%** **/.../** Adoption of AI in science presents what seems to be a paradox: an expansion of individual scientists' impact but a contraction in collective science's reach, as AI-augmented work moves collectively towards areas richest in data. With reduced follow-on engagement, AI tools seem to automate established fields rather than explore new ones, highlighting a tension between personal advancement and collective scientific progress.

BRYNJOLFSSON ET AL. (2025)

« Generative AI at Work », Erik Brynjolfsson, Danielle Li, and Lindsey R. Raymond, (May 2025), *The Quarterly Journal of Economics.*

Experimental study

Focus:

- Customer service sector (IT helpdesk)
- Adoption of a Generative AI system in a Fortune 500 company that advises SMEs on enterprise software
- The job: mainly answering SME managers' questions on how to install the software

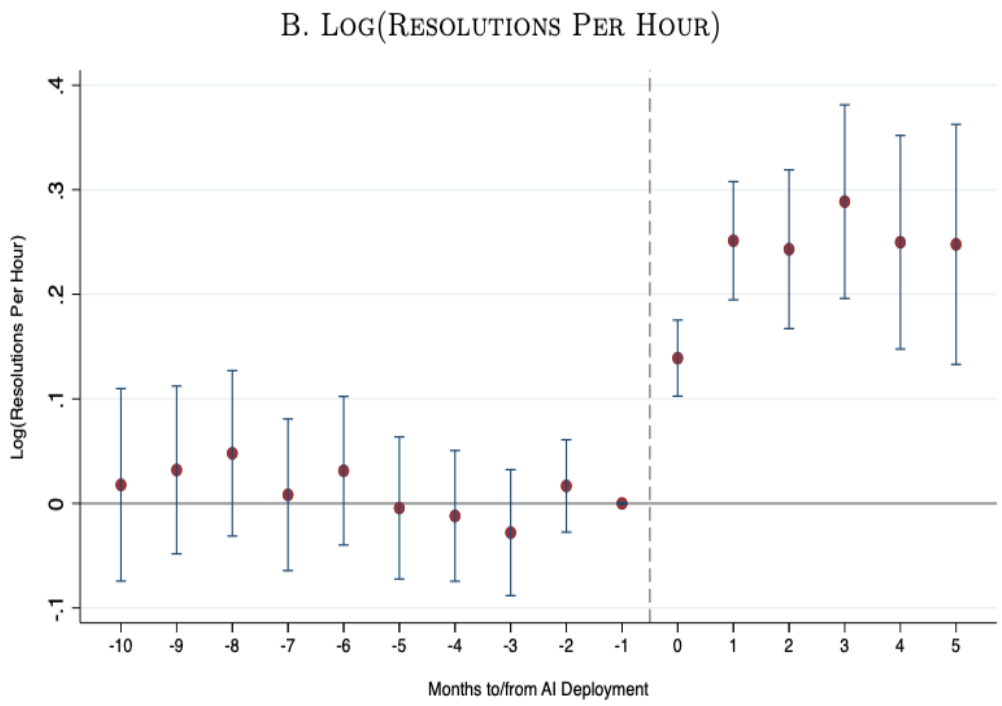
Measuring agents' productivity:

- Average duration of a chat
- Percentage of successful chats
- Customer's satisfaction

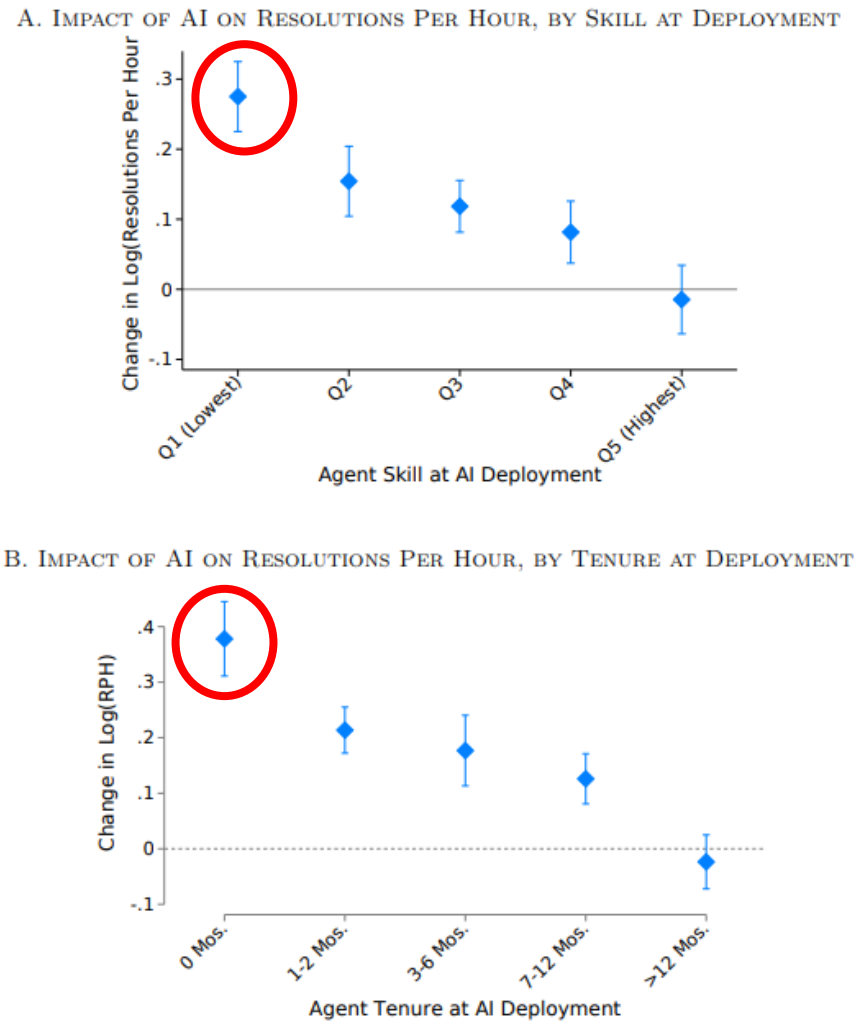
AI Tool

- Suggests responses which the agent may or may not endorse

BRYNJOLFSSON et al. (2025): productivity effect, especially on less-skilled and less-experiences employees



- **Significant productivity boost already one month after AI adoption (+14%)**
- Further productivity increase thereafter **(up to +25%)**
- Time=0 is the start of adoption.



- **Catching-up effect of AI in the case of the less-skilled and less-experienced employees.**

Debate still on whether AI is having deskilling effect on labour or not

- An example of deskilling technology from past: GPS changed the role of skills of taxi drivers (learning the streets of very large cities can take years vs GPS)

The benefits of AI and the role of prior skills are heterogeneous across different types of tasks

Otis, N., Clarke, R. P., Delecourt, S., Holtz, D., & Koning, R. (2024). The uneven impact of generative AI on entrepreneurial performance. *Current status of the paper: R&R at Management Science.*

University of California Berkeley

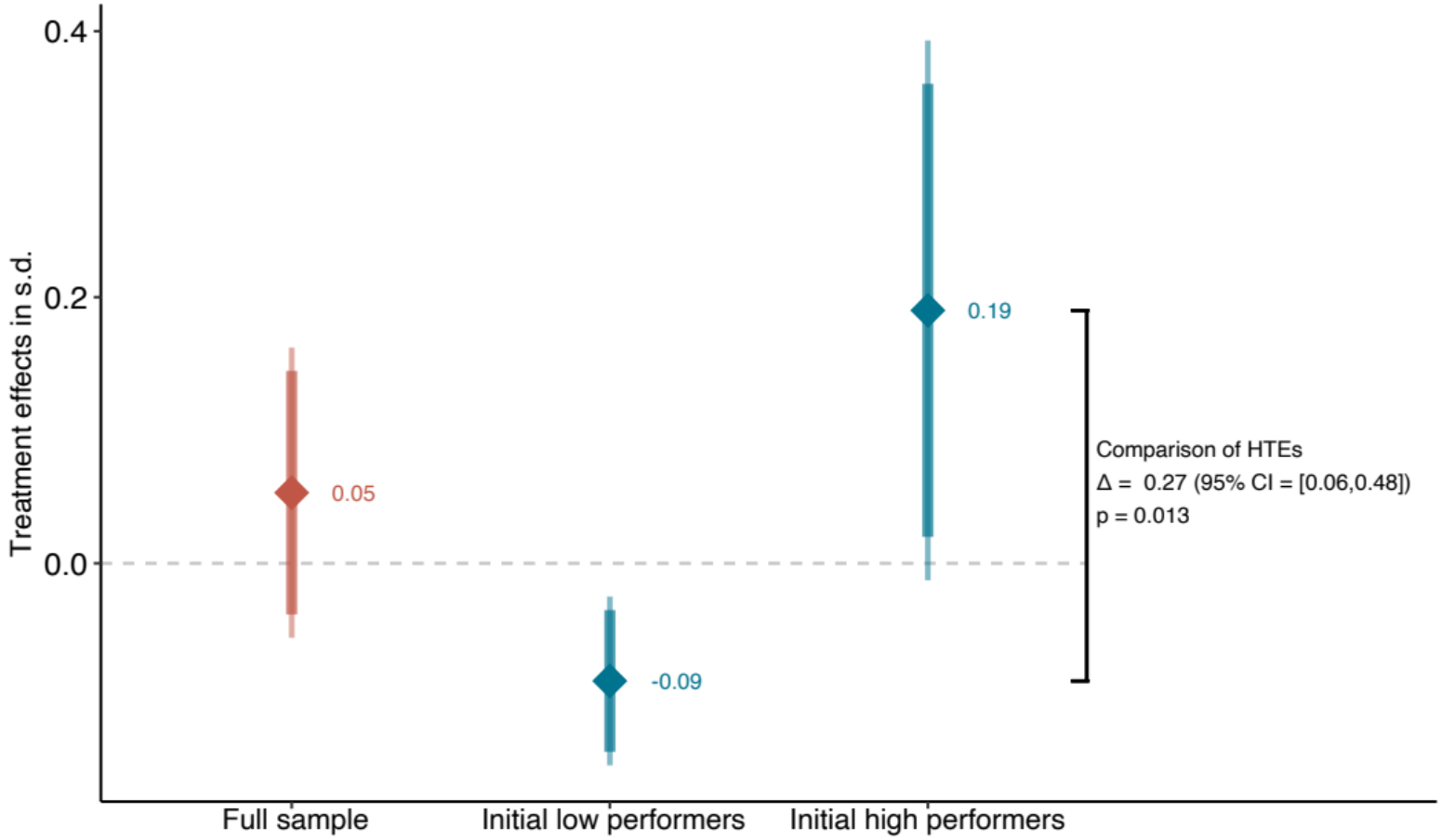
- An experimental study on effects of adoption of AI among entrepreneurs in a developing country

<u>AI Tool</u>

- ChatGPT 4.0 based tool, gives **advice to entrepreneur's related to running a business**

Otis et al. (2024). A result emphasizing the role of capabilities: prior low performers even lose and only high performers (i.e., above average performers) gain as a result of business consulting AI's adoption.

An interpretation: in the case of ***complex decision making contexts and tasks****, selecting better ideas among many AI-generated options requires* ***strong ability of judgement****.*



Evidence from Estonia: the effects of AI and automation are especially strong if they are used together with innovation in work-practices and management

Effects of adoption of automation technologies and AI on total factor productivity of firms, %

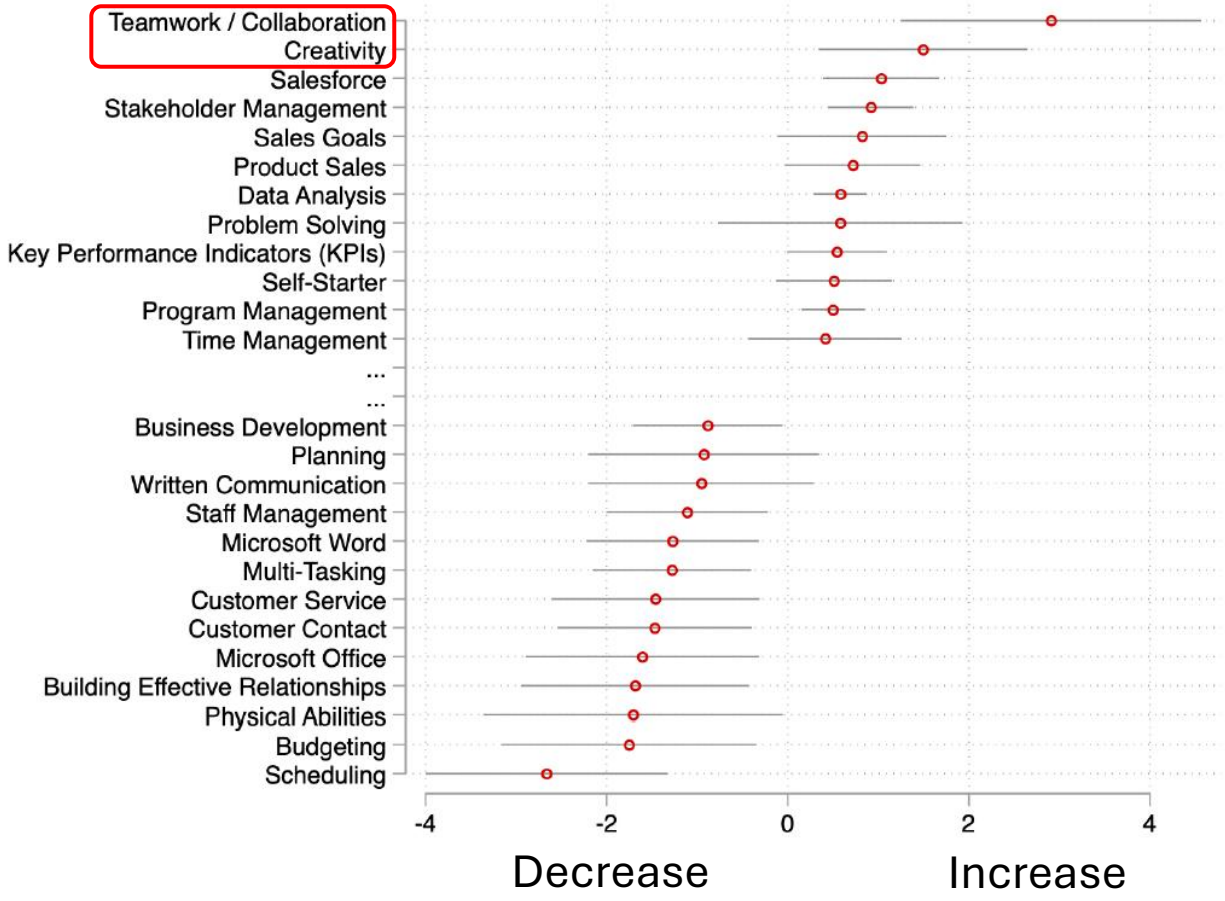
Field (effect, in %)	Manufacturing	Knowledge Intensive Services
Only automation	6.3***	8.9*
Automation together with organizational innovation	9.3***	24.8**
Only adoption of AI	n.s.	n.s.
Adoption of AI together with organizational innovation	18.9*	23.2*

Source: MKM-POL15 research project (2025) and Tiwari, Vadi and Vahter (2026). Period of AI adoption: 2021-2023. Period of analysis for effects of automation: 2000-2023.

AI adoption at firms and demand for managerial expertise: evidence from USA (Alekseeva, Azar, Giné, Samila 2024)

Alekseeva, Azar, Giné, Samila (2024):

- Data: more than 300 million US job postings merged with firm level data.
- **Increase of AI adoption at the firm affects positively the amount of total management vacancies by the firm and the share of managers.**



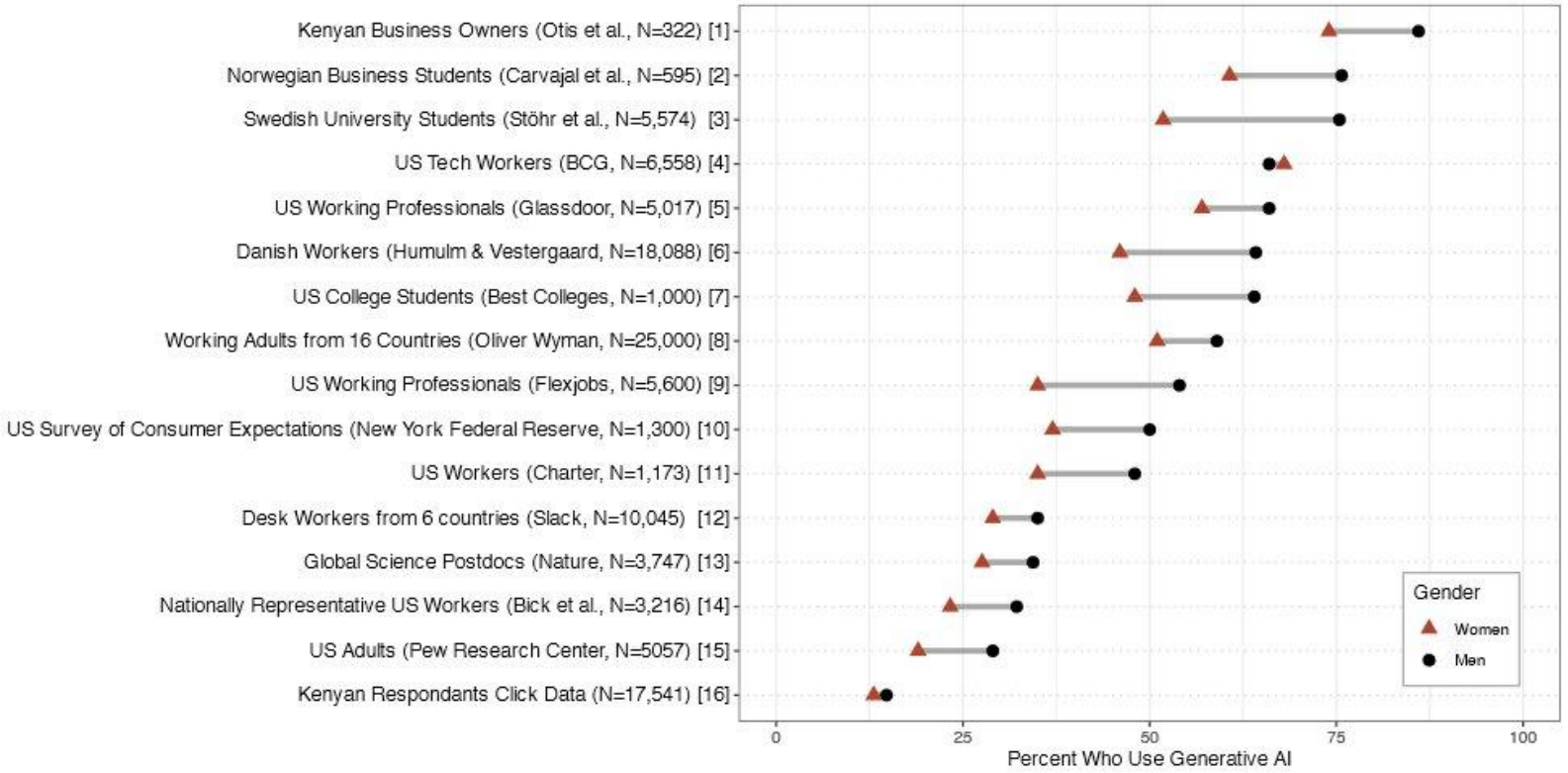
CONCLUSIONS

- Large potential for effects of generative AI on productivity.
- In the case of some tasks: AI can act as a potentially highly useful tool for training and upgrading the less-skilled or new employees at the firm.
- However, in the case of rather complex tasks AI may benefit more the skilled and experienced entrepreneurs and employees and firms with higher capabilities.
- **Technology alone is not enough: the role of complementarities in the effects of AI.** Some evidence of that from Estonia. Technological innovation has much larger effects if combined **with organizational innovation.**
- **Role of managerial and social skills** in reaching the benefits of adoption of AI.
- Potential of AI evident especially in new knowledge creation.
- However, short run vs long run effects can differ and will differ.

Lisaslaidid: tehisaru ja lõhed tööturul

Food for thought on diffusion gaps of generative AI. Almost any recent study on AI adoption finds gender gaps in diffusion

Figure 1: Generative AI Usage by Gender Across Studies

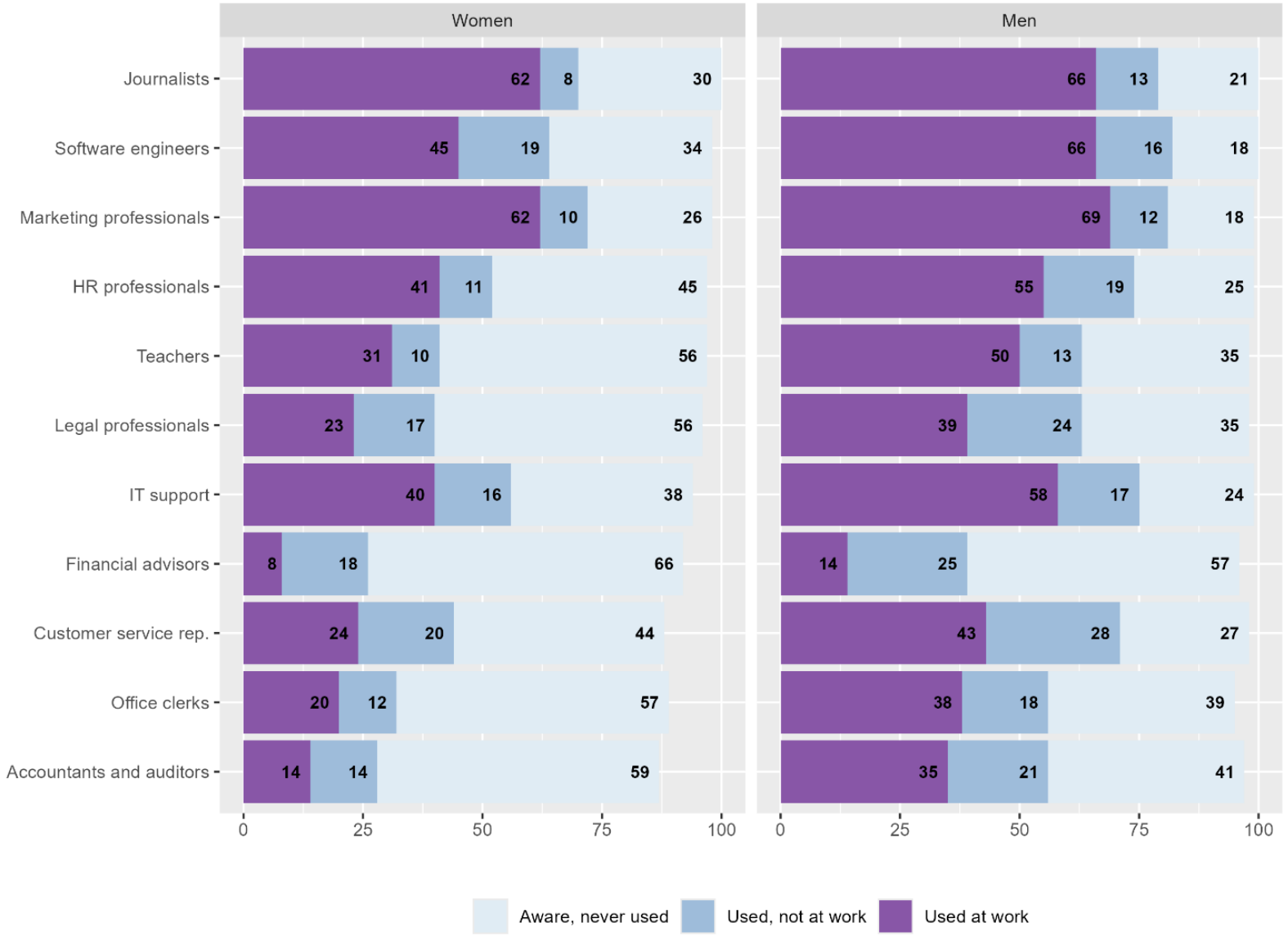


Source: Otis et al. 2024, https://www.hbs.edu/faculty/Pages/item.aspx?num=66548

Diffusion of AI among employees in occupations expected t be most affected, example from Denmark

See: AI adoption at work. Notice the gender gaps in adoption in this example,

- **Period: November 2023 – January 2024.**
- **Data: 100 000 employee survey data, Statistical Office of Denmark.**
- **Source: University of Chicago research by Humlum ja Vestergaard (2024).**



For Background: Did Computers Close the Gender Pay Gap? Effects on wages of women and men

	Women		Men	
	(1)	(2)	(3)	(4)
Sector:	All	Subset	All	Subset
Period:	1970-2000s	1970-2000s	1970-2000s	1970-2000s
$\Delta comp_o$	**0.591*** **	**0.859*** **	**0.990*** **	**1.330*** **
	(0.190)	(0.122)	(0.246)	(0.143)
$\ln w_{o,1970}$	0.129	-0.845***	-0.0562	-1.165***
	(0.318)	(0.0926)	(0.341)	(0.202)
$\Delta_{1940-1970} \ln w_o$	0.00684	0.284***	0.477*	0.203
	(0.219)	(0.0997)	(0.255)	(0.176)
Δhrs_o	0.0193	0.0430***	0.0437***	0.0632***
	(0.0181)	(0.00759)	(0.0105)	(0.00836)
Constant	-0.0227	1.696***	-0.270	2.357***
	(0.561)	(0.167)	(0.807)	(0.537)
Observations	266	266	266	266

Robust SE in parentheses. Sign at: *** p<0.01, ** p<0.05, * p<0.1.
All specifications are 2SLS and use $Pr(comp_{1970})$ as an IV.

Source: **Nedelkoska, L., et al., 2023**. Eight Decades of Changes in Occupational Tasks, Computerization and the Gender Pay Gap.

AI (re)creating biases: example on age and gender-based treatment by ChatGPT

- **Guilbeault, D., Delecourt, S. & Desikan, B.S.** (October 2025). Age and gender distortion in online media and large language models. *Nature* 646, 1129–1137 (2025). https://doi.org/10.1038/s41586-025-09581-z
- **Would ChatGPT hire you? Your age and gender matter.** Answer: "…when generating and evaluating resumes, ChatGPT assumes that women are younger and less experienced, **rating older male applicants as of higher quality**. Our study shows how gender and age are jointly distorted throughout the internet and its mediating algorithms, thereby revealing critical challenges and opportunities in the fight against inequality."