Large Language Models, Small Labor Market Effects*

Anders Humlum† Emilie Vestergaard‡

March 20, 2025

Abstract

We examine the labor market effects of AI chatbots using two large-scale adoption surveys (late 2023 and 2024) covering 11 exposed occupations (25,000 workers, 7,000 workplaces), linked to matched employer-employee data in Denmark. AI chatbots are now widespread—most employers encourage their use, many deploy in-house models, and training initiatives are common. These firm-led investments boost adoption, narrow demographic gaps in take-up, enhance workplace utility, and create new job tasks. Yet, despite substantial investments, economic impacts remain minimal. Using difference-in-differences and employer policies as quasi-experimental variation, we estimate precise zeros: AI chatbots have had no significant impact on earnings or hours in any occupation, with confidence intervals ruling out effects larger than 1%. Modest productivity gains (average time savings of 2.8%), combined with weak wage pass-through, help explain these limited labor market effects. Our findings challenge narratives of imminent labor market transformation due to Generative AI.

*This project received financial support from the Becker Friedman Institute, the Center for Applied Artificial Intelligence, Chicago Booth, and the Polsky Center for Entrepreneurship and Innovation. Caspar Ringhof provided excellent research assistance.

†University of Chicago, Booth School of Business, anders.humlum@chicagobooth.edu

‡University of Copenhagen, Department of Economics, emilievestergaard@econ.ku.dk

The emergence of AI chatbots marks the rise of Generative Artificial Intelligence (AI). By some measures, these technologies are already living up to the immense hype: AI chatbots have seen the fastest worker adoption of any new technology (Blandin, Bick and Deming, 2025; Humlum and Vestergaard, 2025), randomized controlled trials (RCTs) demonstrate substantial productivity gains for users (Brynjolfsson, Li and Raymond, 2025; Noy and Zhang, 2023), and case studies indicate notable effects on online labor market platforms (Hui, Reshef and Zhou, 2024; Teutloff et al., 2025).

However, the broader labor market implications of Generative AI remain unclear for at least three reasons. First, while workers have embraced AI chatbots for their low costs and ease of use, we lack evidence on whether firms are making meaningful investments in integrating these tools into workplace processes (Bonney et al., 2024). Second, RCTs show that the effects of AI chatbots can turn negative if applied to the wrong tasks (Dell'Acqua et al., 2023; Otis et al., 2024*b*), raising caution in extrapolating effects from controlled settings to the broader economy. Third, while studies have documented effects on productivity, it remains unclear how these translate into earnings, hours, and job mobility, as high-quality microdata on such outcomes is rarely available (Brynjolfsson, Li and Raymond, 2025).

This paper addresses these gaps by conducting two large-scale surveys on AI chatbot adoption and linking the responses to matched employer-employee data in Denmark. Our dataset includes two survey rounds (late 2023 and 2024), each covering about 25,000 workers from 7,000 workplaces across 11 occupations exposed to AI chatbots, linked to monthly panel data on earnings, hours, and occupations.[1] Our analysis proceeds in three parts.

First, we examine how firm-led investments in AI chatbots influence workers' take-up

[1]Our list of occupations is accountants, customer support specialists, financial advisors, HR professionals, IT support specialists, journalists, legal professionals, marketing professionals, office clerks, software developers, and teachers.

of the tools. Employers are now heavily invested in AI chatbots: most encourage their use, 38% deploy in-house models, and 23% of employees have received training.

These initiatives greatly boost adoption, nearly doubling take-up rates for the typical worker from 47% to 83%. The relative importance of employer encouragement becomes even more pronounced for more intensive usage. Notably, these efforts narrow demographic disparities in take-up: the gender gap in chatbot adoption shrinks from 11.9 to 5 percentage points when firms actively encourage use, with training initiatives proving particularly effective.

Second, we investigate how chatbot adoption affects work processes. While AI chatbots save time across all exposed occupations (for 64%–90% of users), their impact on work quality and job satisfaction varies. For instance, marketing professionals are more than twice as likely as teachers to report that chatbots improve work quality (69.8% vs. 32.1%), while software developers are more than twice as likely than journalists to report increased job satisfaction from chatbot use (30.5% vs. 12.6%). Notably, AI chatbots have created new job tasks for 8.4% of workers, including some who do not use the tools themselves. We examine how AI chatbots are reshaping work by applying LLM analysis to workers' free-text descriptions of their new tasks. The role of task creation in shaping the impact of AI chatbots on work aligns with existing theories on how automation technologies reinstate labor demand (Acemoglu and Restrepo, 2019; Autor et al., 2024).

Importantly, the benefits from AI chatbots—time savings, quality improvements, creativity, task expansion, and job satisfaction—are 10%-40% greater when employers encourage their usage. This underscores the importance of firm-led complementary investments in unlocking the productivity potential of new technologies (Brynjolfsson, Rock and Syverson, 2021).

However, despite substantial investments in AI chatbots, their overall impact on work remains modest: users report average time savings of just 2.8% of work hours. This

contrasts with the significant productivity gains—often exceeding 20%—documented by RCTs in our study occupations (Brynjolfsson, Li and Raymond, 2025; Noy and Zhang, 2023; Peng et al., 2023). Two key factors help explain this discrepancy. First, effect heterogeneity—RCTs tend to focus on occupations with the largest gains from AI chatbots, potentially overstating their broader impact. Second, firm-based complementary investments—many real-world workers do not operate under the same favorable conditions as those in experimental settings, limiting realized productivity gains. These findings caution against directly extrapolating productivity gains from controlled experiments to the broader economy.

In the third part of the paper, we examine the effects of AI chatbots on labor market outcomes. We link our survey data to administrative records on monthly earnings, hours, and occupations through June 2024—one and a half years after ChatGPT's launch. Using a difference-in-differences framework, we compare adopters and non-adopters before and after the arrival of AI chatbots, leveraging employer policies to isolate quasi-exogenous variation in adoption.

Our main finding is that AI chatbots have had minimal impact on workers' economic outcomes. Difference-in-differences estimates for earnings, hours, and job mobility are all precisely estimated zeros, with confidence intervals ruling out average effects larger than 1%. At the occupation level, effects are similarly close to zero, generally ruling out changes greater than 6%. These limited impacts persist in the quasi-experimental analysis based on employer policies, suggesting that the average causal effect is indeed negligible. Moreover, a direct survey question—*"Have AI chatbots affected your labor earnings?"*—confirms that workers perceive no earnings impact as of November 2024.

While reported time savings from AI chatbots are modest, we have statistical power to rule out comparable earnings effects. Specifically, we estimate that only 3–7% of workers' time savings are passed through to higher earnings, with greater elasticity at firms that

encourage chatbot use. These pass-through estimates align with, but fall at the lower end of, existing estimates (Card et al., 2018). In summary, the limited impacts of AI chatbots on workers' earnings reflect a combination of modest productivity gains and weak pass-through to wages, although employer policies can enhance both.

As a final analysis, we assess whether AI chatbots have affected workplace outcomes, potentially influencing non-adopting coworkers. Comparing workplaces with high versus low rates of AI chatbot usage, we find no evidence that firms with greater chatbot adoption have fared differently. Direct survey questions confirm that non-users perceive no chatbot-related changes, with one exception: teachers report new job tasks resulting from students' chatbot use.

Overall, our findings challenge narratives of imminent labor market transformations due to Generative AI. While adoption has been rapid, with firms now heavily invested in unlocking the technological potential, the economic impacts remain small.

1 Data and Institutional Setting

Denmark provides an ideal setting for examining the labor market impacts of Generative AI. First, Denmark has exceptional infrastructure for measuring the adoption of new technologies. In particular, every Dane has a digital mailbox that Statistics Denmark can use to send survey invitations. Using this infrastructure, we conducted two large-scale, representative surveys on AI chatbot adoption, which we detail below. Second, our partnership with Statistics Denmark enables us to link these surveys to matched employer-employee data, offering a unique opportunity to analyze labor market effects such as changes in earnings, working hours, and job mobility. Third, Danish workers have been at the forefront of Generative AI adoption, with take-up rates comparable to those in the United States (RISJ, 2024). Finally, Denmark's labor market is highly flexible—similar to that of the U.S.—allowing firms and workers to adjust hours and

earnings in response to technological change (Botero et al., 2004). Taken together, these factors make Denmark a prime setting to observe early labor market effects of Generative AI, with an unparalleled data infrastructure to assess these impacts rigorously.

1.1 Data Sources

This paper builds on two large-scale surveys on AI chatbot adoption, conducted in November–December of 2023 and 2024. The first survey provided the dataset for Humlum and Vestergaard (2025), which documented adoption patterns of ChatGPT, the dominant AI chatbot. This paper extends that dataset in two key ways. First, we link survey responses to administrative labor market data after the introduction of ChatGPT, enabling us to assess impacts on earnings, work hours, and job mobility. Second, we introduce a second survey round in 2024 that (*i*) broadens the scope to include all AI chatbots, including in-house models, (*ii*) provides extensive data on firm-led adoption initiatives, and (*iii*) offers deeper insights into workers' actual usage and perceived benefits of these tools. Section 1.3 outlines the 2024 survey, which is the primary focus of this paper.

1.2 Occupations

Our surveys focus on 11 occupations that are particularly exposed to AI chatbots: *accountants, customer support specialists, financial advisors, HR professionals, IT support specialists, journalists, legal professionals, marketing professionals, office clerks, software developers, and teachers*. These occupations were selected based on three criteria: (*i*) they have at least one job task where AI chatbots can save time, as measured by the "Direct Exposure (E1)" metric from Eloundou et al. (2024); (*ii*) they are captured by a well-defined set of ISCO codes; and (*iii*) they contain a sufficient number of workers for statistical analysis. Humlum and Vestergaard (2025) details the selection and empirical measurement of these occupations.

1.3 Survey Outline

Our 2024 survey is organized into the four blocks summarized below. The 2023 round followed a similar structure. The full questionnaires are in Appendix F.

Block 1: Occupation and tasks. Workers first select their occupation and report the importance of six representative tasks in their occupations.

Block 2: Adoption. Workers report their experiences with various AI chatbots, including the domains, frequency, and duration of usage.

Block 3: Employer initiatives. Workers are asked about any employer initiatives related to AI chatbots, including usage policies, in-house chatbots, and employee training.

Block 4: Impact on work. Workers are asked about their experienced benefits and estimated effects of AI chatbots.

1.4 Register Data

We use several administrative registers at Statistics Denmark. Our matched employer-employee data come from the *E-Income Register,* which records earnings, hours, occupation, and industry for all job spells in Denmark on a monthly basis from 2008 onward. This register is compiled by the Danish tax authorities and subsequently harmonized by Statistics Denmark into the *Employment Statistics of Employees* (BFL) dataset. We complement this with demographics data on individuals from the *Population Register* (BEF), and wealth information for the *Personal Wealth Register* (FORMPERS). Because our survey was sent to workers identified in the register data by their (deidentified) social security numbers (*pnr*), all respondents can be matched to the register data.

1.5 Survey Sample

We invited 115,000 workers to participate in each of our survey rounds in 2023 and 2024. The registers at Statistics Denmark enabled us to target these invitations by occupation and workplace. In particular, for each of our 11 occupations, we conducted a workplace-based sampling procedure, first drawing a random set of workplaces within the occupations and then sampling all relevant workers for these workplaces. This sampling procedure maximizes the statistical power of the workplace-level analyses whilst keeping our sample representative. Appendix A.1 details the sampling protocol. We sent three reminders per survey round, two by e-mail and one by text. The invitation letters are in Appendix E. We received about 25,000 valid and complete responses to each of the survey. Appendix A.2 details our survey response rates. While our main analysis focuses on responses from the 2024 round, we use the 2023 round to examine the dynamics of our estimated effects.

1.5.1 Representativeness and Response Quality

Appendix A.2.1 conducts several checks on the representativeness and quality of our survey responses. These analyses extend the checks in Humlum and Vestergaard (2025) to the 2024 survey round. First, we ensure that our sample represents the population based on observables, including age, gender, experience, earnings, and wealth. Second, following Dutz et al. (2022), we use randomized participation incentives to show that our findings are also balanced on workers' latent willingness to participate in the survey. Finally, we cross-check that the survey responses align with variables that are also recorded in the administrative registers.

2 Adoption

2.1 Employer Initiatives

Figure 1, Panel (a) shows the prevalence of employer policies related to AI chatbot usage across our 11 occupations. Firms are now heavily invested in AI chatbots: about 43% of workers are explicitly encouraged to use them, another 21% are allowed, while only about 6% are explicitly prohibited from doing so. This marks a shift from early responses to ChatGPT, when many employers restricted its use due to concerns over data confidentiality and output accuracy (Humlum and Vestergaard, 2025).

Employers' encouragements are supported by substantial investments in tools and training. Panel (b) shows that 38% of firms have their own AI chatbots—most often customized versions—and Panel (c) shows that 30% of employees have participated in training courses on AI chatbot usage, with most of these courses organized by their employer. Notably, these firm-wide investments are prevalent in all 11 occupations but are particularly widespread in journalism and marketing and more limited in teaching. The widespread investments in AI chatbots at the workplace are consistent with their potential as a general-purpose technology (Eloundou et al., 2024).[2]

Who is most exposed to the employer initiatives on AI chatbot adoption? Table B.1 shows a strong correlation in coworkers' responses regarding their employers' initiatives, validating that these are largely firm-wide efforts. However, Table 1 reveals that these initiatives reinforce existing adoption patterns: younger, higher-earning men are more likely to report being encouraged to use the tools and to have participated in firm-provided training. Conversely, workers who are less likely to adopt the tool on their own are also less likely to feel encouraged to do so or to receive firm-provided training. This suggests that, as currently implemented, employer initiatives may not mitigate the unequal adoption

[2]Appendix B.2.1 shows that ChatGPT remains the dominant product. Even when firms invest in their own AI chatbots, they often base them on GPT.

patterns that have emerged in the adoption of Generative AI (Humlum and Vestergaard, 2025; Otis et al., 2024*a*).

2.2 Worker Adoption

How do employer initiatives affect workers' adoption of these tools? To answer this question, we compare workers in the same occupations with similar characteristics and examine how their adoption behavior changes in response to employer initiatives:

$$Y_j = \gamma' X_j + \beta \times \text{EmployerInitiative}_j + \varepsilon_j, \tag{1}$$

where Y_j represents a worker outcome, such as the use of AI chatbots for work; X_j is a vector of worker characteristics, including age, gender, experience, and occupation fixed effects; and $\text{EmployerInitiative}_j$ denotes an employer-driven initiative, such as encouraging employees to use AI chatbots.

Figure 2 shows that employer encouragement policies significantly boost adoption, nearly doubling take-up rates for the typical worker from 47% to 83%. The relative impact of employer encouragement becomes even more pronounced for more intensive usage. For example, the share of workers using AI chatbots daily rises from 8% to 21% when employers encourage their use.

Do employer initiatives influence which workers use AI chatbots? In Figure 3, we estimate demographic gaps in AI chatbot adoption separately based on employers' initiatives while controlling for workers' occupations and task mixes.

Employer encouragement significantly reduces demographic disparities in AI chatbot adoption. For example, the gender gap in chatbot use narrows from 11.9 to 5 percentage points when firms actively encourage adoption. Firm-provided training courses are even more effective, reducing the gender gap in AI chatbot uptake to 3.6 percentage points. [3]

[3]Figure B.2 shows that while training consistently reduces disparities across all usage intensities—including daily use—encouragement alone may widen the gender gap in frequent chatbot usage.

The effectiveness of training interventions aligns with results from the earlier 2023 survey round, where women were significantly more likely to cite a lack of training as a barrier to AI chatbot adoption (Humlum and Vestergaard, 2025). By contrast, Figure 3 shows that training initiatives are less effective at inducing AI chatbot adoption among more experienced workers, highlighting the challenges of reskilling within jobs.

2.3 Comparison to the Literature

The widespread adoption of AI chatbots and the substantial demographic gaps in usage are now well-documented facts in the literature. For example, our 2023 survey found that 39.8% of workers had used ChatGPT for work, with adoption rates 15.9 percentage points lower among women within occupations (Humlum and Vestergaard, 2025).[4] Blandin, Bick and Deming (2025) report similar adoption patterns among U.S. workers, and Otis et al. (2024*a*) show that the gender gap in Generative AI adoption is pervasive across contexts.

We contribute to this evidence by documenting that employer-driven adoption initiatives for AI chatbots are now common and play a crucial role in shaping overall adoption rates and demographic disparities in usage.[5]

By contrast, earlier surveys on AI have found relatively low take-up rates among firms. For example, Bonney et al. (2024) document 5.4% of US firms reported using AI as of February 2024, with adoption in the leading sector (Information) below 20%. Our survey provides the first comprehensive evidence on how employers are now integrating Generative AI into the workplace.

The figure also shows that the gender gap is not driven by men using AI chatbots when they are explicitly prohibited, as the gender gap is consistently smaller when AI chatbot usage is not allowed in the workplace. This contrasts with Carvajal, Franco and Isaksson (2024), who document a similar gender gap in ChatGPT adoption among Norwegian bachelor's students but attribute it largely to male students using the tools even when they are not allowed in the courses.

[4]For comparison, in our 2024 survey round, ChatGPT adoption has risen to 49.1%, with a gender gap of 12.3 percentage points (see Appendix B.2.2 for a comparison of the 2023 and 2024 adoption patterns).

[5]For instance, the rise of employer initiatives is likely a primary driver of the shifts between the 2023 and 2024 surveys (increased adoption and narrowed gender gap), as most initiatives were rolled between the two surveys. For example, one of the first in-house language models, DanskeGPT—the AI chatbot of Denmark's largest bank—was launched in March 2024 (Danske Bank, 2024).

We find that while employer policies—particularly those related to training—have the potential to reduce demographic gaps in adoption, their current targeting tends to reinforce the existing inequalities documented in the literature, favoring younger, higher-earning men (Humlum and Vestergaard, 2025; Otis et al., 2024*a*).

More generally, the importance of firm-wide complementary investments for the take-up of AI chatbots aligns with the literature on "Productivity J-Curves" in the diffusion of general-purpose technologies (Brynjolfsson, Rock and Syverson, 2021). In the following sections, we examine how the employer investments in AI chatbots influence the tools' impacts on work processes and labor market outcomes.

3 Work

3.1 Benefits for Users

What benefits do workers report from using AI chatbots? Figure 4 shows that workers primarily report time savings as a main benefit (Panel (a)), with an average saving of 25 minutes per day of use (Panel (b)). Additionally, nearly half of workers cite improved work quality and enhanced creativity as key advantages. In contrast, increased job satisfaction is the least commonly reported benefit.

Table C.1 breaks down these benefits by occupation, revealing significant variation. For instance, marketing professionals are more than twice as likely as teachers to report that chatbots improve work quality (69.8% vs. 32.1%), while software developers are more than twice as likely as journalists to report increased job satisfaction from chatbot use (30.5% vs. 12.6%). Despite these differences, AI chatbots help save time across all exposed occupations, with time savings reported by 64%–90% of users.

Importantly, the benefits from AI chatbots—time savings, quality improvements, creativity, task expansion, and job satisfaction—are all 10%-40% greater when employers encourage their usage. This highlights the importance of firm-based complementary

investment for unlocking the work-related benefits of new technologies (Brynjolfsson, Rock and Syverson, 2021).

What is the economic significance of the reported benefits of AI chatbots? In Table 3, we combine workers' frequency of use (from Figure 2) with their reported time savings per day of usage (from Figure 4.(b)) to estimate time savings as a percent of total work hours. Average time savings from AI chatbots vary from 6.8% among marketing professionals whose employers encourage their use to 0.6% among teachers in schools that do not encourage their use. The larger time savings for encouraged workers reflect both that they use the AI chatbots more often and report greater time savings per day of use. Across our 11 occupations and employer policies, the average time savings amount to 2.8% of the total work hours of users.

How do workers allocate the time savings from AI chatbots? Figure 4.(c) shows that the vast majority (80%) reallocate this time to other job tasks, while fewer than 10% use it for additional breaks or leisure. Finally, 25% spend more time on the same tasks they saved time on, particularly when their employers actively encourage AI adoption. This suggests that firm-led investments play an important role in enabling workers to expand task outputs in response to task-specific productivity gains (Brynjolfsson, Rock and Syverson, 2021).

3.2 Workloads and Task Creation

Figure 5 examines how AI chatbots influence workloads. Notably, AI chatbots have created new workloads for 17% of users (Panel (a)), with 4.4 percentage points performing more of the same tasks, 10.9 percentage points taking on new tasks, and 1.7 percentage points doing both. Importantly, new workloads are 20-50% more pronounced in workplaces with that encourage the use. This highlights the importance on firm-led initiatives for realizing the workplace transformations from new technologies (Brynjolfsson, Rock and Syverson,

2021).

To further understand how AI chatbots affect the nature of work, we asked respondents to describe their new job tasks from AI chatbots. In Appendix C.2.1, we use a Large Language Model (LLaMA 3.3) to categorize the free-text responses and report the most common new tasks associated with AI chatbots in each occupation. AI chatbots have introduced new tasks related to their use, such as reviewing AI-generated output (e.g., for accountants), writing shorter and faster stories (for journalists), developing AI policies and ensuring compliance (for lawyers), and correcting AI errors (e.g., for customer support). Interestingly, some new tasks arise from others' use of AI chatbots. For example, teachers report new responsibilities related to students' use of AI chatbots.

Consistent with the findings that workloads from AI chatbots extend beyond tasks directly related to using them, Figure 5.(b) shows that 5% of non-users report new workloads from AI chatbots. Specifically, about 10%-15% of teachers who have not used AI chatbots report new workloads from the technologies. In general, the new workloads for non-users reflect almost entirely new tasks, and these effects are stronger in workplaces that encourage the use of AI chatbots.

Taken together, the widespread creation of new tasks, the spillovers to non-users, and the stronger effects in workplaces that encourage the tools all highlight the broader workplace transformations caused by AI chatbots.

3.3 Comparison to the Literature

The importance of task creation for the impact of AI chatbots on workloads supports key theoretical predictions for how automation technologies may reinstate the demand for labor in the production process (Acemoglu and Restrepo, 2019; Autor et al., 2024). Notably, across all occupations, workplaces that encourage AI chatbot use experience greater task creation from these tools. This underscores the importance of firm-led investments for

driving workplace transformations from technological change (Brynjolfsson, Rock and Syverson, 2021).

That said, the average reported time savings of 2.8% for adopters may seem small compared to the substantial productivity gains—often exceeding 20%—documented by RCTs in our study occupations.[6] How can we reconcile workers' modest reported time savings with the substantial effects observed in RCTs?

First, our reported time savings are highest precisely in the occupations covered by RCTs, such as customer and IT support (Brynjolfsson, Li and Raymond, 2025), marketing and human resources (Noy and Zhang, 2023), and software development (Peng et al., 2023). In contrast, reported savings are about half as large among teachers, accountants, and financial advisors, whose tasks may be less suited to chatbot assistance. This occupational heterogeneity supports the concept of a "jagged frontier" of AI chatbot costs and benefits (Dell'Acqua et al., 2023), warranting caution against extrapolating productivity estimates across tasks or occupations.

Second, reported time savings are significantly higher when employers actively encourage chatbot use. For example, marketers and software developers whose employers promote AI chatbots report time savings of approximately 7%. In this sense, RCTs may capture the productivity effects of a well-coordinated and carefully managed adoption of these tools. While such estimates provide valuable insight into the workplace potential of AI chatbots, our survey indicates that many users do not operate under similarly favorable conditions. This highlights the need for caution when extrapolating productivity benefits from controlled settings onto the broader economy.

Our time savings estimates align more closely with those of Blandin, Bick and Deming

[6]Noy and Zhang (2023) report time savings of 37% from ChatGPT in text writing tasks representative of marketing and HR professionals. Brynjolfsson, Li and Raymond (2025) estimate productivity effects of 15% from a GPT-based chat assistant among costumer and IT support agents, with more pronounced effects for less experienced workers. Cui et al. (2024) estimate a 26% productivity gain from GitHub Copilot among software developers, while Peng et al. (2023) report a 58% increase.

(2025), who, in a nationally representative U.S. survey, find an average reported time savings of 5.4% among users. However, their study does not split the time savings by occupation or employer policies, limiting direct comparability to our estimates.

4 Labor Market Outcomes

Our preceding analysis shows that AI chatbots are now widespread, with adopters reporting time savings and other work-related benefits, especially in workplaces that encourage their usage. Have these changes affected workers' labor market outcomes, such as earnings, work hours, or job mobility? To answer this question, we link the survey responses to matched employer-employee data on labor market outcomes (see Section 1.4 for details). We first outline our empirical strategy in Section 4.1 before presenting our results in the subsequent sections

4.1 Empirical Strategy

Our primary analysis employs a difference-in-differences specification, comparing the labor market outcomes of adopters and non-adopters before and after the introduction of AI chatbots. A key concern in this analysis is that adopters may have fared differently in the labor market even without AI chatbots. We take three steps to address this issue.

First, we control for workers' pre-determined characteristics—including gender, age, and labor market experience—to ensure these factors do not drive our estimates (e.g., adopters being younger and naturally on upward earnings trajectories).

Second, we leverage our panel data to implement a difference-in-differences approach indexed to November 2022, the release date of ChatGPT.[7] This allows us to control for time-invariant differences between workers (e.g., high-ability adopters who would have earned more regardless) and examine whether adopters experienced differential changes

[7]Appendix B.2.1 shows that ChatGPT remains the dominant AI chatbot to date.

after this date. Additionally, we assess whether adopters were on distinct labor market trends even before AI chatbots became available, enabling us to control for potential pre-existing differences.

Finally, to address unobserved confounding shocks (e.g., adopters facing sudden setbacks or tailwinds in the labor market after November 2022), we leverage quasi-exogenous variation from the employer policies documented in Section 2.1. Specifically, we compare similar workers whose AI chatbot adoption differs due to employer policies. Encouragements (e.g., training programs or in-house chatbots) increase adoption, while restrictions (e.g., firm-wide bans) suppress it. Section 4.2.1 presents the results from these quasi-experimental analyses, which closely align with our main difference-in-differences estimates.

4.1.1 Regression Specifications

Let Y_{jt} denote a labor market outcome (e.g., earnings) for worker j in month-year t, let X_j represent a vector of workers' pre-determined characteristics (age, gender, experience, and occupation FEs), and let A_j indicate whether the worker has adopted AI chatbots.

Dynamic Difference-in-Differences. To assess overall impacts, we employ a dynamic difference-in-differences specification that compares the monthly outcomes of adopters and non-adopters before and after the introduction of AI chatbots:

$$Y_{jt} = \underbrace{\sum_{\tau} \lambda_{1\tau} X_j \mathbf{1}_{\{t=\tau\}}}_{\text{Pre-Determined Controls}} + \underbrace{\sum_{m} \lambda_{2m} \mathbf{1}_{\{m=m(t)\}}}_{\text{Seasonality}} + \underbrace{\sum_{\tau \neq 2022M11} \beta_\tau A_j \mathbf{1}_{\{t=\tau\}}}_{\text{Dynamic Diff-in-Diffs}} + \beta_0 A_j + \varepsilon_{jt}, \quad (2)$$

where λ_{2m} are month fixed effects. The parameters of interest, β_τ, capture the differential changes in labor market outcomes for adopters, indexed to November 2022, the release of ChatGPT. In the quasi-experimental analysis of employer policies, we swap A_j for an indicator of the policy considered, such that β_τ identifies the reduced-form effect

of facing the policy.

Pooled Difference-in-Differences. To examine heterogeneous impacts across multiple dimensions, we use a pooled specification that compares the average outcomes of adopters and non-adopters before and after the introduction of AI chatbots:

$$Y_{jt} = \underbrace{\sum_{\tau} \lambda_{1\tau} X_j \mathbf{1}_{\{t=\tau\}}}_{\text{Pre-Determined Controls}} + \underbrace{\sum_{m} \lambda_{2m} \mathbf{1}_{\{m=m(t)\}}}_{\text{Seasonality}} + \underbrace{\lambda_3 t + \lambda_4 A_j t}_{\text{Time Trends}} + \underbrace{\beta A_j \mathbf{1}_{\{t \geq 2022M11\}}}_{\text{Pooled Diff-in-Diff}} + \beta_0 A_j + \varepsilon_{jt}, \tag{3}$$

where we add adopter-specific time trends to ensure our pooled difference-in-differences estimates are not driven by spurious trends in outcomes. The parameter of interest, β, captures the average differential change in the labor market outcomes of adopters after November 2022.

4.2 Earnings and Hours

Figure 6 presents dynamic difference-in-differences estimates for the impact of AI chatbot adoption on workers' earnings and work hours. The figure reveals three key results. First, one and a half year after their launch, AI chatbots have had minimal average impact on the earnings or hours of adopters. Our confidence intervals rule out changes larger than 2%. Second, these effects show no differential trend after the arrival of AI chatbots, indicating that the minimal impacts are not just a very short-term phenomenon.[8] Finally, despite employer encouragements boosting the benefits of AI chatbots in Section 3, we find no differential impact on labor market outcomes for adopters whose employers encourage their use.[9]

Do the overall zero effects mask heterogeneous gains and losses across workers? To

[8]Section 4.3 shows that survey responses from November 2024 similarly show no earnings impacts of AI chatbots.

[9]We further analyze the role of employer policies in Section 4.2.1.

investigate this, Figure 7 estimates the effects of AI chatbots on worker earnings separately for each of the 11 occupations in our sample. Notably, we do not find significant effects of AI chatbots in any occupation: the occupation-specific estimates are all close to zero, generally ruling out effects larger than 6%.

4.2.1 Impacts of Employer Initiatives

The difference-in-differences results above show that adopters have not fared better in the labor market after the introduction of AI chatbots, even those who report large benefits or are in flexible jobs. To ensure that these estimates are not confounded by unobserved shocks to adopters,[10] we now exploit that employer policies cause variation in adoption among similar workers. Table 2 reports the "first stage" effects of these policies, showing how encouragements raise adoption among otherwise similar workers.

Figure 8 shows the "reduced form" effects of employer encouragements on workers' labor market outcomes, with dynamic effects in Panel (a) and occupation-specific impacts in Panel (b). Across all of our occupations studied, workers who are encouraged to use AI chatbots have not fared differently in the labor market. These results support our conclusion that AI chatbots have had no causal effect on the labor market outcomes of adopters.

4.3 Perceived Impacts

The absence of earnings impacts from AI chatbots may seem surprising, given that workers report work-related benefits in Section 3. While reported time savings are also modest (around 2%–4% for the average user; see Table 3), the confidence bands in Figure 6 are narrow enough to rule out a comparable effect on earnings. For example, our pooled estimate ("All" in Figure 7.(b)) rejects effects on earnings larger than 1%. More specifically,

[10]For example, workers experiencing unforeseen personal or professional setbacks may struggle to adopt new technology. Conversely, those who expect to succeed regardless may see little need for chatbot assistance.

software developers and marketing professionals report time savings of approximately 7% when employers encourage AI chatbot use—effect sizes that Figure 7 also rules out for earnings.

To further investigate the earnings impacts, we directly asked workers: *"Have AI chatbots affected your labor earnings?"* If so, we followed up with, *"By how much?"* Figure 9 plots workers' responses against their estimated time savings, yielding four key insights.

First, workers overwhelmingly report that AI chatbots have not meaningfully affected their earnings: the average perceived earnings impact ranges from 0.04% to 0.2%, depending on whether their employer encourages their use. These estimates are an order of magnitude smaller than the reported time savings in Section 3 and fall within the confidence bands of the actual earnings effects in Section 4.2. Moreover, because these perceived earnings effects were collected in November 2024, they provide reassurance that the zero difference-in-differences estimates in Section 4.2 are not merely a consequence of a short post-treatment window ending in June 2024. The continued absence of meaningful effects in November 2024 aligns with the difference-in-differences estimates, which show no differential trend following the introduction of AI chatbots.

Second, the limited perceived earnings effects primarily reflect that about 97% of workers report no change in earnings due to AI chatbots—rather than large positive and negative effects canceling each other out (see Appendix D.1 for a detailed breakdown). This further supports our conclusion from Figure 7 that AI chatbots have not had significant heterogeneous impacts on labor market outcomes.

Third, workers' perceived earnings effects are only weakly correlated with their reported time savings. As the slopes in Figure 9 indicate, only 3–7% of their estimated time savings translate into earnings. This suggests that the limited labor market impacts result from a genuinely weak pass-through of time savings and other benefits, rather than from workers misperceiving their gains from AI chatbots.

Fourth and finally, all these effects— time savings, pass-through rates, and ultimately earnings impacts—are significantly larger when employers encourage AI chatbot use. This highlights the critical role of firm-led adaptions, not only in unlocking the work-related benefits of the technology (as documented in Section 3) but also in translating these benefits into labor market outcomes such as earnings.

4.4 Workplace Outcomes

In this final section, we examine whether AI chatbots have influenced workplace outcomes. Even if the work-related benefits of AI chatbots have not yet translated into changes in users' earnings or hours, employers may already be adjusting total employment or wage bills in response to these tools. If so, AI chatbots could be affecting non-adopting coworkers, potentially violating the "no spillovers" assumption in our worker-level difference-in-differences analysis. Indeed, Section 3.2 showed that AI chatbots have already created new workloads for non-users, signaling broader workplace changes.

Section 4.4.1 outlines how we adapt our empirical strategy to assess workplace impacts, while Section 4.4.2 presents the results.

4.4.1 Empirical Strategy

To investigate the workplace impacts of AI chatbots, we shift our difference-in-differences analysis to the workplace level, comparing workplaces with high versus low adoption rates. Specifically, we run the regression models in Section 4.1.1, where Y_{jt} is now an outcome of workplace j (e.g., total employment or wage bill), X_j are the average pre-determined characteristics of its employees, and A_j is the share of its employees who have adopted AI chatbots.

A concern for this analysis is that our survey may not cover all employees at workplace j, leading to measurement error in the survey-based adoption rates A_j, which could attenuate our difference-in-difference estimates. We take two steps to address this issue. First, as

described in Section 1.5, we implement a two-stage sampling strategy that maximizes the coverage of our sampled workplaces—first drawing a random set of workplaces, then sampling all their employees. Second, we apply an Empirical Bayes shrinkage procedure to correct for measurement error in the survey-based adoption rates. Appendix D.2.1 details this procedure and demonstrates that our results remain robust when using the raw survey-based adoption rates.

4.4.2 Results

Figure 10 shows the impacts of AI chatbot adoption on total workplace earnings and employment hours. Panel (a) shows dynamic difference-in-differences, and Panel (b) shows the pooled difference-in-differences for each occupation. Across the board, workplaces with higher rates of AI chatbots adoptions have not fared differently. Scaling the point estimates with the standard deviation of workplace adoption rates (20pp after shrinkage; see Appendix D.2.1), we can rule out standardized effects larger than 1%.

Finally, to further investigate potential labor market spillovers from AI chatbots, we also asked non-users directly whether AI chatbots have affected their earnings. Figure D.3 in Appendix D.3 provides the answers, showing 99.6% answers "No". This solidifies our conclusion that—despite changing workloads, even for non-users—AI chatbots have not had meaningful spillover effects on labor market outcomes such as earnings.

4.5 Comparison to the Literature

The literature provides little evidence on how AI chatbots affect workers' labor market outcomes, and a core contribution of this paper is to fill that gap.

The closest existing evidence comes from case studies of specific labor markets, often online platforms for freelance work. These studies document remarkable shifts in labor demand following the launch of ChatGPT (Hui, Reshef and Zhou, 2024; Teutloff et al., 2025). For example, Teutloff et al. (2025) report that demand for substitutable freelance

services, such as writing and translation, declined by 20–50% after ChatGPT. By contrast, we do not find significant impacts on broader labor market outcomes. What could explain this difference? Our evidence points to four factors.

First, while freelance proofreading may be highly substitutable by AI chatbots, most exposed occupations do not fall into this extreme category.[11] Indeed, workers in our survey report only modest time savings from AI chatbots. This reiterates our observations from Section 3.3 that existing studies tend to concentrate on the occupations where the productivity gains from the tools are the largest.

Second, freelance work offers far less job security and rigidity, allowing productivity changes to pass through more quickly to labor market outcomes. In contrast, we find only a weak relationship between workers' time savings and earnings effects from AI chatbots. While the flexibility of freelance work makes it useful for identifying short-run changes in labor demand, our findings on the weak pass-through of productivity gains caution against extrapolating these effects to the broader labor market. Indeed, our pass-through estimates align more closely with existing literature, which suggests that about 5% to 15% of firm-level productivity gains are passed through to wages (Card et al., 2018). By comparison, we estimate an average pass-through of 7% when employers encourage AI chatbot use.

Finally, although existing studies document shifts in demand on specific platforms, it remains unclear how these shifts affect workers' total earnings and hours, as workers may adapt by reallocating their tasks. In our survey, most workers report using time saved by AI chatbots for other tasks, including new job responsibilities introduced by AI. A key advantage of our administrative data is that it allows us to measure workers' total earnings and hours, regardless of how they reallocate time in the labor market.

[11] Teutloff et al. (2025) show that the overall impacts of ChatGPT on freelance work are more mixed, with some complementary skills seeing increases.

5 Conclusion

Generative AI is heralded as the engine of a new industrial revolution (World Economic Forum, 2024), yet we lack evidence on its economic impacts outside laboratory settings and case studies (Brynjolfsson, Li and Raymond, 2025; Noy and Zhang, 2023).

This paper provides large-scale evidence on the labor market impacts of AI chatbots, the most widely adopted Generative AI tool to date. Our study is based on a series of extensive surveys on AI chatbot usage in 11 exposed occupations, linked to matched employer-employee data in Denmark.

Despite rapid adoption and substantial investments by both workers and firms, our key finding is that AI chatbots have had a minimal impact on productivity and labor market outcomes thus far. In this sense, our results echo Robert Solow's famous remark on the IT revolution: *"You can see the computer age everywhere but in the productivity statistics"* (Solow, 1987).

However, our analysis sheds light on mechanisms through which Generative AI may become transformative in the longer term. First, consistent with Brynjolfsson, Rock and Syverson (2021), we find that firm-driven investments and workplace reorganizations are critical to unlocking AI's potential: Take-up rates and productivity benefits of AI chatbots are substantially higher when employers encourage usage, provide training, or deploy in-house models. Second, aligning with theoretical predictions for how automation technologies may reinstate labor demand (Acemoglu and Restrepo, 2019), we find that AI chatbots have created new job tasks—extending even to workers who do not use the tools directly, signaling broader workplace transformations. Finally, labor market rigidities further delay the economic impact, as productivity gains from AI chatbots translate only weakly into earnings growth, particularly in firms that do not actively promote their usage.

Tracking these developments—firm-wide complementary investments, job task creation, and labor market rigidities—will be essential to understanding the longer-term labor market effects of Generative AI.

References

Acemoglu, Daron, and Pascual Restrepo. 2019. "Automation and New Tasks: How Technology Displaces and Reinstates Labor." *Journal of economic perspectives*, 33(2): 3–30.

Autor, David, Caroline Chin, Anna Salomons, and Bryan Seegmiller. 2024. "New Frontiers: The Origins and Content of New Work, 1940–2018." *The Quarterly Journal of Economics*, qjae008.

Blandin, Adam, Alexander Bick, and David Deming. 2025. "The Rapid Adoption of Generative AI." *Working Paper*.

Bonney, Kathryn, Cory Breaux, Cathy Buffington, Emin Dinlersoz, Lucia S Foster, Nathan Goldschlag, John C Haltiwanger, Zachary Kroff, and Keith Savage. 2024. "Tracking Firm Use of AI in Real Time: A Snapshot From the Business Trends and Outlook Survey." National Bureau of Economic Research.

Botero, Juan C, Simeon Djankov, Rafael La Porta, Florencio Lopez-de Silanes, and Andrei Shleifer. 2004. "The Regulation of Labor." *The Quarterly Journal of Economics*, 119(4): 1339–1382.

Brynjolfsson, Erik, Danielle Li, and Lindsey R. Raymond. 2025. "Generative AI at Work." *The Quarterly Journal of Economics*.

Brynjolfsson, Erik, Daniel Rock, and Chad Syverson. 2021. "The productivity J-curve: How intangibles complement general purpose technologies." *American Economic Journal: Macroeconomics*, 13(1): 333–372.

Card, David, Ana Rute Cardoso, Joerg Heining, and Patrick Kline. 2018. "Firms and labor market inequality: Evidence and some theory." *Journal of Labor Economics*, 36(S1): S13–S70.

Carvajal, Daniel, Catalina Franco, and Siri Isaksson. 2024. "Will Artificial Intelligence Get in the Way of Achieving Gender Equality?" *NHH Dept. of Economics Discussion Paper*, , (03).

Cui, Zheyuan Kevin, Mert Demirer, Sonia Jaffe, Leon Musolff, Sida Peng, and Tobias Salz. 2024. "The effects of generative ai on high skilled work: Evidence from three field experiments with software developers." *Available at SSRN 4945566*.

Danske Bank. 2024. "Danske Bank News Article." Accessed: 2025-02-23.

Dell'Acqua, Fabrizio, Edward McFowland, Ethan R Mollick, Hila Lifshitz-Assaf, Katherine Kellogg, Saran Rajendran, Lisa Krayer, François Candelon, and Karim R Lakhani. 2023. "Navigating the Jagged Technological Frontier: Field Experimental Evidence of the Effects of AI on Knowledge Worker Productivity and Quality." *Harvard Business School Technology & Operations Mgt. Unit Working Paper*, , (24-013).

Dutz, Deniz, Ingrid Huitfeldt, Santiago Lacouture, Magne Mogstad, Alexander Torgovitsky, and Winnie Van Dijk. 2022. "Selection in Surveys: Using Randomized Incentives to Detect and Account for Nonresponse Bias." Working Paper.

Eloundou, Tyna, Sam Manning, Pamela Mishkin, and Daniel Rock. 2024. "GPTs are GPTs: Labor Market Impact Potential of LLMs." *Science*, 384(6702): 1306–1308.

Hui, Xiang, Oren Reshef, and Luofeng Zhou. 2024. "The short-term effects of generative artificial intelligence on employment: Evidence from an online labor market." *Organization Science*, 35(6): 1977–1989.

Humlum, Anders, and Emilie Vestergaard. 2024. "The Adoption of ChatGPT." *University of Chicago, Becker Friedman Institute for Economics Working Paper*, , (2024-50).

Humlum, Anders, and Emilie Vestergaard. 2025. "The unequal adoption of ChatGPT exacerbates existing inequalities among workers." *Proceedings of the National Academy of Sciences*, 122(1): e2414972121.

Noy, Shakked, and Whitney Zhang. 2023. "Experimental Evidence on the Productivity Effects of Generative Artificial Intelligence." *Science*, 381(6654): 187–192.

Otis, Nicholas G, Solène Delecourt, Katelyn Cranney, and Rembrand Koning. 2024*a*. *Global Evidence on Gender Gaps and Generative AI.* Harvard Business School.

Otis, Nicholas, Rowan P Clarke, Solene Delecourt, David Holtz, and Rembrand Koning. 2024*b*. "The Uneven Impact of Generative AI on Entrepreneurial Performance." *Available at SSRN 4671369*.

Peng, Sida, Eirini Kalliamvakou, Peter Cihon, and Mert Demirer. 2023. "The impact of ai on developer productivity: Evidence from github copilot." *arXiv preprint arXiv:2302.06590*.

RISJ. 2024. "Reuters Institute for the Study of Journalism: What Does the Public in Six Countries Think about Generative AI in News?" *https://reutersinstitute.politics.ox.ac.uk/what-does-public-six-countries-think-generative-ai-news#:~:text=Averaging%20across%20six%20countries%2C%20people,tried%20to%20use%20generative%20AI*, [Accessed 28-June-2024].

Solow, Robert M. 1987. "We'd better watch out." *New York Review of Books*.

Teutloff, Ole, Johanna Einsiedler, Otto Kässi, Fabian Braesemann, Pamela Mishkin, and R Maria del Rio-Chanona. 2025. "Winners and losers of generative AI: Early Evidence of Shifts in Freelancer Demand." *Journal of Economic Behavior & Organization*, 106845.

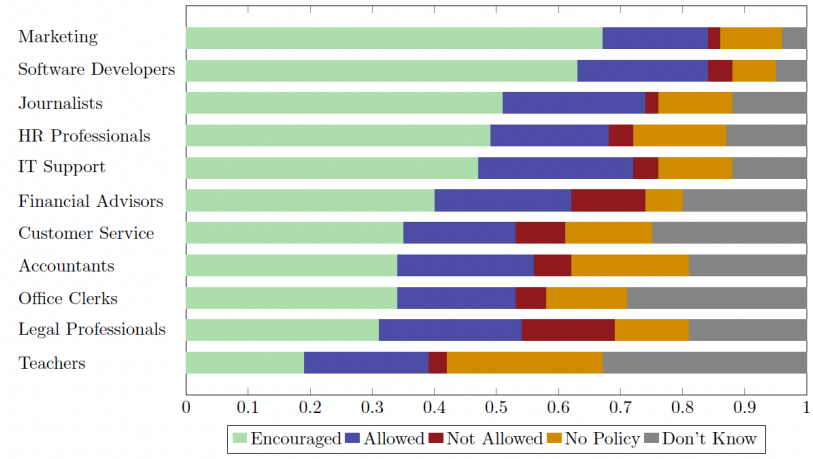
Walters, Christopher. 2024. "Empirical Bayes methods in labor economics." In *Handbook of Labor Economics*. Vol. 5, 183–260. Elsevier.

World Economic Forum. 2024. "Generative AI: Steam Engine of the Fourth Industrial Revolution?" Accessed: 2024-12-11.

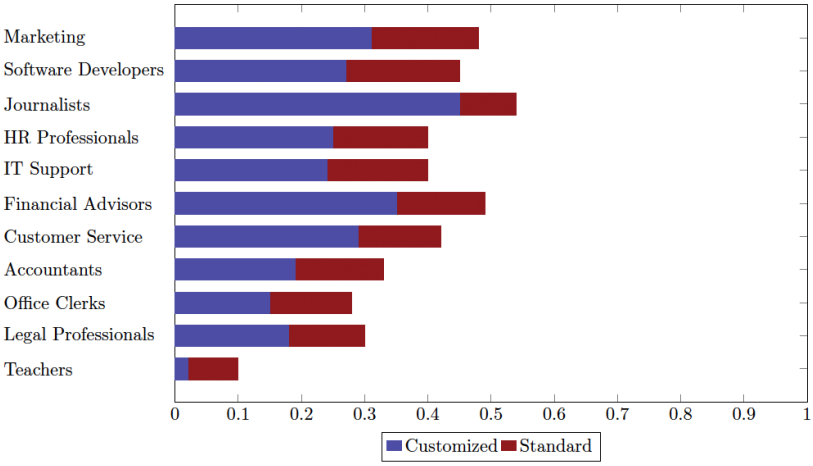
Figures and Tables

Figure 1: How Prevalent Are Employer Initiatives for AI Chatbot Adoption?

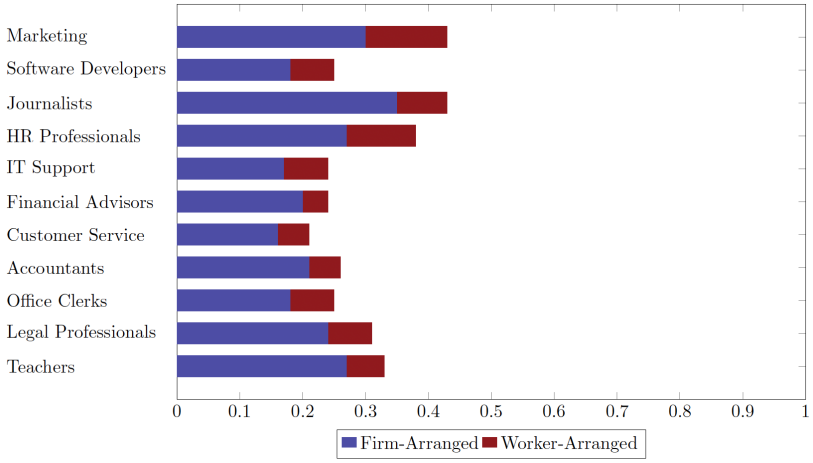
(a) Usage Policies



(b) In-House AI Chatbots

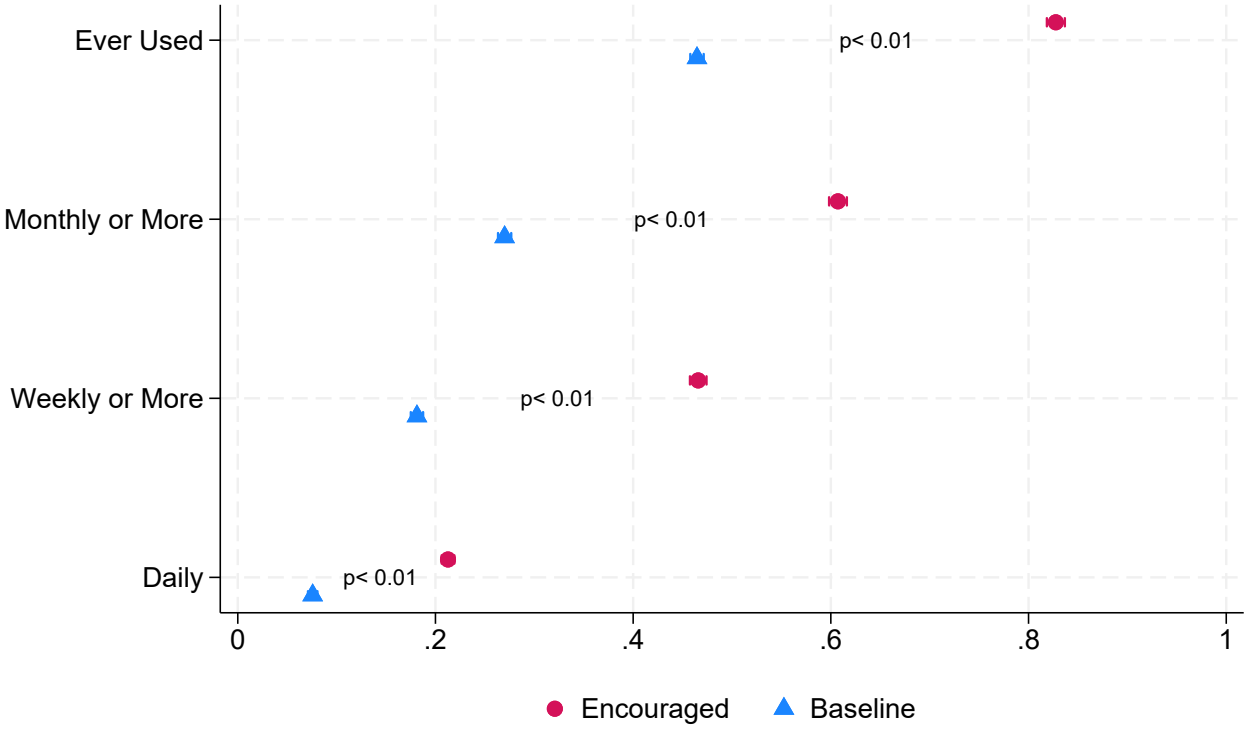


(c) Training in AI Chatbots



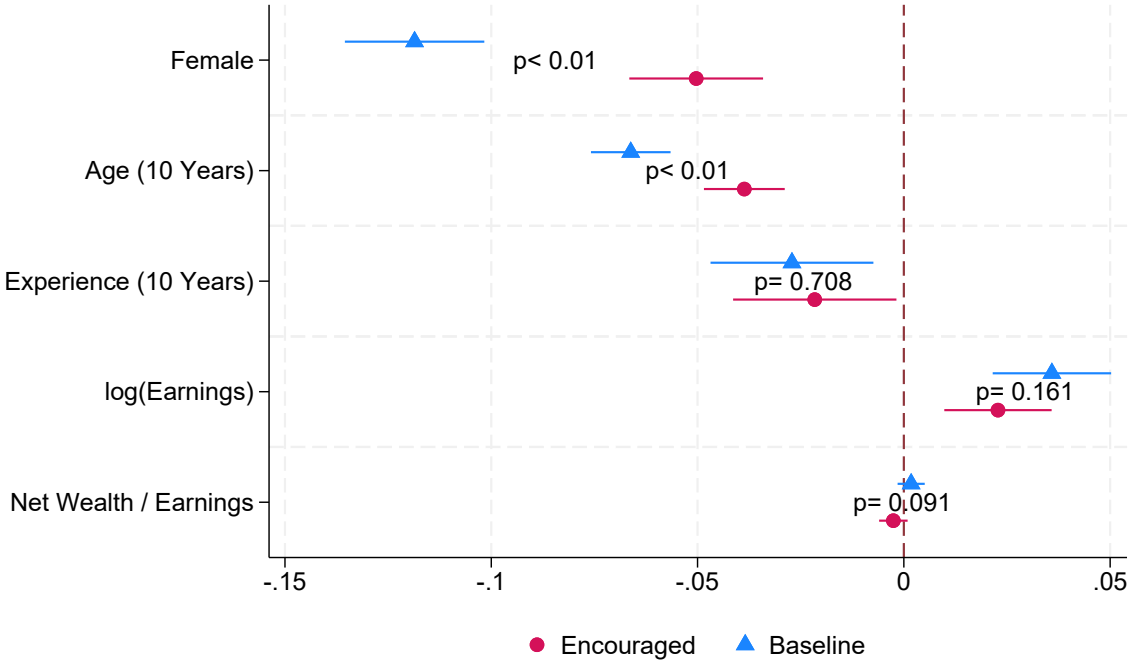
Notes: This figure shows the share of workers affected by various employer initiatives related to AI chatbot adoption. Panel (a) shows employers' policies on AI chatbot usage for work. Panel (b) indicates whether the employer has its own AI chatbot. Panel (c) reports whether workers have participated in AI chatbot training courses. Figure B.1 provides a workplace-level version of this graph, yielding similar results. *Sample*: All completed responses from the 2024 survey.

Figure 2: How Important Are Employer Policies in AI Chatbot Adoption?



Notes: This figure illustrates the impact of employer policies on workers' use of AI chatbots. The estimates are based on predicted values from Equation (1), varying employer usage policies ("Encouraged" vs. "Others") while holding workers' characteristics X at their mean values. Whiskers represent 95% confidence bands. The estimates correspond to Table 2. *Sample*: All completed responses from the 2024 survey linked to registry data.

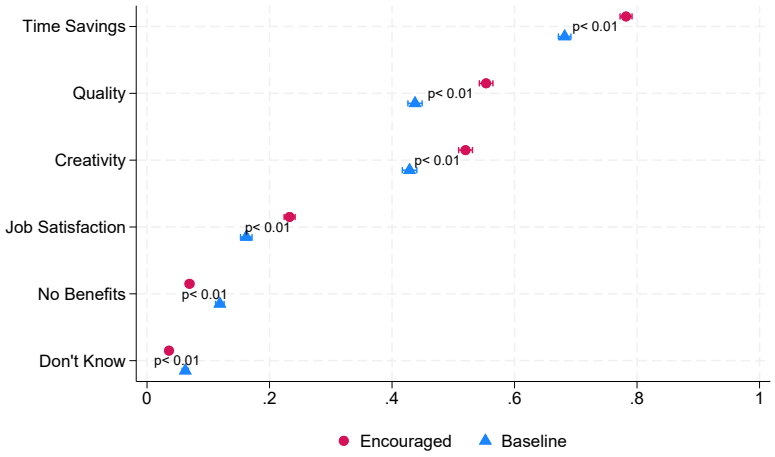
Figure 3: How Do Employer Encouragements Influence Worker Gaps in AI Chatbot Adoption?



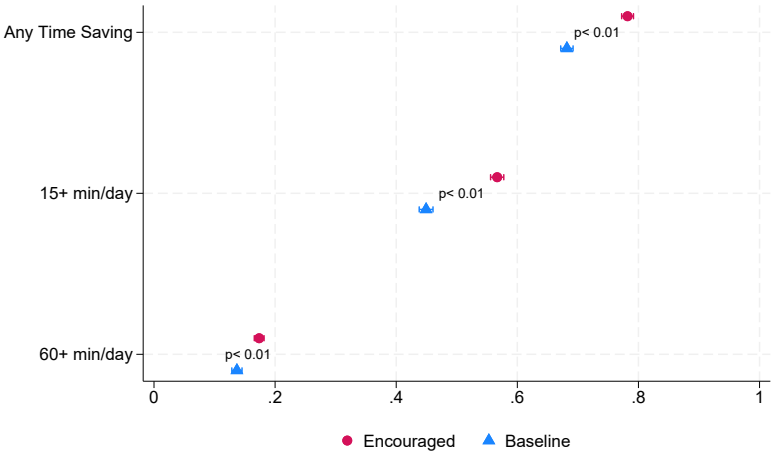
Notes: *Notes*: This figure illustrates the impact of employer usage policies on worker disparities in AI chatbot adoption. The estimates are obtained from regressions of AI chatbot adoption on worker characteristics X, controlling for occupation fixed effects, and are estimated separately based on employers' AI chatbot initiatives. Whiskers represent 95% confidence intervals. The reported p-values test whether the coefficients differ between the two groups. *Sample*: All completed responses from the 2024 survey linked to registry data.

Figure 4: What Benefits Do Adopters Report from AI Chatbots?

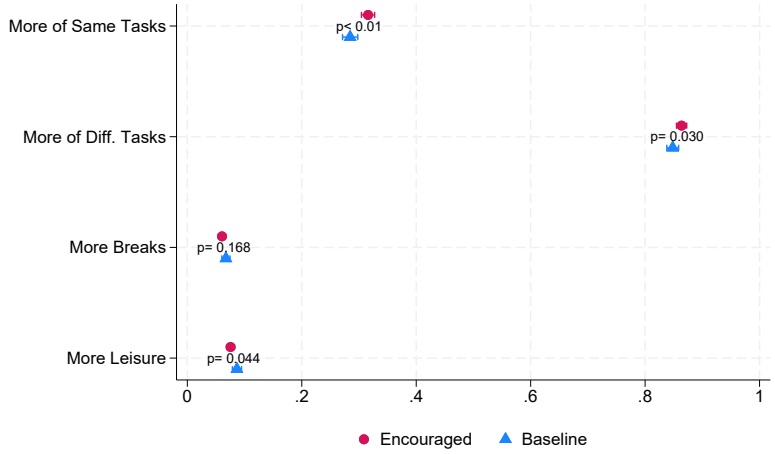
(a) Reported Benefits



(b) Estimated Time Savings



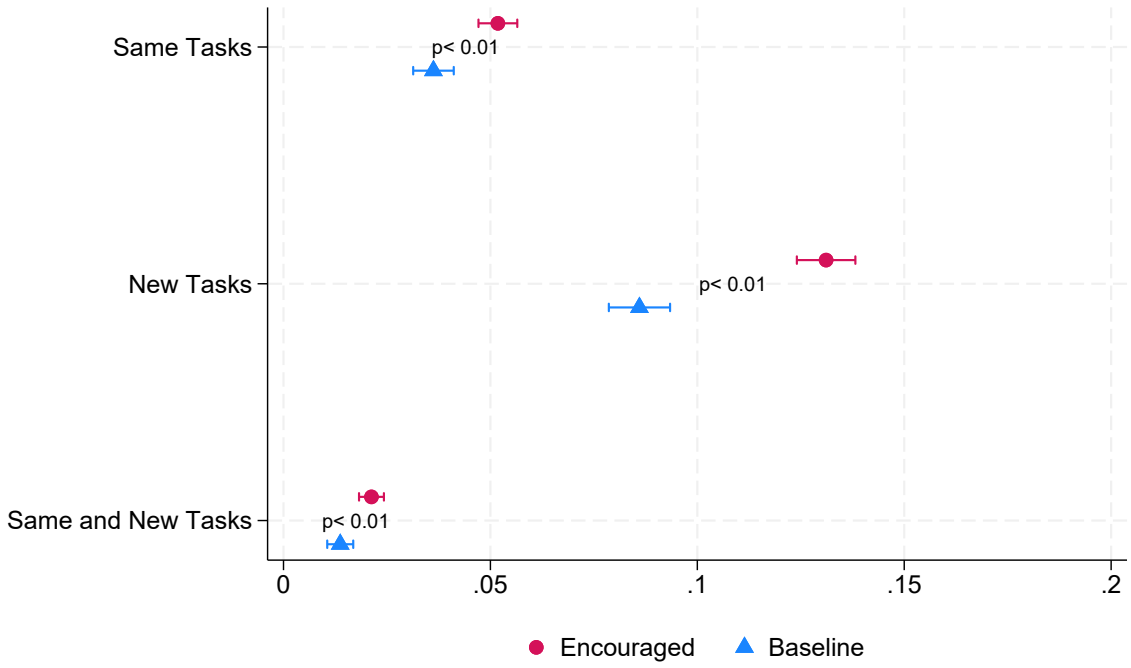
(c) Allocation of Time Savings



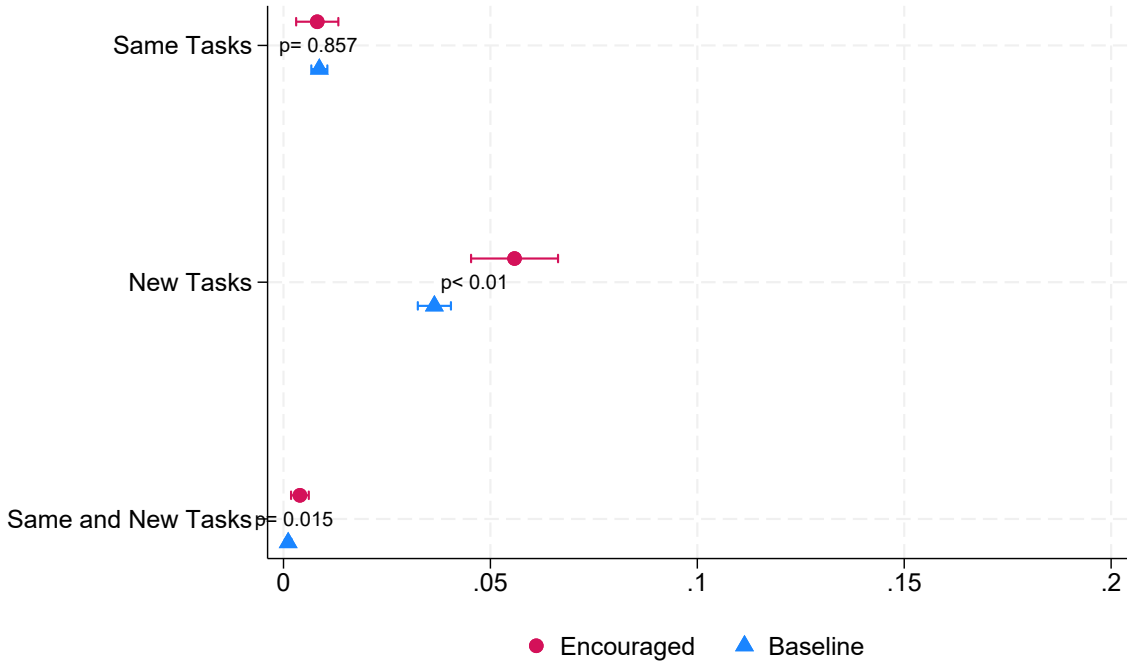
Notes: This figure illustrates how employer initiatives influence the benefits workers report from using AI chatbots. Panel (a) presents the share of adopters reporting various benefits, Panel (b) shows the share reporting different levels of time savings, and Panel (c) details how these workers allocate their saved time. The estimates are based on predicted values from Equation (1), varying employer usage policies ("Encouraged" vs. "Others") while holding workers' characteristics X at their mean values. *Sample*: All completed responses from the 2024 survey linked to registry data.

Figure 5: Have AI Chatbots Created New Workloads?

(a) Adopters



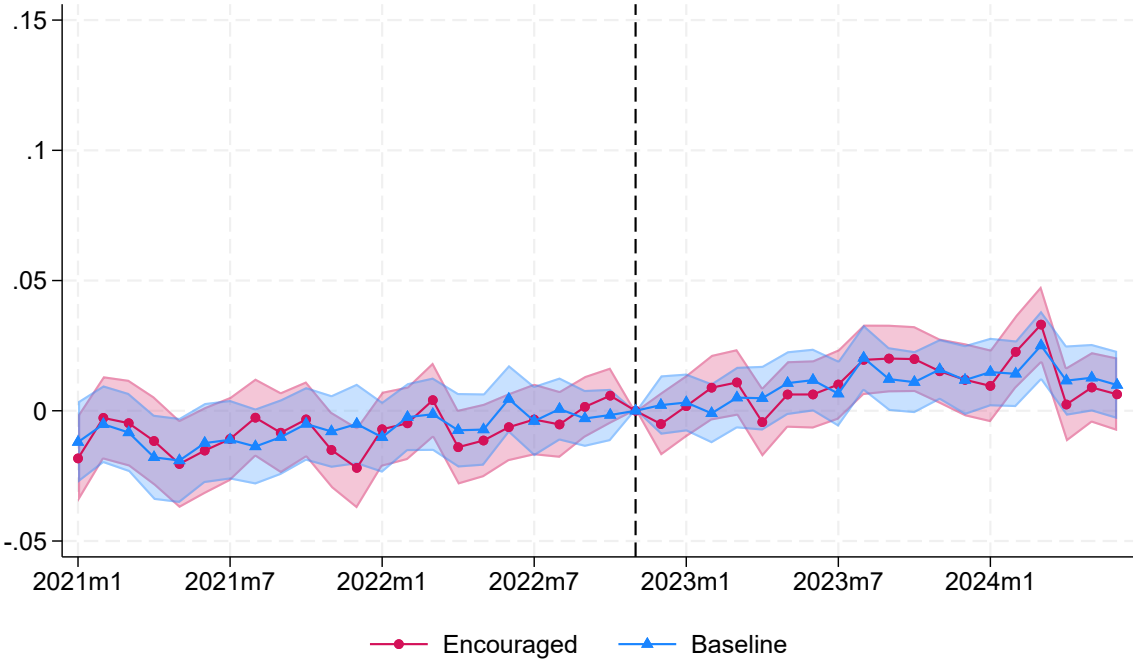
(b) Non-Adopters



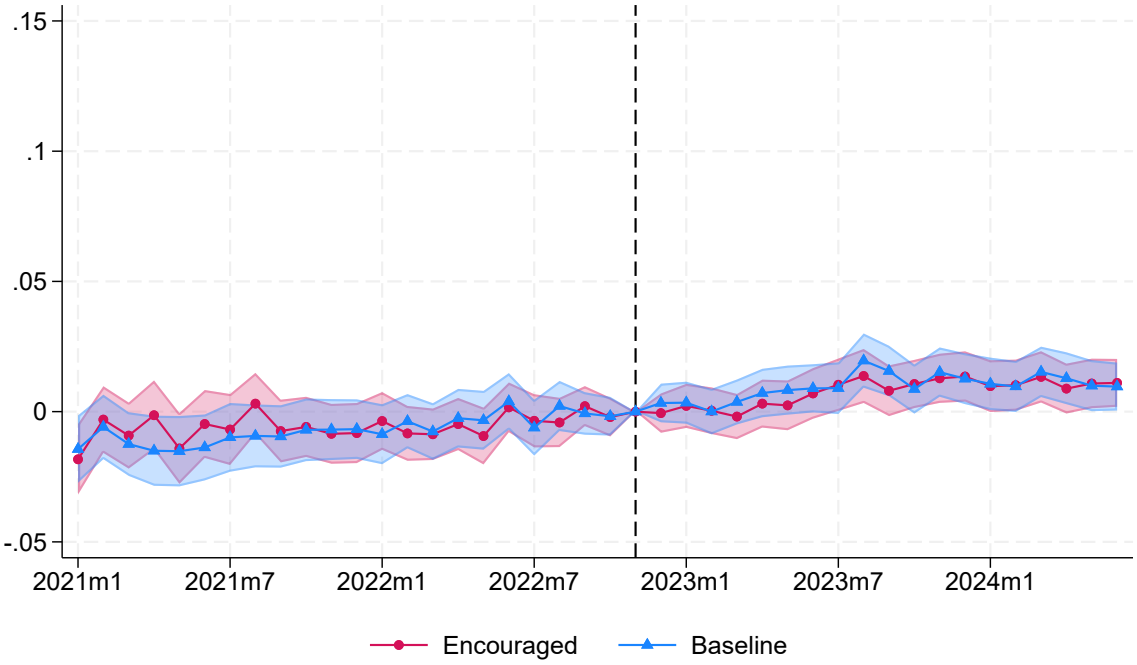
Notes: This figure illustrates how employer initiatives influence the new workloads created by AI chatbots. Panel (a) presents results for adopters, while Panel (b) focuses on non-adopters (workers who have never used AI chatbots for work). Estimates are predicted values from Equation (1), varying employer usage policies ("Encouraged" vs. "Others") while holding workers' characteristics X at their mean values. *Sample:* All completed responses from the 2024 survey linked to registry data.

Figure 6: Have Adopters Fared Better in the Labor Market?
(Dynamic Difference-in-Differences)

(a) log Earnings

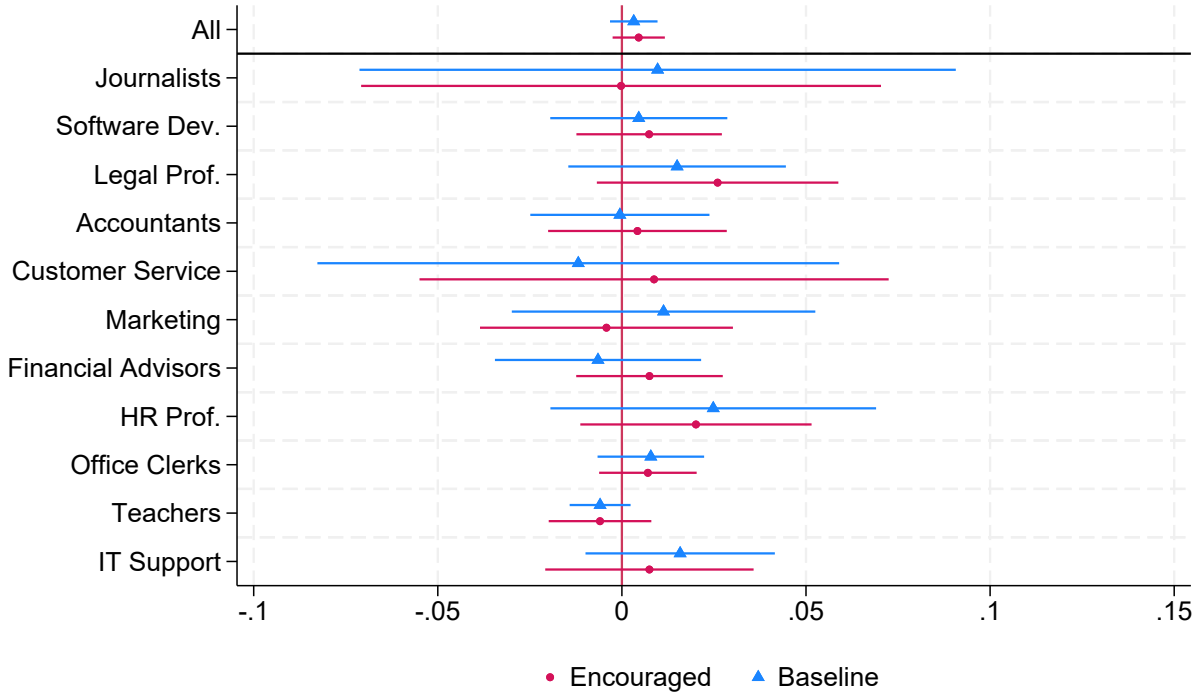


(b) log Hours



Notes: This figure presents the differential labor market outcomes of AI chatbot adopters relative to non-adopters, indexed to the launch of ChatGPT in November 2022. Effects are estimated separately for adopters whose employers encourage AI chatbot use ("Encouraged") and those without encouragement ("Other"), with all non-adopters serving as the control group in both cases. Estimates are based on the dynamic difference-in-differences specification in Equation (2). Shaded areas represent 95% confidence intervals. *Sample:* All completed responses from the 2024 survey linked to registry data.

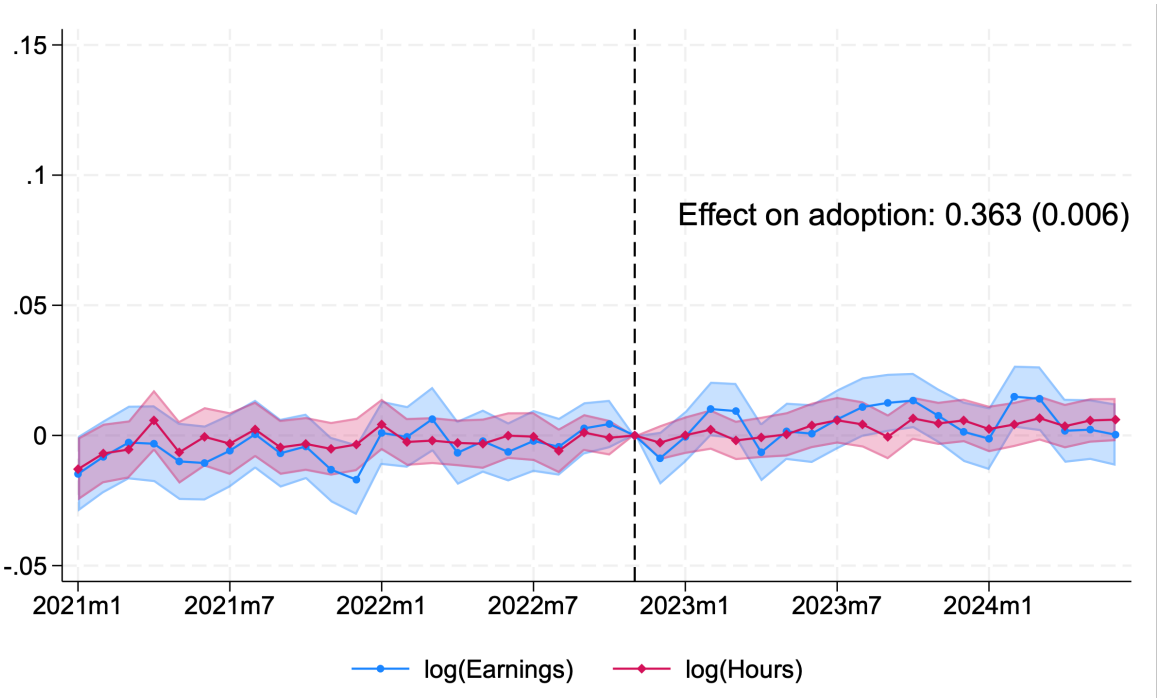
Figure 7: Do the Earnings Effects of Adoption Vary Across Occupations?
(Pooled Difference-in-Differences)



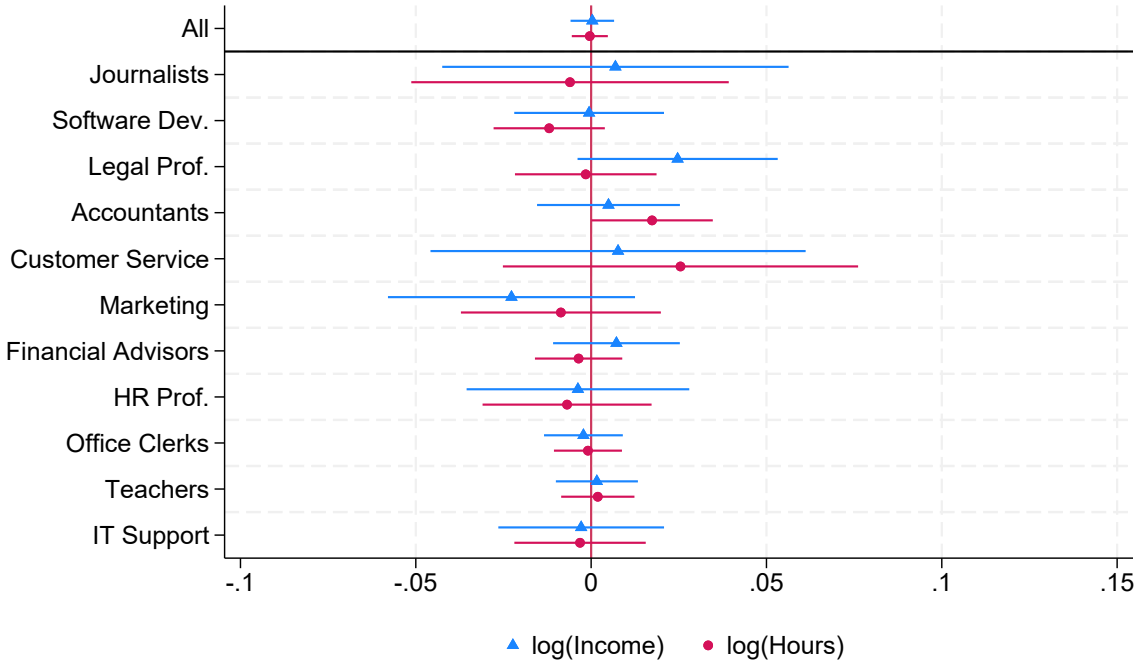
Notes: This figure presents the differential labor market outcomes of AI chatbot adopters relative to non-adopters, indexed to the launch of ChatGPT in November 2022. Effects are estimated separately for adopters whose employers encourage AI chatbot use ("Encouraged") and those without encouragement ("Other"), with all non-adopters serving as the control group in both cases. Estimates are based on the pooled difference-in-differences specification in Equation (3), with whiskers representing 95% confidence intervals. The figure estimates the impacts separately for each of our 11 study occupations. *Sample:* All completed responses from the 2024 survey linked to registry data.

Figure 8: Have Employer Chatbot Policies Affected Workers' Outcomes? (Reduced Form)

(a) Labor Market Effects of Encouragement (Dynamic Diff-in-Diffs)

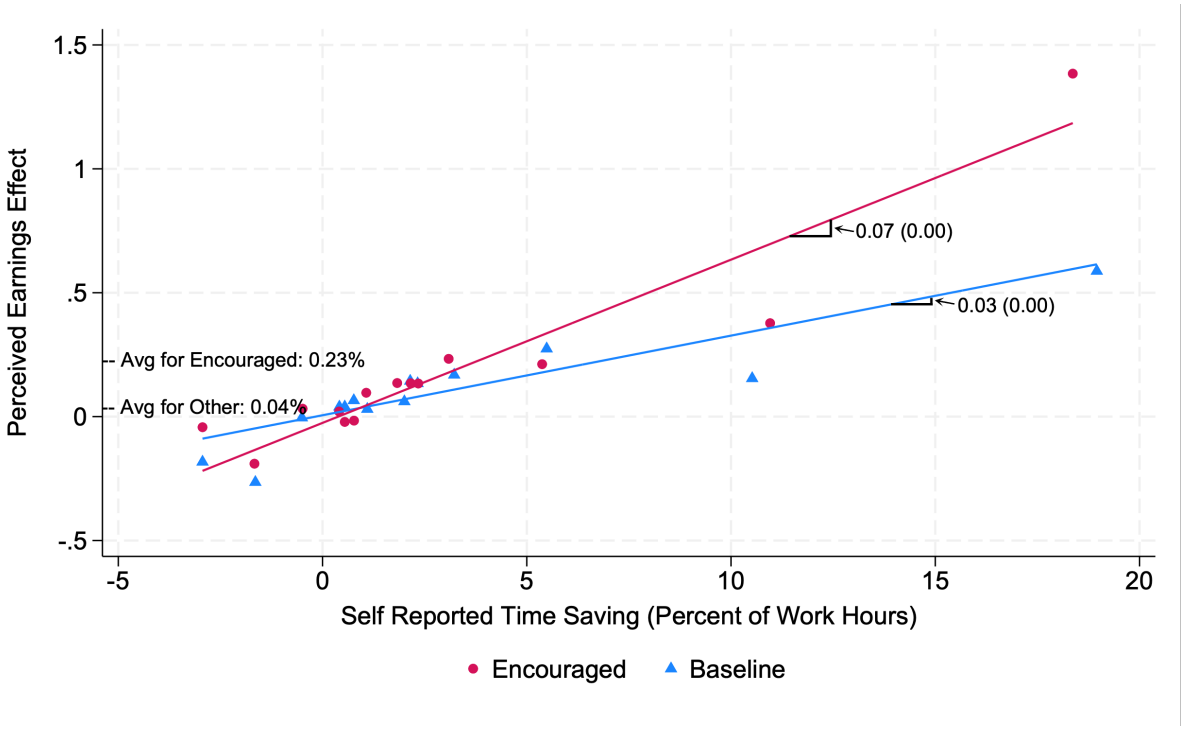


(b) Occupation-Level Effects of Encouragement (Pooled Diff-in-Diffs)



Notes: This figure presents the differential labor market outcomes of workers who are encouraged to use AI chatbots by their employers, compared to all other workers, indexed to the launch of ChatGPT in November 2022. Panel (a) is based on the dynamic difference-in-differences specification in Equation (2), with shaded areas representing 95% confidence intervals. Panel (b) is based on the pooled difference-in-differences specification in Equation (3), with whiskers representing 95% confidence intervals. *Sample:* All completed responses from the 2024 survey linked to registry data.

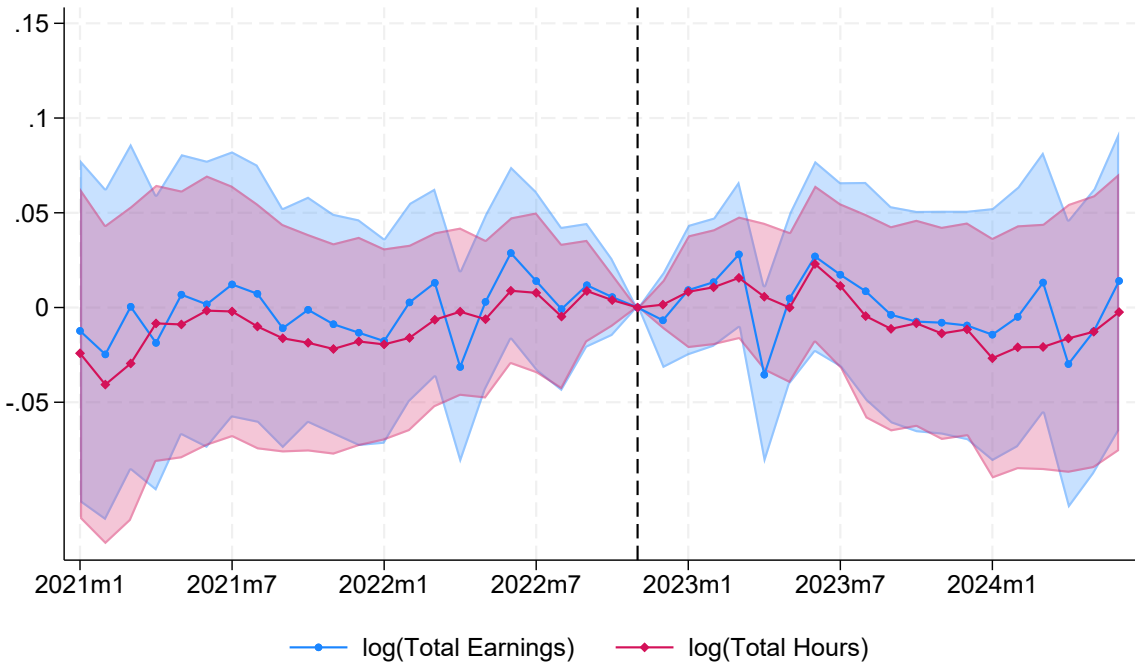
Figure 9: How Do Workers' Earnings Impacts Relate to Their Time Savings?



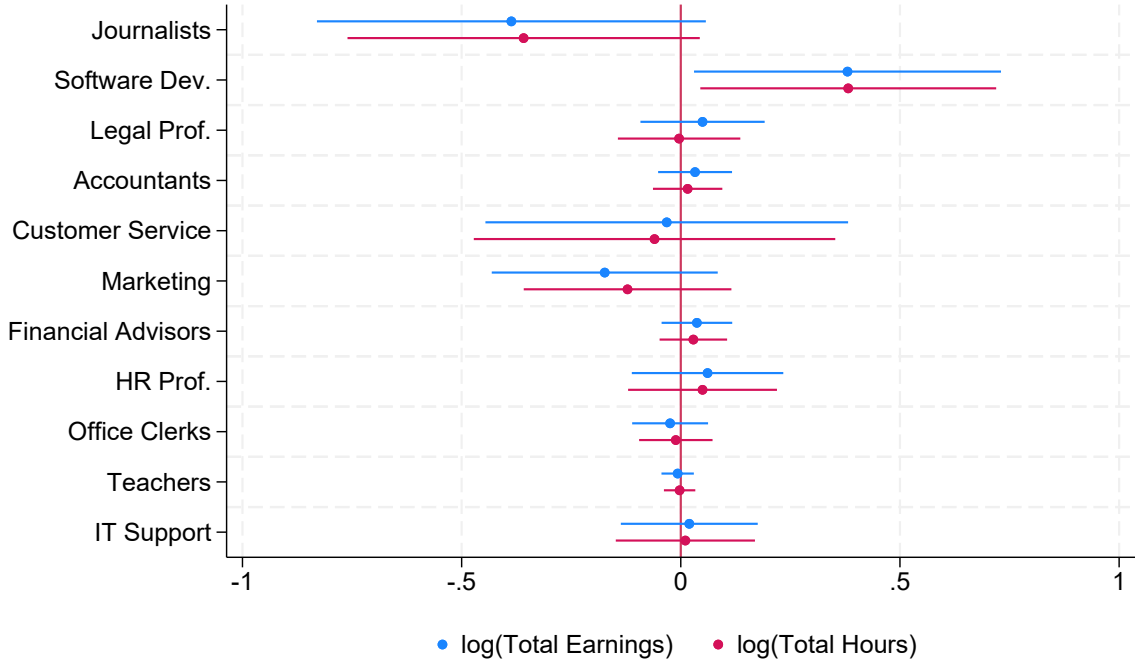
Notes: This figure presents a binned scatterplot of workers' perceived earnings impacts from AI chatbots against their estimated time savings from these tools. The sample is divided based on whether employers encourage AI chatbot use. The regression line represents the line of best fit for each group. *Sample*: All completed responses from the 2024 survey.

Figure 10: Have High-Adoption Workplaces Fared Differently?

(a) Workplace Outcomes



(b) Occupation-Level Effects



Notes: *Notes*: This figure presents the differential change in workplace outcomes by adoption rates, indexed to the launch of ChatGPT in November 2022. Adoption rates are measured as the share of employees who have used AI chatbots for work, adjusted for measurement error using an Empirical Bayes shrinkage procedure detailed in Appendix D.2.1. Panel (a) is based on the dynamic difference-in-differences specification in Equation (2), with shaded areas indicating 95% confidence intervals. Panel (b) shows the effects separately by occupation, based on the pooled difference-in-differences specification in Equation (3), with whiskers indicating 95% confidence intervals. *Sample*: All completed responses from the 2024 survey linked to registry data.

Table 1: Who Is Subject to Employer AI Chatbot Initiatives?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Used AI for Work	Encouraged	Allowed	Not Allowed	No Policy	Don't Know	In-House Chatbot	Firm-Arranged Training
Female	-0.124***	-0.048***	-0.030***	0.002	-0.032***	0.108***	-0.049***	-0.024***
	(0.007)	(0.007)	(0.006)	(0.003)	(0.005)	(0.006)	(0.006)	(0.006)
Age (10 Years)	-0.076***	-0.045***	0.012***	-0.005*	0.005	0.032***	-0.046***	-0.036***
	(0.004)	(0.004)	(0.003)	(0.002)	(0.003)	(0.004)	(0.004)	(0.003)
Experience (10 Years)	-0.048***	-0.020*	-0.001	-0.000	0.004	0.018*	-0.006	-0.006
	(0.008)	(0.008)	(0.007)	(0.004)	(0.006)	(0.007)	(0.008)	(0.007)
log(Earnings)	0.068***	0.068***	0.005	0.002	-0.016***	-0.059***	0.071***	0.058***
	(0.006)	(0.006)	(0.005)	(0.003)	(0.004)	(0.005)	(0.006)	(0.005)
Net Wealth / Earnings	0.003*	0.004**	0.003**	0.000	-0.005***	-0.003*	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Occupation FE's	✓	✓	✓	✓	✓	✓	✓	✓
Mean of Outcome	0.596	0.363	0.205	0.054	0.153	0.225	0.296	0.221
Observations	24796	24796	24796	24796	24796	24796	24796	24796

Notes: This table compares workers within occupations and asks what characterizes those who are affected by various employer initiatives on AI chatbot adoption (see definitions in the note of Figure 1). For reference, Column (1) uses actual adoption (AI chatbot usage for work) as the outcome variable. Columns (2)–(6) examine employers' usage policies, Column (7) indicates whether the employer has its own AI chatbot, and Column (8) assesses whether the worker has received firm-provided training in AI chatbot use. The regressions control for occupation fixed effects. Standard errors in parentheses. All characteristics are based on register variables from 2022. *Experience* is the years of employment in the relevant occupation. *Earnings* are total labor income. *Net Wealth* is the sum of real assets, financial assets, and pension savings minus the sum of priority debt, other private debt, and public debt, winsorized at the 5th and 95th percentiles. *Sample*: The table is based on all complete and valid responses from the 2024 survey that can be linked to the registry data.

Table 2: Who Has Adopted AI Chatbots?

	Ever Used	Monthly or More	Weekly or More	Daily
	(1)	(2)	(3)	(4)
Encouraged	0.363***	0.337***	0.285***	0.137***
	(0.006)	(0.006)	(0.005)	(0.004)
Female	-0.106***	-0.130***	-0.098***	-0.041***
	(0.006)	(0.006)	(0.006)	(0.004)
Age (10 Years)	-0.060***	-0.051***	-0.038***	-0.017***
	(0.004)	(0.004)	(0.003)	(0.003)
Experience (10 Years)	-0.040***	-0.044***	-0.044***	-0.032***
	(0.007)	(0.007)	(0.007)	(0.005)
log(Earnings)	0.043***	0.018***	0.011**	-0.000
	(0.005)	(0.005)	(0.005)	(0.004)
Net Wealth / Earnings	0.002	-0.001	-0.001	-0.003***
	(0.001)	(0.001)	(0.001)	(0.001)
Occupation FE's	✓	✓	✓	✓
Mean of Outcome	0.596	0.392	0.285	0.126
Observations	24796	24796	24796	24796

Notes: This table compares workers within occupations and asks what characterizes those who have adopted AI chatbots for work. The columns vary by frequency of usage. *Encouraged* indicates that the employer actively encourages AI chatbot use for work (see definitions in the note of Figure 1). All other characteristics are based on register variables from 2022. *Experience* is the years of employment in the relevant occupation. *Earnings* are total labor income. *Net Wealth* is the sum of real assets, financial assets, and pension savings minus the sum of priority debt, other private debt, and public debt, winsorized at the 5th and 95th percentiles. The regressions control for occupation fixed effects. Standard errors in parentheses. *Sample*: The table is based on all complete and valid responses from the 2024 survey that can be linked to the registry data.

Table 3: What Drives Workers' Time Savings from AI Chatbots?

Occupation	Policy	Time Savings / Work Hours (1)	Time Saved Per Day Used / Daily Work Hours (2)	Days Used / Work Days (3)	Covariance (4)
Marketing Professionals	Encouraged	0.068	0.109	0.513	0.012
Marketing Professionals	Other	0.046	0.087	0.386	0.012
Software Developers	Encouraged	0.065	0.093	0.566	0.012
Software Developers	Other	0.039	0.074	0.377	0.011
HR Professionals	Encouraged	0.042	0.081	0.403	0.009
HR Professionals	Other	0.026	0.074	0.235	0.009
IT Support	Encouraged	0.041	0.075	0.405	0.011
IT Support	Other	0.028	0.060	0.282	0.011
Customer Service Rep.	Encouraged	0.039	0.066	0.439	0.010
Customer Service Rep.	Other	0.020	0.050	0.238	0.008
Legal Professionals	Encouraged	0.033	0.074	0.335	0.008
Legal Professionals	Other	0.018	0.065	0.165	0.007
Office Clerks	Encouraged	0.029	0.065	0.308	0.009
Office Clerks	Other	0.015	0.047	0.176	0.007
Journalists	Encouraged	0.028	0.050	0.373	0.009
Journalists	Other	0.021	0.048	0.219	0.011
Financial Advisors	Encouraged	0.022	0.053	0.287	0.007
Financial Advisors	Other	0.015	0.040	0.177	0.008
Accountants and Auditors	Encouraged	0.022	0.055	0.281	0.006
Accountants and Auditors	Other	0.009	0.041	0.141	0.003
Teachers	Encouraged	0.010	0.049	0.138	0.003
Teachers	Other	0.006	0.044	0.087	0.002
All	Encouraged	0.036	0.070	0.368	0.010
All	Other	0.022	0.057	0.226	0.009

Notes: This table presents workers' time savings from This table presents time savings from AI chatbots, categorized by workers' occupations and employer policies. The table focuses on workers who have ever used AI chatbots for work. Column (1) reports the average time savings as a percentage of total work hours. The remaining columns decompose these time savings into three components: (1) time savings per day of use (Column (2)), (2) the share of workdays with AI chatbot usage (Column (3)), and (3) the covariance between Columns (2) and (3) (Column (4)). These components satisfy the relationship: Column (1) = Column (2) × Column (3) + Column (4), which follows from the identity: $E[XY] = E[X]E[Y] + \text{Cov}(X, Y)$. *Sample*: The table is based on all complete and valid responses from the 2024 survey that can be linked to the registry data.

Online Appendix

Large Language Models, Small Labor Market Effects

Anders Humlum
University of Chicago

Emilie Vestergaard
University of Copenhagen

A Data and Institutional Setting **2**
A.1 Sampling Protocol 2
A.2 Survey Sample 3

B Adoption **6**
B.1 Employer Initiatives 6
B.2 Worker Adoption 8

C Work **12**
C.1 Benefits for Users 12
C.2 Workloads and Task Creation 13

D Labor Market Outcomes **18**
D.1 Perceived Impacts 18
D.2 Workplace Outcomes 19
D.3 Results 22

E Invitation Letter **23**
E.1 English Translation 24
E.2 Original Danish Version 26

F Survey Questionnaire **28**
F.1 English Translation 29
F.2 Original Danish Version 34

A Data and Institutional Setting

A.1 Sampling Protocol

Our 2024 survey aims to sample 115,000 workers across 11 occupations. Ideally, we would sample an equal number from each—i.e., 10,450 journalists, 10,450 software developers, etc. However, some occupations in Denmark employ fewer than 10,450 workers. To address this, we follow these steps:

1. If an occupation has fewer than 10,450 workers, we sample all available workers.
2. The remaining invitations are redistributed equally among the other occupations.
3. Workplaces are randomly selected for sampling, and if chosen, all relevant workers (i.e., those in the target occupation) within the workplace are included.
4. Large workplaces can distort the sample balance. To mitigate this, we apply individual-level sampling to the top 2.5% of workplaces (ranked by the number of employees in the relevant occupation), randomly selecting employees using the same sampling probability as in Step 3.
5. To precisely reach our target of 115,000 workers, we make final adjustments by randomly including or excluding workers, independent of their workplace.

For details on the 2023 sampling procedure, see Humlum and Vestergaard (2024).

A.2 Survey Sample

Table A.1: Sample Reduction

	2024 Survey		*2023 Survey*			
			Main Survey		*Follow-Up Only*	
	Individuals	Percent of invitees	Individuals	Percent of invitees	Individuals	Percent of invitees
1. Invitees	115,000	100	99,619	100	14,934	100
2. Respondents	30,411	26.4	29,067	29.2	4,094	27.4
3. In target occupation(s)	27,027	23.5	25,121	25.2	3,504	23.5
4. Complete responses	25,254	22.0	18,109	18.2	2,561	17.1
5. Linked to registers	24,796	21.6	17,907	18.0	2,559	17.1

Notes: This table outlines how sample restrictions reduce our analysis sample. We conducted two survey rounds in November 2023 and 2024, each inviting 115,000 workers to participate. The 2023 survey included both a main survey and a two-week follow-up, with 15,000 workers invited only to the follow-up. Row 2 reports the number of individuals who responded to the survey. Row 3 shows the respondents who were still employed in one of our 11 target occupations at the time of the surveys. Row 4 presents the respondents who fully completed the survey questionnaire. Row 5 indicates the complete responses that could be linked to registry data.

A.2.1 Representativeness and Response Quality

Table A.2: Balance Table for Survey Respondents

	2024 Survey			*2023 Main Survey*		
	Population	Sampled	Responded	Population	Sampled	Responded
	(1)	(2)	(3)	(1)	(2)	(3)
Age	42.98	42.99	46.24	42.43	42.42	45.40
	(11.54)	(11.52)	(11.48)	(11.57)	(11.57)	(11.50)
Female	0.56	0.56	0.55	0.52	0.52	0.49
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
log(Earnings)	12.98	12.98	13.03	13.07	13.07	13.11
	(0.70)	(0.70)	(0.66)	(0.58)	(0.59)	(0.53)
Experience	6.11	6.11	6.95	6.05	6.05	7.12
	(4.80)	(4.80)	(4.91)	(4.58)	(4.57)	(4.67)
Wealth / Earnings	10.92	6.50	8.95	4.09	4.87	4.10
	(2,148.44)	(286.36)	(437.88)	(157.40)	(262.31)	(39.57)
Observations	283,066	114,404	28,546	283,399	99,817	18,088

Notes: This table compares the mean characteristics of workers in our population (Column 1), our sampled survey invitees (Column 2), and survey respondents with complete responses (Column 3) for each survey round. Standard deviations are shown in parentheses. *Sample*: The table includes all individuals in our survey population.

Table A.3: Balance Table for Complete vs. Partial Responses

	2024 survey		*2023 survey*			
			Main Survey		*Follow-Up Only*	
	Completed	Drop Out	Completed	Drop Out	Completed	Drop Out
	(1)	(2)	(1)	(2)	(1)	(2)
Panel A: Characteristics						
Age	46.24	44.59	45.40	45.01	46.80	45.37
	(11.48)	(11.96)	(11.50)	(11.52)	(11.38)	(11.30)
log(Earnings)	13.03	13.00	13.11	13.10	13.13	13.15
	(0.66)	(0.71)	(0.53)	(0.53)	(0.50)	(0.47)
Experience	6.95	6.52	7.12	6.88	7.62	7.29
	(4.91)	(4.82)	(4.67)	(4.63)	(4.65)	(4.58)
Net Wealth/Earnings	8.95	3.77	4.10	3.75	5.20	3.23
	(437.88)	(10.08)	(39.57)	(16.43)	(64.01)	(11.94)
Female	0.55	0.57	0.49	0.60	0.47	0.52
	(0.50)	(0.49)	(0.50)	(0.49)	(0.50)	(0.50)
Panel B: Adoption						
Used	0.69	0.75	0.55	0.51	0.54	0.59
	(0.46)	(0.43)	(0.50)	(0.50)	(0.50)	(0.49)
Used for Work	0.50	0.58	0.40	0.38	0.38	0.44
	(0.50)	(0.49)	(0.49)	(0.48)	(0.49)	(0.50)
Used for Core Task	0.27	0.14	0.21	0.17	0.20	0.24
	(0.45)	(0.35)	(0.41)	(0.38)	(0.40)	(0.43)
Observations	28,546	1,755	18,088	7,003	6,515	1,775

Notes: This table compares the mean characteristics and adoption behaviors of workers who fully completed (Column 1) and partially completed (Column 2) our surveys. Standard deviations are shown in parentheses. *Sample*: All individuals with partial survey responses.

Table A.4: Balance Table for Participation Prize Categories

	2024 Survey					*2023 Main Survey*				
	Levels	Differences to 1000 DKK			p-value	Levels	Differences to 1000 DKK			p-value
	1000 DKK	2500 DKK	5000 DKK	10000 DKK		1000 DKK	2500 DKK	5000 DKK	10000 DKK	
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Panel A: Characteristics										
Age	46.24	-0.21	-0.17	-0.38	0.24	45.40	-0.46	-0.43	-0.50	0.14
	(0.19)	(1.05)	(1.05)	(1.05)			(0.24)	(0.84)	(0.85)	
log(Earnings)	13.03	-0.00	-0.02	-0.02	0.31	13.11	-0.03	-0.00	-0.01	0.04
	(0.01)	(0.07)	(0.07)	(0.07)			(0.01)	(0.05)	(0.05)	
Experience	6.95	-0.09	-0.10	-0.06	0.51	7.12	-0.01	-0.01	-0.05	0.95
	(0.07)	(0.24)	(0.24)	(0.24)			(0.09)	(0.35)	(0.35)	
Net Wealth/Earnings	8.95	-1.25	9.68	0.65	0.56	4.10	-0.05	0.87	0.38	0.55
	(1.57)	(33.94)	(33.31)	(33.31)			(0.27)	(0.42)	(0.42)	
Female	0.55	-0.01	0.00	-0.01	0.12	0.49	0.00	-0.01	-0.00	0.44
	(0.01)	(0.04)	(0.04)	(0.04)			(0.01)	(0.03)	(0.03)	
Panel B: Adoption										
Used	0.69	0.00	-0.00	0.00	0.72	0.55	-0.02	-0.01	-0.01	0.42
	(0.01)	(0.03)	(0.03)	(0.03)			(0.01)	(0.03)	(0.03)	
Used for Work	0.50	-0.00	-0.02	-0.01	0.04	0.40	-0.01	-0.00	-0.00	0.63
	(0.01)	(0.04)	(0.04)	(0.04)			(0.01)	(0.03)	(0.03)	
Used for Core Task	0.27	-0.00	-0.01	-0.00	0.89	0.21	-0.01	0.00	-0.00	0.59
	(0.01)	(0.04)	(0.04)	(0.04)			(0.01)	(0.02)	(0.03)	
Response Rate	0.23	0.02	0.02	0.03	0.00	0.16	0.02	0.02	0.04	0.00
	(0.00)	(0.00)	(0.00)	(0.00)			(0.00)	(0.00)	(0.00)	
Observations	6,559	7,175	7,262	7,550		4,021	4,518	4,547	5,002	

Notes: This table shows that individuals assigned to different participation prize categories (1,000 DKK, 2,500 DKK, 5,000 DKK, and 10,000 DKK) have similar characteristics (Panel A) and adoption behaviors (Panel B) but differ in their rates of completed responses (last row). Column (5) reports p-values from a joint test of whether mean outcomes are equal across the four prize categories. *Sample*: All complete survey responses.

Table A.5: Correlation Between Occupation in Survey vs. Register, P(Survey|Register)

	In Survey											
	Journalists	Software Developers	Paralegals	Accountants and Auditors	Customer Service Rep.	Marketing Professionals	Financial Advisors	HR Professionals	Office Clerks	Teachers	IT Support	Observations
Panel A: 2024 Survey												
Journalists	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	325.00
Software Developers	0.00	0.86	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.08	2,799.00
Paralegals	0.01	0.03	0.81	0.02	0.00	0.00	0.02	0.02	0.07	0.01	0.01	2,106.00
Accountants and Auditors	0.00	0.02	0.01	0.86	0.01	0.01	0.02	0.01	0.05	0.00	0.01	2,793.00
Customer Service Rep.	0.00	0.02	0.01	0.01	0.79	0.03	0.00	0.01	0.09	0.01	0.01	631.00
Marketing Professionals	0.00	0.07	0.01	0.01	0.09	0.69	0.01	0.01	0.07	0.01	0.03	1,781.00
Financial Advisors	0.00	0.00	0.00	0.00	0.01	0.00	0.96	0.00	0.01	0.00	0.00	1,243.00
HR Professionals	0.01	0.03	0.03	0.01	0.00	0.02	0.02	0.73	0.12	0.01	0.01	849.00
Office Clerks	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.00	0.01	6,488.00
Teachers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	6,440.00
IT Support	0.00	0.13	0.00	0.00	0.02	0.02	0.00	0.00	0.03	0.00	0.79	1,470.00
Panel B: 2023 Survey												
Journalists	0.97	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	555.00
Software Developers	0.00	0.87	0.00	0.00	0.01	0.02	0.00	0.00	0.01	0.00	0.08	3,185.00
Paralegals	0.01	0.03	0.79	0.02	0.01	0.00	0.01	0.02	0.08	0.01	0.01	2,518.00
Accountants and Auditors	0.00	0.02	0.01	0.85	0.01	0.01	0.02	0.02	0.05	0.00	0.01	2,710.00
Customer Service Rep.	0.01	0.03	0.01	0.01	0.79	0.04	0.01	0.01	0.07	0.01	0.01	869.00
Marketing Professionals	0.00	0.05	0.00	0.00	0.09	0.74	0.01	0.01	0.06	0.00	0.03	2,125.00
Financial Advisors	0.00	0.00	0.00	0.00	0.01	0.00	0.95	0.00	0.02	0.00	0.00	1,918.00
HR Professionals	0.01	0.03	0.06	0.01	0.00	0.01	0.02	0.68	0.14	0.01	0.02	1,434.00
Office Clerks	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.96	0.00	0.01	3,395.00
Teachers	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	4,135.00
IT Support	0.00	0.15	0.00	0.00	0.02	0.02	0.00	0.01	0.03	0.00	0.76	2,277.00

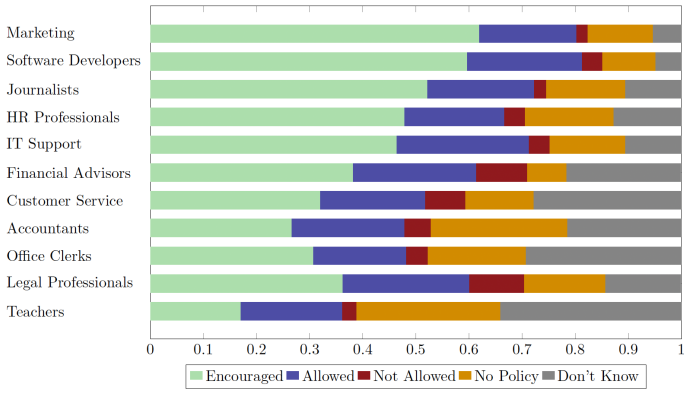
Notes: This table presents the correlation between occupational codes reported in the survey and those recorded in the administrative data of Statistics Denmark. Each cell represents the probability of reporting the column occupation in the survey, conditional on having the row occupation registered with Statistics Denmark. The average agreement rate (diagonal elements) is 87%. *Sample*: All completed survey responses.

B Adoption

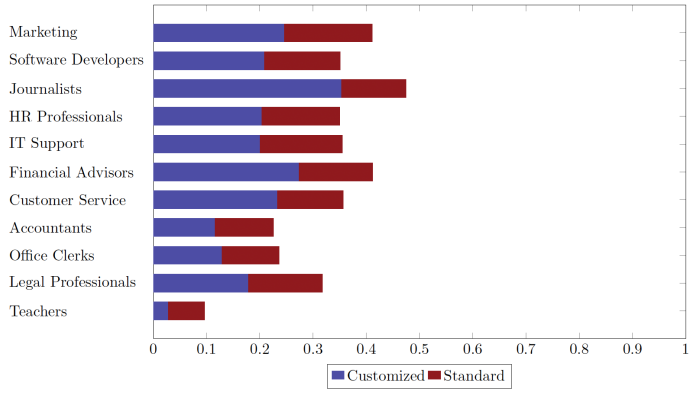
B.1 Employer Initiatives

Figure B.1: The Prevalence of Employer Initiatives for AI Chatbot Adoption (Workplaces)

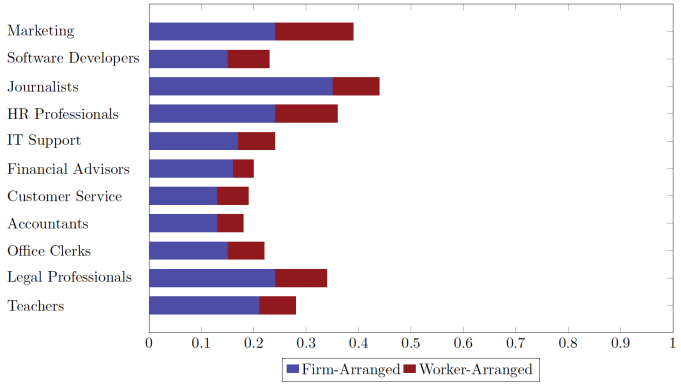
(a) Usage Policies



(b) In-House AI Chatbots



(c) Training in AI Chatbots



Notes: This figure shows the share of workplaces affected by various employer initiatives related to AI chatbot adoption. Workers in our sample have been reweighted so all workplaces have the same weight. Panel (a) shows employers' policies on AI chatbot usage for work. Panel (b) indicates whether the employer has its own AI chatbot. Panel (c) reports whether workers have participated in AI chatbot training courses. Figure B.1 provides a workplace-level version of this graph, yielding similar results. *Sample*: All completed responses from the 2024 survey.

Table B.1: Coworker Correlations for Employer Policies

	(1) Encouraged	(2) Allowed	(3) Not Allowed	(4) No Policy	(5) Don't Know	(6) In-House Chatbot	(7) Firm-Arranged
Share of Coworkers	0.574	0.207	0.364	0.197	0.359	0.640	0.659
	(0.015)	(0.019)	(0.028)	(0.020)	(0.017)	(0.015)	(0.014)
Observations	19868	19868	19868	19868	19868	19868	19868

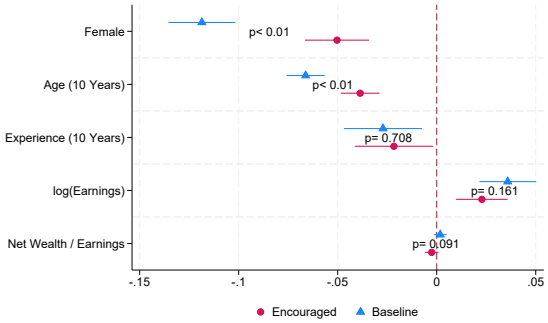
Notes: This table presents the correlation between coworkers' responses regarding their employer's AI chatbot adoption policies. The estimates are derived from a regression of individual workers' responses on the average response of their coworkers (within the same occupation and workplace), controlling for occupation fixed effects. Standard errors are clustered at the workplace level. *Sample*: All completed responses from the 2024 survey with at least one coworker in the sample.

B.2 Worker Adoption

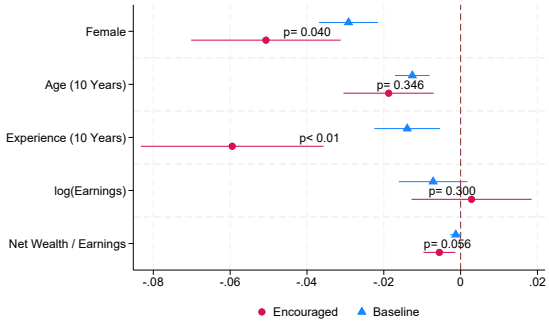
Figure B.2: How Do Employer Initiatives Influence Worker Gaps in AI Chatbot Adoption?

(i) Usage Policy: Encouraged

(a) Ever Used

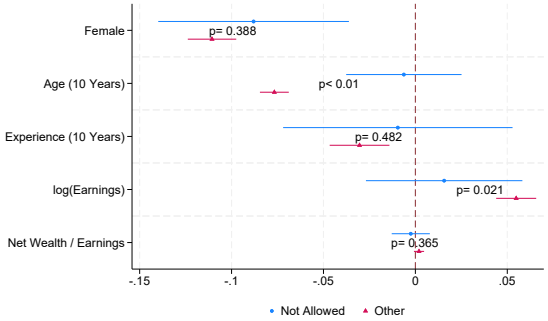


(b) Daily Use

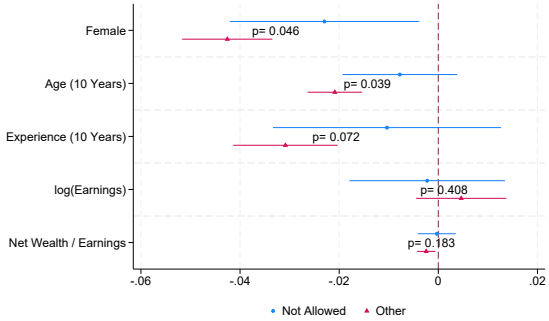


(ii) Usage Policy: Not Allowed

(a) Ever Used

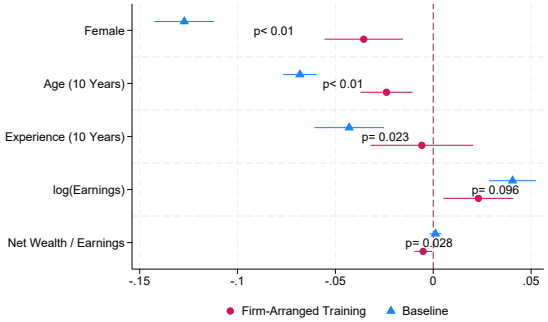


(b) Daily Use

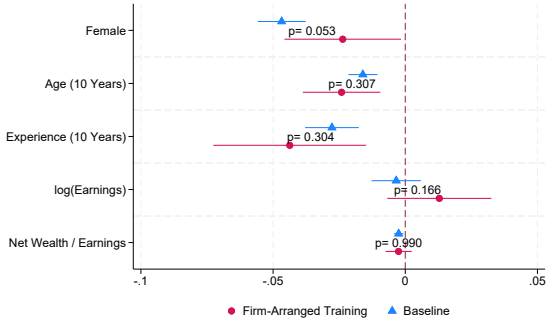


(iii) Firm-Arranged Training

(a) Ever Used



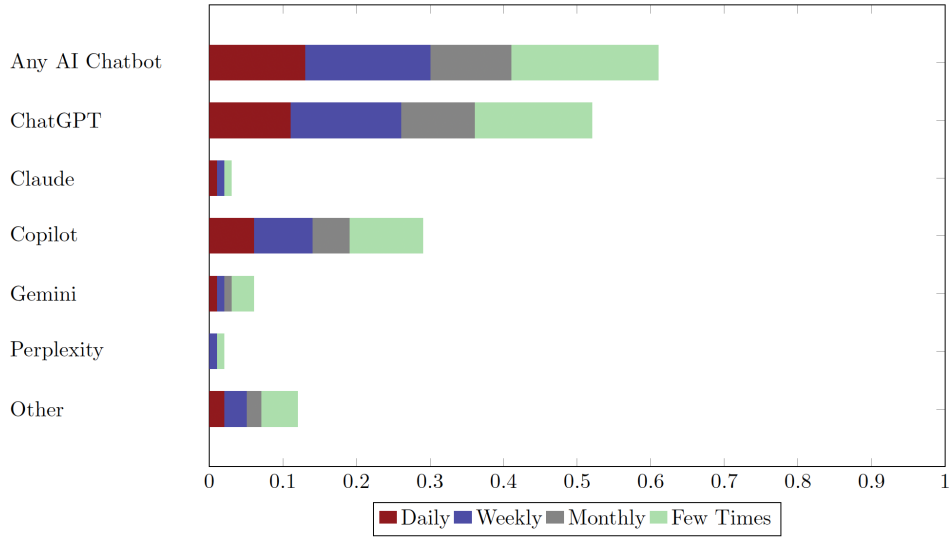
(b) Daily Use



Notes: *Notes*: This figure illustrates the impact of employer initiatives on worker disparities in AI chatbot adoption. The estimates are obtained from regressions of AI chatbot adoption on worker characteristics X, controlling for occupation fixed effects, and are estimated separately based on employers' AI chatbot initiatives. Panel (i) splits workers based on whether their employer encourages AI chatbot use, Panel (ii) splits workers based on whether their employer allows AI chatbot use, and Panel (iii) splits workers based on whether they have participated in firm-arranged AI chatbot training. For each of these, Panel (a) predicts whether workers have ever used AI chatbots for work, while Panel (b) predicts whether workers use AI chatbots daily. Whiskers represent 95% confidence intervals. The reported p-values test whether the coefficients differ between the two groups. *Sample*: All completed responses from the 2024 survey linked to registry data.

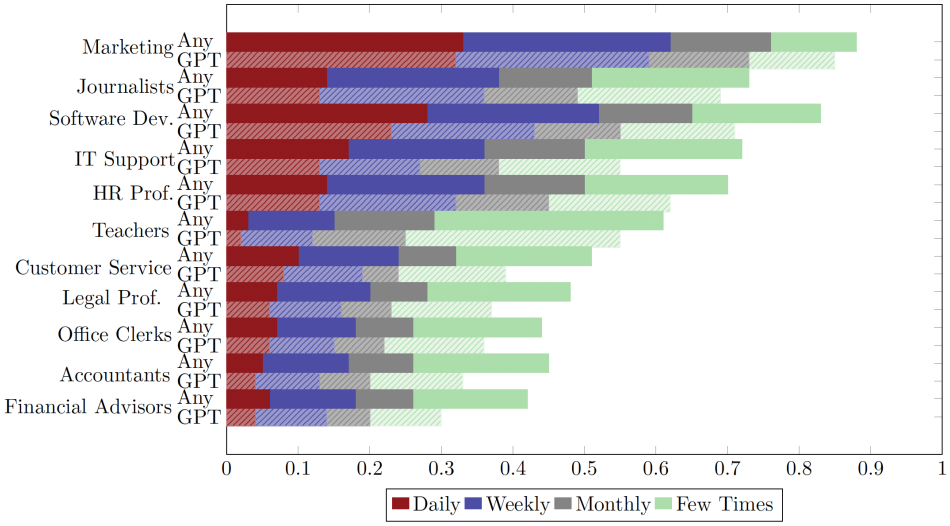
B.2.1 AI Chatbot Products

Figure B.3: The Prevalence of AI Chatbot Products



Notes: This figure displays the share of workers who have used various AI chatbots for work, categorized by frequency of usage. *Sample:* All completed responses from our 2024 survey round.

Figure B.4: The Dominance of ChatGPT



Notes: This figure shows the share of workers in our study occupations who have used AI chatbots for work, distinguishing between those who have used any AI chatbot and those who have specifically used ChatGPT. *Sample:* All completed responses from our 2024 survey round.

Table B.2: Correlation Between AI Chatbot Product Usage, P(Column|Row)

(a) Ever Used for Work

	Any	ChatGPT	Claude	Copilot	Gemini	Perplexity	Other
Any	1.00	0.82	0.04	0.45	0.09	0.04	0.19
ChatGPT	1.00	1.00	0.05	0.39	0.10	0.05	0.17
Claude	1.00	0.94	1.00	0.66	0.39	0.23	0.39
Copilot	1.00	0.72	0.06	1.00	0.11	0.05	0.16
Gemini	1.00	0.91	0.18	0.56	1.00	0.15	0.32
Perplexity	1.00	0.90	0.22	0.56	0.32	1.00	0.36
Other	1.00	0.73	0.08	0.39	0.15	0.08	1.00

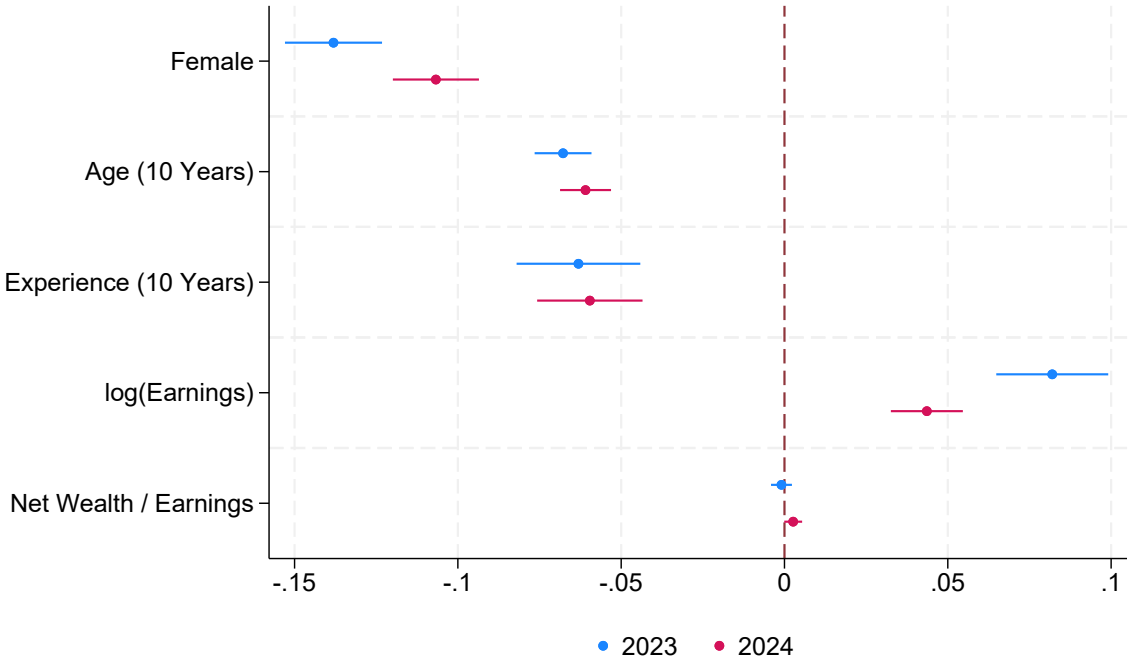
(b) Daily Use for Work

	Any	ChatGPT	Claude	Copilot	Gemini	Perplexity	Other
Any	1.00	0.69	0.03	0.36	0.03	0.02	0.13
ChatGPT	1.00	1.00	0.03	0.20	0.04	0.02	0.07
Claude	1.00	0.63	1.00	0.38	0.09	0.10	0.20
Copilot	1.00	0.39	0.04	1.00	0.04	0.01	0.08
Gemini	1.00	0.84	0.10	0.43	1.00	0.08	0.26
Perplexity	1.00	0.66	0.14	0.22	0.10	1.00	0.20
Other	1.00	0.38	0.05	0.21	0.06	0.04	1.00

Notes: This table presents the correlation between the use of different AI chatbot products. Each cell represents the probability of using the column product, conditional on using the row product. Panel (a) reports probabilities for any work-related use, while Panel (b) focuses on daily work-related use. *Sample:* All completed survey responses from our 2024 survey round.

B.2.2 Comparison to 2023 Survey

Figure B.5: Use of ChatGPT for Work (Nov '23, '24)



Notes: This figure presents estimates from a regression of ChatGPT usage for work on worker characteristics, controlling for occupation fixed effects. The regressions are estimated separately for the 2023 and 2024 survey rounds. *Sample*: All completed responses from the 2023 and 2024 survey rounds.

C Work

C.1 Benefits for Users

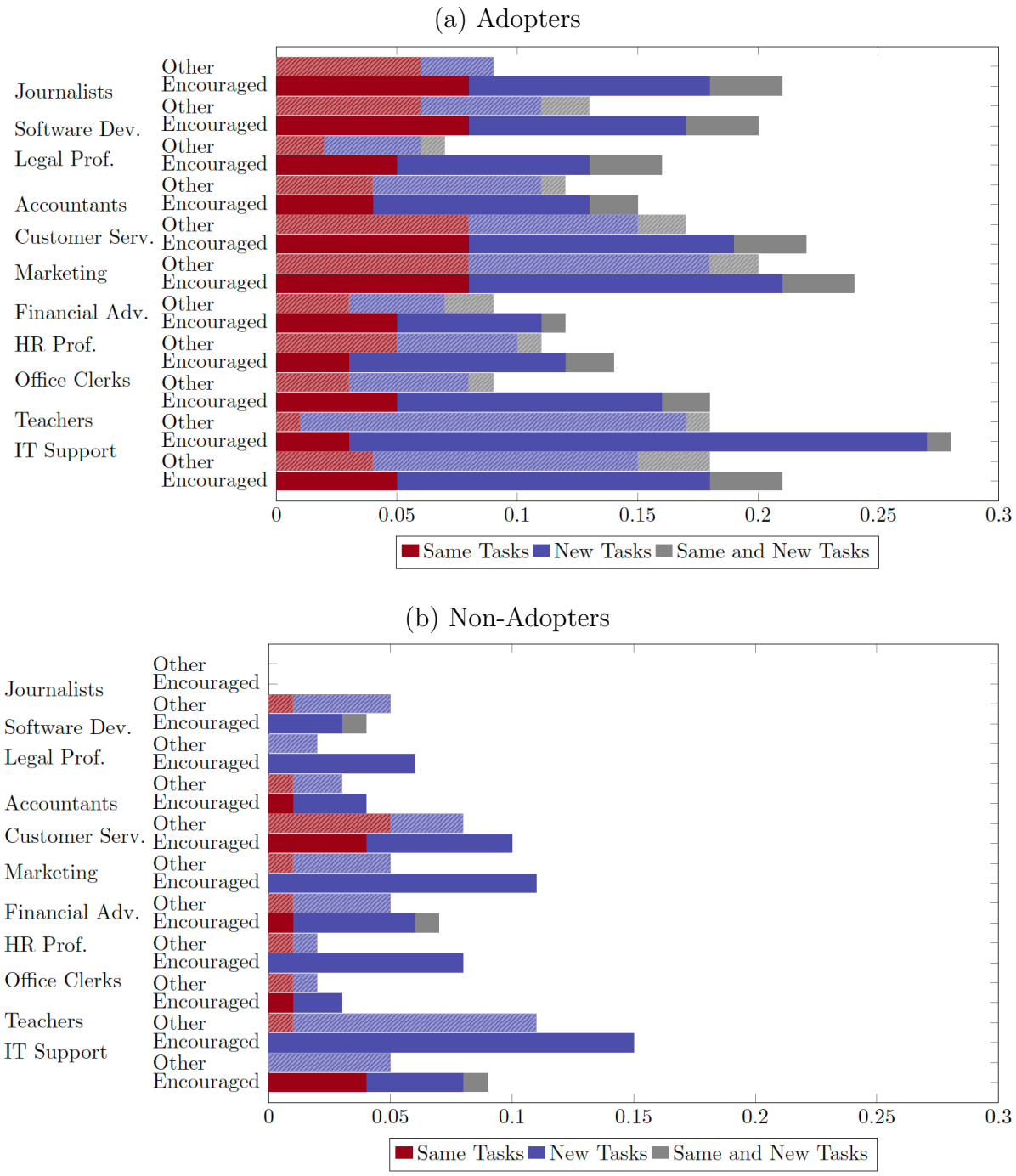
Table C.1: Perceived Benefits of AI Chatbots by Occupation

Occupation		Time Savings (1)	Quality (2)	Creativity (3)	Job Satisfaction (4)	No Benefits (5)	Don't Know (6)
Journalists	Encouraged	.67	.403	.49	.136	.142	.049
Journalists	Other	.67	.379	.43	.109	.129	.029
Software Dev.	Encouraged	.875	.582	.472	.341	.053	.014
Software Dev.	Other	.759	.411	.391	.227	.126	.039
Legal Prof.	Encouraged	.832	.597	.501	.234	.06	.017
Legal Prof.	Other	.719	.474	.386	.166	.113	.041
Accountants	Encouraged	.771	.582	.44	.184	.055	.048
Accountants	Other	.627	.448	.389	.119	.113	.073
Customer Service	Encouraged	.765	.583	.437	.135	.067	.031
Customer Service	Other	.674	.56	.385	.15	.102	.054
Marketing	Encouraged	.924	.718	.655	.305	.015	.008
Marketing	Other	.838	.651	.553	.253	.04	.028
Financial Adv.	Encouraged	.808	.593	.509	.191	.06	.013
Financial Adv.	Other	.685	.46	.443	.134	.129	.039
HR Prof.	Encouraged	.856	.7	.662	.312	.025	.025
HR Prof.	Other	.827	.546	.565	.168	.032	.037
Office Clerks	Encouraged	.747	.619	.527	.225	.056	.048
Office Clerks	Other	.614	.491	.439	.132	.095	.093
Teachers	Encouraged	.683	.377	.545	.159	.118	.049
Teachers	Other	.62	.301	.427	.122	.161	.079
IT Support	Encouraged	.814	.585	.466	.263	.061	.034
IT Support	Other	.695	.453	.371	.209	.142	.034

Notes: This table presents the share of workers who report various benefits from using AI chatbots for work, broken down by occupation and by whether their employer encourages AI chatbot use. *Sample*: All completed responses from the 2024 survey round.

C.2 Workloads and Task Creation

Figure C.1: Workloads from AI Chatbots



Notes: This figure presents the share of workers who report increased workloads due to AI chatbots, distinguishing between additional tasks of the same type, new job tasks, or both. The responses are broken down by occupation and by whether employers encourage AI chatbot use. Panel (a) focuses on adopters (workers who have ever used AI chatbots for work), while Panel (b) examines non-adopters. *Sample*: All completed responses from the 2024 survey round linked to registry data.

C.2.1 New Job Tasks from AI Chatbots

Our survey includes qualitative, open-ended responses about the new tasks workers have received due to AI chatbots. To categorize these responses, we use the LLaMA 3.3 language model (`llama3.3:70b-instruct-q2_K`). LLaMA offers the advantage of local processing, ensuring secure handling of personal data, and its parameters and quantization are well-suited to our needs.

We approached categorization in three steps. First, we manually categorized 50 randomly selected free-text responses per occupation to identify patterns in new tasks. Next, we used LLaMA to categorize the remaining responses based on these patterns. Finally, we took a different random sample of 50 responses per occupation from the LLM's classification and manually reviewed them for accuracy.

To execute LLaMA, we developed a Python script to streamline command execution, prompt generation, and data processing. We crafted prompts and corresponding examples, which we fed to the model to classify responses by both general task categories and occupation-specific categories.

Below, we list common tasks for a selection of occupations.

Journalists

Major Task	Subtasks
AI Training and Strategy	Training in AI chatbot usage, Creative brainstorming and idea development with AI, AI-related management tasks, Exploring and testing AI possibilities
Quality Assurance and Control	Quality control of AI-generated texts, Reviewing and analyzing more information with AI, Checking AI output for accuracy

Office Clerks

Major Task	Subtasks
AI Training and Strategy	Learning how to use AI, Implementing AI in administrative tasks
Automation and AI-Assisted Content Creation	Process optimization and automation, Writing emails and text editing, Translation tasks
Quality Assurance and Control	Checking AI-generated outputs, Conducting sample reviews for accuracy

HR Professionals

Major Task	Subtasks
AI Training and Strategy	Developing AI policies, Implementing AI in HR processes, Training HR staff in AI usage
Quality Assurance and Control	Checking job applications for AI-generated content, Reviewing AI-assisted recruitment tools
Automation and AI-Assisted Content Creation	Automating HR processes, Knowledge sharing, Conducting data analysis

Teachers

Major Task	Subtasks
AI Training and Strategy	Investigating AI applications in teaching, Developing own teaching materials, Setting guidelines for acceptable AI use in schools

Quality Assurance and Control	Checking student submissions for AI-generated content, Adapting written assessments in schools, Statistical analysis of student responses
AI-Assisted Learning	Conversations with students about AI and cheating, Incorporating creative AI elements in teaching, Reviewing and analyzing AI-generated responses

IT Support

Major Task	**Subtasks**
AI Training and Strategy	Developing AI policies, Advising and guiding AI adoption
Automation and AI-Assisted Content Creation	Implementing and monitoring AI in business operations, Automating and supervising processes
Programming and Technical Development	Troubleshooting and developing AI solutions, Creating custom AI tools

Software Developers

Major Task	**Subtasks**
AI Training and Strategy	Developing AI policies, Training in prompt engineering
Automation and AI-Assisted Content Creation	Less time spent coding, more on complex tasks, Adapting workflows to AI
Quality Assurance and Control	Troubleshooting and quality assurance of AI output
Programming and Technical Development	Developing and implementing AI tools, Integrating AI into existing software

Legal Professionals

Major Task	**Subtasks**
AI Training and Strategy	Developing AI policies and compliance strategies, Exploring AI applications in legal work
Quality Assurance and Control	Risk assessment of AI solutions, Quality control of AI-generated legal documents
AI-Assisted Legal Consultation	Advising on AI-related regulations and GDPR, Collaborating with IT for AI implementation

Accountants

Major Task	Subtasks
AI Training and Strategy	Understanding and implementing AI in accounting
Automation and AI-Assisted Content Creation	Automating processes, Document editing and reporting with AI
Data Analysis and Research	Data analysis and AI output verification, Exploring new risk assessment methods

Customer Support

Major Task	Subtasks
AI Training and Strategy	Implementing AI chatbots between customers and companies, Developing AI prompts
Quality Assurance and Control	Handling complaints related to AI, Monitoring and troubleshooting AI-related issues
AI-Assisted Customer Support	Knowledge sharing about AI, Handling more complex customer inquiries

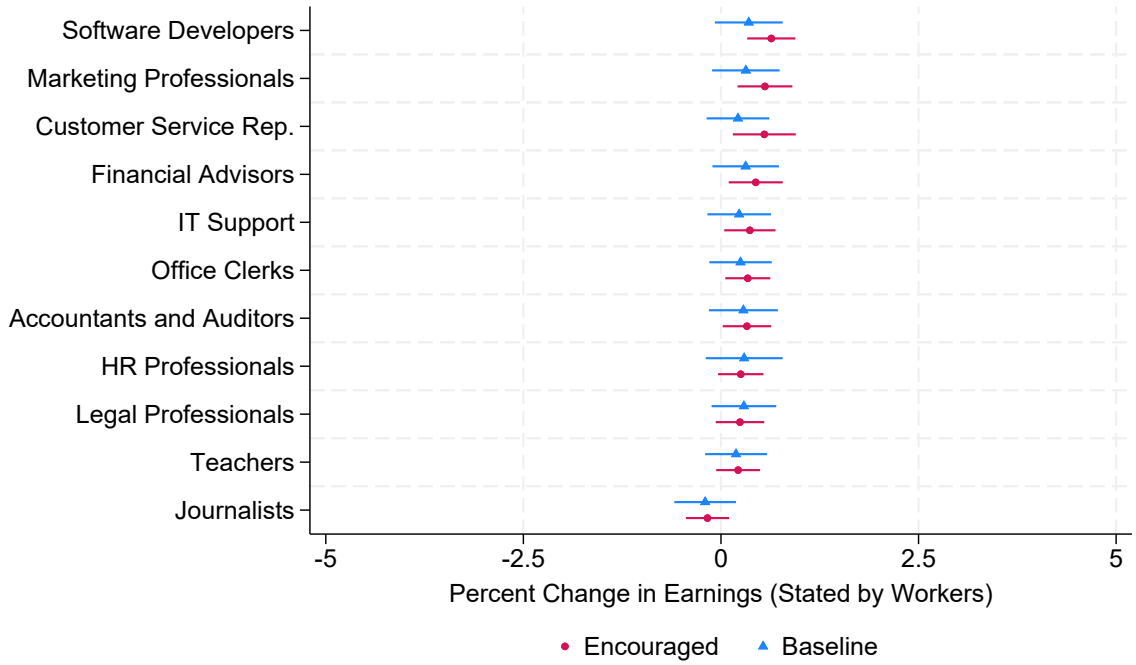
Marketing

Major Task	Subtasks
AI Training and Strategy	Investigating AI's effectiveness in marketing
Automation and AI-Assisted Content Creation	AI-generated content for marketing materials, Generating images and visual elements with AI
Data Analysis and Research	Market research and customer analytics, Checking AI-generated output for marketing campaigns

D Labor Market Outcomes

D.1 Perceived Impacts

Figure D.1: Perceived Earnings Effects of AI Chatbots Among Adopters



Notes: This figure displays the average perceived earnings impact of AI chatbots among adopters, categorized by workers' occupations and whether their employers encourage AI chatbot use. Whiskers represent 95% confidence intervals. *Sample*: All completed responses from the 2024 survey round linked to registry data.

Table D.1: Decomposition of Perceived Earnings Effects of AI Chatbots Among Adopters

Occupation		Average Impact (1)	Share of Impacts: Decreased Earnings (2)	Share of Impacts: Unchanged Earnings (3)	Share of Impacts: Increased Earnings (4)	Conditional Average Impacts: Decreased Earnings (5)	Conditional Average Impacts: Unchanged Earnings (6)	Conditional Average Impacts: Increased Earnings (7)
Journalists	Other	-.118		.994			0	
Journalists	Encouraged	-.159		.983			0	
Software Developers	Other	.092	.008	.974	.015	-12.187	0	12.5
Software Developers	Encouraged	.428		.96	.037		0	11.944
Legal Professionals	Other	.031		.978			0	
Legal Professionals	Encouraged	.057		.987	.009		0	10.5
Accountants and Auditors	Other	0	.004	.915	.004	-13.75	0	13.75
Accountants and Auditors	Encouraged	.126		.973	.015		0	10
Customer Service Rep.	Other	-.11	.013	.913		-9.167	0	
Customer Service Rep.	Encouraged	.303		.942	.041		0	7.25
Marketing Professionals	Other	.112		.956	.023		0	7.25
Marketing Professionals	Encouraged	.37	.006	.955	.038	-16.5	0	12.422
Financial Advisors	Other	.022		.964			0	
Financial Advisors	Encouraged	.214		.979	.019		0	11.667
HR Professionals	Other	0		.964			0	
HR Professionals	Encouraged	.071		.986			0	
Office Clerks	Other	.015	.002	.901	.003	-7.143	0	8.462
Office Clerks	Encouraged	.113		.978	.014		0	10.403
Teachers	Other	-.007	.001	.975	.001	-9.167	0	4
Teachers	Encouraged	.041		.992	.007		0	7.188
IT Support	Other	.039	.006	.981		-4	0	
IT Support	Encouraged	.172		.974	.02		0	11.25

Notes: This table decomposes the average perceived earnings impact of AI chatbots among adopters (Column 1) into contributions from workers reporting decreased earnings (Columns 2 and 5), unchanged earnings (Columns 3 and 6), and increased earnings (Columns 4 and 7). Responses are categorized by workers' occupations and whether their employers encourage AI chatbot use. *Sample*: All completed responses from the 2024 survey round linked to registry data.

D.2 Workplace Outcomes

D.2.1 Empirical Bayes Shrinkage

We estimate workplace adoption rates using Empirical Bayes shrinkage with a Beta-Binomial model.[12] The true adoption rate at each workplace, p_i, follows a Beta prior:

$$x_i \mid p_i \sim \text{Binomial}(n_i, p_i), \quad p_i \sim \text{Beta}(\alpha_0, \beta_0). \tag{4}$$

[12]Walters (2024) provide a detailed introduction to Empirical Bayes methods.

The Beta prior captures workplace-level variation. We estimate α_0, β_0 via Method of Moments, matching the Beta distribution's first two moments to observed data:

$$\bar{p} = \frac{1}{m}\sum_{i=1}^{m}\frac{x_i}{n_i}, \quad s^2 = \frac{1}{m}\sum_{i=1}^{m}\left(\frac{x_i}{n_i} - \bar{p}\right)^2. \tag{5}$$

From the Beta mean and variance formulas:

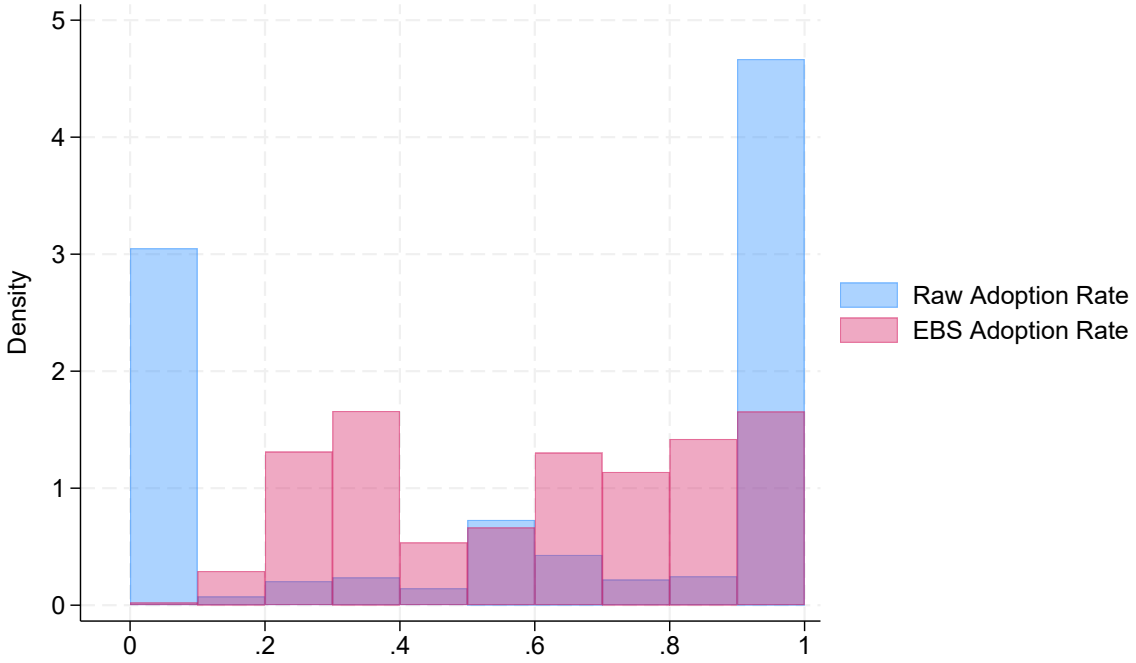
$$\alpha_0 = \frac{\bar{p}(1-\bar{p})}{s^2} - 1, \quad \beta_0 = \alpha_0\frac{1-\bar{p}}{\bar{p}}.$$

With these, we compute the posterior mean:

$$\mathbb{E}[p_i \mid x_i] = \frac{\alpha_0 + x_i}{\alpha_0 + \beta_0 + n_i}.$$

This shrinks estimates toward the overall mean, especially for small n_i. Figure D.2 compares the raw and adjusted distributions of workplace adoption rates, while Table D.2 presents summary statistics for the adjusted rates. The standard deviation is 0.15 percentage points.

Figure D.2: Workplace Adoption Rates (Raw vs. Shrinkage)



Notes: This figure compares the raw and adjusted distributions of workplace adoption rates. The adjusted estimates are derived using an Empirical Bayes shrinkage procedure, as described in Section D.2.1. *Sample:* All completed responses from our 2024 survey round linked to registry data.

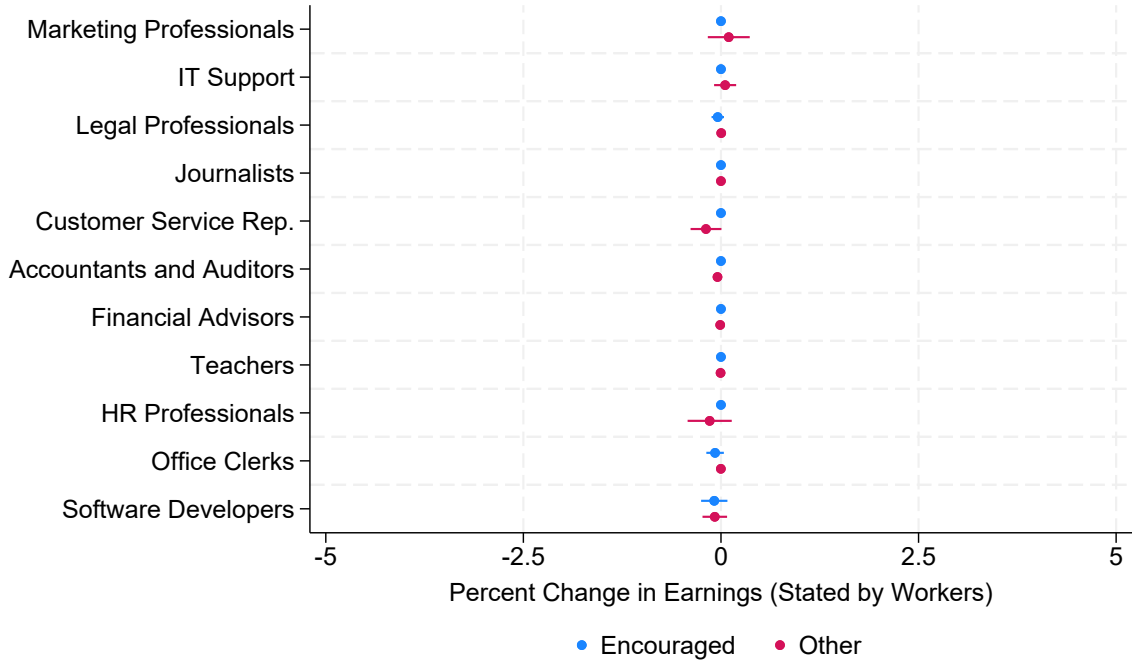
Table D.2: Workplace Adoption Rates (Empirical Bayes Shrinkage)

	p25	p50	p75	sd
Journalists	0.71	0.83	0.83	0.14
Software Developers	0.90	0.90	0.93	0.12
Legal Professionals	0.28	0.70	0.70	0.24
Accountants	0.25	0.25	0.73	0.24
Customer Service Rep.	0.27	0.50	0.74	0.24
Marketing Professionals	0.97	0.97	0.97	0.19
Financial Advisors	0.29	0.48	0.65	0.21
HR Professionals	0.54	0.92	0.92	0.30
Office Clerks	0.31	0.38	0.63	0.18
Teachers	0.51	0.63	0.69	0.13
IT Support	0.58	0.88	0.88	0.22
All	0.51	0.68	0.79	0.20

Notes: This figure presents summary statistics for the adjusted distributions of workplace adoption rates, categorized by occupation. The adjusted estimates are derived using an Empirical Bayes shrinkage procedure, as described in Section D.2.1. *Sample:* All completed responses from our 2024 survey round linked to registry data.

D.3 Results

Figure D.3: Average Effect of AI Chatbots on Earnings (Non-Users of AI Chatbots for Work)



Notes: This figure shows workers' average perceived earnings impacts from AI chatbots, broken down by their occupations and whether employers encourage AI chatbot use. The figure focuses on workers who have not used AI chatbots for work. *Sample*: All completed responses from the 2024 survey.

E Invitation Letter

This section includes the invitation letter for our survey. We sent three reminders: two via email (Digital Post) and one via text message (SMS).

The section below focuses on our 2024 survey round. The invitation letter for the 2023 round follows the same format and is documented in Humlum and Vestergaard (2025).

The English translation begins on page 24, followed by the original Danish version on page 26.

November 2024

Artificial intelligence and your job tasks

Dear [name]

Statistics Denmark is inviting you to participate in a research project about AI chatbots and your job tasks. You can participate by clicking the link below and completing the questionnaire.

AI chatbots use artificial intelligence to read and write text. You have been selected because you work in an occupation where AI chatbots may be relevant.

Your responses are important for research on new technology in the labor market. Everyone who completes the questionnaire will automatically participate in a lottery with **a prize of [X,XXX] DKK tax-free**.

Statistics Denmark is conducting the survey on behalf of researchers at the University of Copenhagen and the University of Chicago. The questionnaire takes **about 10 minutes** to complete.

Start the survey [url]

Or access www.dst.dk/ditsvar and enter your response code **[code]**.

Statistics Denmark handles your data confidentially. Results are presented in a way that prevents individual answers from being identified, and the data is used solely for statistical and scientific purposes.

Participation is voluntary. If you do not wish to participate, you can indicate this here: [refusal_link]

If you have any questions, you can e-mail info@dstsurvey.dk or call on 7777 7708 (every day between 9am and 4pm). Please provide your response code when contacting us.

Best regards,

Marie Fuglsang
Head of Division, DST Survey

Anders Humlum
Assistant Professor, University of Chicago

Information about Statistics Denmark's surveys and your rights

Who is invited to Statistics Denmark's surveys?

Anyone residing in Denmark may be invited to participate in one of Statistics Denmark's surveys. Participants are randomly selected. Our surveys aim to reflect the opinions and attitudes of the entire population, across gender, age, education, and place of residence.

Why is Statistics Denmark allowed to contact you?

Statistics Denmark can use its statistical production and related activities to carry out tasks under the rules for revenue-financed activities. This is stipulated in §1, section 3, no. 5, of the Act on Statistics Denmark.

How do we process your information?

The responses you provide in the survey are handled in accordance with the European General Data Protection Regulation (GDPR) and the Danish Data Protection Act.

The University of Copenhagen is the data controller for this survey. You can read more about the data controller and find contact information here: https://informationssikkerhed.ku.dk/persondatabeskyttelse/publikation-af-videnskab/

Statistics Denmark is the data processor and is responsible for data collection on behalf of the data controller.

Your responses will only be used for statistical and scientific purposes in this survey. Your answers will be deleted or archived in accordance with applicable laws when they are no longer needed for the study.

You can read more about how we process your data at: https://www.dst.dk/privatlivspolitik-i-en-frivillig-undersoegelse.

If you have any other questions regarding the processing of your personal data, you are welcome to contact Statistics Denmark's Data Protection Officer at databeskyttelse@dst.dk.

November 2024

Kunstig intelligens og dine arbejdsopgaver

Kære [navn]

Danmarks Statistik inviterer dig til at deltage i et forskningsprojekt om AI chatbots og dine arbejdsopgaver. Du deltager ved at klikke på nedenstående link og svare på spørgeskemaet.

AI chatbots bruger kunstig intelligens til at læse og skrive tekst. Du er blevet udvalgt til at deltage i denne undersøgelse, fordi du arbejder i et erhverv, hvor det kan være relevant at bruge AI chatbots.
Dine svar er vigtige for forskning i ny teknologi på arbejdsmarkedet. Alle der gennemfører spørgeskemaet, deltager automatisk i lodtrækningen om **en præmie på [X.XXX] kr. skattefrit**.

Danmarks Statistik gennemfører spørgeskemaet for forskere på Københavns Universitet og University of Chicago. Det tager **ca. 10 minutter** at besvare spørgeskemaet.

Start undersøgelsen [url]

Eller gå ind på www.dst.dk/ditsvar og tast svarkoden **[kode]**

Danmarks Statistik behandler dine svar fortroligt. Vi formidler resultaterne på en måde, så ingen kan se, hvad den enkelte har svaret og data anvendes alene til statistiske og videnskabelige formål.

Det er frivilligt at deltage. Ønsker du ikke at deltage, kan du tilkendegive det: [refusal_link]

Har du spørgsmål, kan du skrive til info@dstsurvey.dk eller ringe på tlf. 7777 7708 (alle dage ml. kl. 9-16). Oplys venligst din svarkode ved henvendelse.

Med venlig hilsen

Marie Fuglsang
Kontorchef, DST Survey

Anders Humlum
Adjunkt, University of Chicago

Information om Danmarks Statistiks undersøgelser og dine rettigheder

Hvem bliver inviteret til Danmarks Statistiks undersøgelser?

Alle, der har bopæl i Danmark, har mulighed for at blive inviteret til at deltage i en af Danmarks Statistiks undersøgelser. Udvælgelse af personer til undersøgelsen sker tilfældigt. I vores undersøgelser er det vigtigt at kende meninger og holdninger fra hele befolkningen på tværs af køn, alder, uddannelse og bopæl.

Hvorfor må Danmarks Statistik kontakte dig?

Danmarks Statistiks kan bruge den statistiske produktion og afledte aktiviteter til at udføre opgaver efter reglerne for indtægtsdækket virksomhed. Det følger af § 1, stk. 3, nr. 5, i lov om Danmarks Statistik.

Hvordan behandler vi oplysninger om dig?

De svar, du afgiver ved deltagelse i spørgeskemaundersøgelsen, bliver behandlet i overensstemmelse med reglerne i den europæiske databeskyttelsesforordning (GDPR) og den danske databeskyttelseslov.

Københavns universitet er dataansvarlig for undersøgelsen. Du kan læse mere om den dataansvarlige og finde kontaktoplysninger her: https://informationssikkerhed.ku.dk/persondatabeskyttelse/publikation-af-videnskab/

Danmarks Statistik er databehandler og står for dataindsamlingen på vegne af den dataansvarlige.

Dine svar bruges udelukkende til statistiske og videnskabelige formål i denne undersøgelse. Dine svar slettes eller arkiveres efter gældende lovgivning, når oplysningerne ikke længere har et formål i undersøgelsen.

På linket https://www.dst.dk/privatlivspolitik-i-en-frivillig-undersoegelse kan du læse mere om, hvordan vi behandler oplysninger om dig.

Har du andre spørgsmål til behandling af dine personoplysninger, er du velkommen til at kontakte Danmarks Statistiks databeskyttelsesrådgiver på databeskyttelse@dst.dk

F Survey Questionnaire

This section contains our survey questionnaire. The questionnaire follows a common structure for the different occupations but with job tasks and titles tailored to each specific occupation.

For the sake of brevity, the questionnaire below focuses on one occupation (journalism), listing one of their six job tasks (write commentaries, columns, or scripts).

The section below focuses on our 2024 survey round. The survey questionnaire for the 2023 round follows a similar format and is documented in Humlum and Vestergaard (2025).

The English translation starts on page 29, with the original Danish version on page 34.

Survey Questionnaire – English Translation

1. Introduction

AI chatbots use artificial intelligence to read and write text. You have been selected to participate in this survey because you work in a profession where AI chatbots may be relevant.

Your participation is important regardless of your knowledge of chatbots or artificial intelligence.

Block 1: Occupation and tasks

2.a Occupation

Are you employed in [journalism]?

- Yes
- No

2.b Occupation [if 2.a='No']

Are you employed in one of the following areas?

If you are employed in multiple areas, please select your primary work area.

- HR work
- IT support
- Office and secretarial work
- Customer support
- Legal work
- Marketing
- Auditing and accounting work
- Software development
- Teaching
- Financial consulting
- I am not employed in any of the above work areas

3. Task Importance [if 2.b!= 'I am not employed in any of the above work areas'; all tasks]

We will first ask about some typical work tasks among [journalists].

For each task, please assess how **important the task is for your work**.

Extremely important means that the task is critical for performing your current job.

[Write commentaries, columns, or scripts]

- Not important
- Slightly important
- Important
- Very important
- Extremely important

Block 2: Adoption

4. Awareness of AI chatbots

AI chatbots use artificial intelligence to read and write text. We will now ask about your experiences with AI chatbots.

Had you heard of the following chatbots before this survey?

Mark all tools you had heard of before this survey.

- ChatGPT (developed by OpenAI)
- Claude (developed by Anthropic)
- Copilot (developed by Microsoft)
- Gemini (developed by Google)
- Perplexity (developed by Perplexity AI)
- Other AI chatbots
- Had not heard of AI chatbots before this survey

5. Prior Use of AI Chatbots [if 4 = 'Yes']

Have you used the following AI chatbots?

[ChatGPT / Claude / Copilot / Gemini / Perplexity / Other AI chatbots]

- Yes, only for work
- Yes, only for leisure
- Yes, for work and leisure

6.a Purposes of Prior Use [if 5='Yes, only for leisure' or 'Yes, for work and leisure']

How often have you used the following AI chatbots **for leisure**?

[ChatGPT / Claude / Copilot / Gemini / Perplexity / Other AI chatbots]

- Never
- A few times
- Monthly
- Weekly
- Daily

6.b Purposes of Prior Use [if 5='Yes, only for work or 'Yes, for work and leisure']

How often have you used the following AI chatbots **for work**?

[ChatGPT / Claude / Copilot / Gemini / Perplexity / Other AI chatbots]

- Never
- A few times
- Monthly
- Weekly
- Daily

6.c Purposes of Prior Use [if 5='Yes, only for work or 'Yes, for work and leisure' for any option]
Have you used an AI chatbot to perform the following work tasks?

- [Job task 1-6]
- None of the above

7. Time use on AI chatbots [if 5='Yes, only for work or 'Yes, for work and leisure' for any option]
Think back to the days when you used AI chatbots for your work. How much time did you spend using AI chatbots on average?

- Less than 15 minutes per day
- Between 15 minutes and an hour per day
- More than an hour per day

8. Paid subscription [if 5='Yes, only for work or 'Yes, for work and leisure' for 'ChatGPT']
Do you have an active Plus subscription for ChatGPT?

- Yes
- No

Block 3: Employer Initiatives

9. Employer policies
What is your employer's policy regarding the use of AI chatbots?

- Allowed and encouraged
- Allowed but not encouraged
- Not allowed
- No policy
- Don't know

10. In-house AI chatbot
Does your workplace have its own AI chatbot?

- Yes, a custom-designed product
- Yes, a standard product
- No
- Don't know

11.a Training courses
Have you participated in courses on using AI chatbots?

- Yes
- No

11.b Training courses [if 11.a = 'Yes']
Was your AI chatbot course organized by your employer?

- Yes
- No

Block 4: Effects of AI chatbots

12. Benefits from AI chatbots

Have you experienced any of these benefits from using AI chatbots in your work?
Please select all that apply.

- Saved time at work
- Improved work quality
- Increased creativity
- Higher job satisfaction
- Have not experienced benefits
- Don't know

13. Time savings from AI chatbots [if 12='Saved time at work']

Think back to the days when you used AI chatbots for your work. How much time did you save using AI chatbots on average?

- Less than 15 minutes per day
- Between 15 minutes and an hour per day
- More than an hour per day

14.a Earnings impact of AI chatbots

Have AI chatbots affected how much you earn today?

- I earn more today as a result of AI chatbots
- AI chatbots have not affected my income
- I earn less today as a result of AI chatbots

14.b Earnings impact of AI chatbots [if 14.a=' I earn more today as a result of AI chatbots']

How much have AI chatbots increased your earnings?

- Under 5 percent
- Between 5 and 15 percent
- Over 15 percent

14.c Earnings impact of AI chatbots [if 14.a=' I earn less today as a result of AI chatbots']

How much have AI chatbots reduced your earnings?

- Under 5 percent
- Between 5 and 15 percent
- Over 15 percent

15. Allocation of time savings from AI chatbots

If AI chatbots save time on a task, do you expect to:

- Complete more of the same tasks
- Spend more time on other tasks
- Take more breaks
- Take more leisure time

16. Workloads from AI chatbots

Do you find that AI chatbots have increased your workload?

- Yes, more of the same job tasks
- Yes, new types of job tasks
- No

17. New job tasks [if 16='Yes, new types of job tasks']

What types of new tasks have you experienced after using AI chatbots?

- [open text field]

18. End of survey

Thank you for participating in the survey.

If you win one of the prizes, you will be notified directly in your e-Boks.

Survey Questionnaire – Danish Version

1. Introduction

AI chatbots bruger kunstig intelligens til at læse og skrive tekst. Du er blevet udvalgt til at deltage i denne undersøgelse, fordi du arbejder i et erhverv, hvor det kan være relevant at bruge AI chatbots. Din deltagelse er vigtig uanset dit kendskab til chatbots eller kunstig intelligens.

Block 1: Occupation and tasks

2.a Occupation

Er du beskæftiget med [journalistik]?

- Ja
- Nej

2.b Occupation [if 2.a='Nej']

Er du beskæftiget inden for et af følgende områder?

Hvis du er beskæftiget indenfor flere områder, vælg da dit primære arbejdsområde.

- HR-arbejde
- IT-support
- Kontor- og sekretærarbejde
- Kundesupport
- Juridisk arbejde
- Marketing
- Revisions- og regnskabsarbejde
- Softwareudvikling
- Undervisning
- Økonomisk rådgivning
- Jeg er ikke beskæftiget inden for ovenstående arbejdsområder

3. Task Importance [if 2.b!= 'Jeg er ikke beskæftiget inden for ovenstående arbejdsområder'; all tasks]

Vi vil først spørge ind til nogle typiske arbejdsopgaver blandt [journalister].

Til hver opgave bedes du vurdere, hvor **vigtig opgaven er for dit arbejde**.

Ekstremt vigtig betyder, at opgaven er kritisk for varetagelsen af dit nuværende job.

[Skrive kommentarer, klummer eller artikler]

- Ikke vigtig
- Lidt vigtig
- Vigtig
- Meget vigtig
- Ekstremt vigtig

Block 2: Adoption

4. Awareness of AI chatbots

AI chatbots bruger kunstig intelligens til at læse og skrive tekst. Vi vil nu spørge ind til dine erfaringer med AI chatbots.

Havde du hørt om følgende chatbots før denne undersøgelse?

Markér alle værktøjer, du havde hørt om før denne undersøgelse.

- ChatGPT (udviklet af OpenAI)
- Claude (udviklet af Anthropic)
- Copilot (udviklet af Microsoft)
- Gemini (udviklet af Google)
- Perplexity (udviklet af Perplexity AI)"
- Andre AI chatbots
- Havde ikke hørt om AI chatbots før denne undersøgelse

5. Prior Use of AI Chatbots [if 4 = 'Ja']

Har du benyttet følgende AI chatbots?

[ChatGPT / Claude / Copilot / Gemini /Perplexity / Andre AI chatbots]

- Ja, kun til arbejde
- Ja, kun til fritid
- Ja, til arbejde og fritid

6.a Purposes of Prior Use [if 5='Ja, kun til fritid' or 'Ja, til arbejde og fritid']

Hvor ofte har du benyttet følgende AI chatbots **til fritid**?

[ChatGPT / Claude / Copilot / Gemini /Perplexity / Andre AI chatbots]

- Aldrig
- Et par gange
- Månedligt
- Ugentligt
- Dagligt

6.b Purposes of Prior Use [if 5='Ja, kun til arbejde or 'Ja, til arbejde og fritid']

Hvor ofte har du benyttet følgende AI chatbots **til arbejde**?

[ChatGPT / Claude / Copilot / Gemini /Perplexity / Andre AI chatbots]

- Aldrig
- Et par gange
- Månedligt
- Ugentligt
- Dagligt

6.c Purposes of Prior Use [if 5='Ja, kun til arbejde or 'Ja, til arbejde og fritid' for any option]
Har du benyttet en AI chatbot til at udføre følgende arbejdsopgaver?

- [Arbejdsopgave 1-6]
- Ingen af ovennævnte

7. Time use on AI chatbots [if 5='Ja, kun til arbejde or 'Ja, til arbejde og fritid' for any option]
Tænk tilbage på de dage, hvor du har brugt AI chatbots til dit arbejde. Hvor meget tid brugte du med AI chatbots i gennemsnit?

- Mindre end 15 minutter per dag
- Mellem 15 minutter og en time per dag
- Mere end en time per dag

8. Paid subscription [if 5='Ja, kun til arbejde or 'Ja, til arbejde og fritid' for 'ChatGPT']
Har du et aktivt Plus-abonnement på ChatGPT?

- Ja
- Nej

Block 3: Employer Initiatives

9. Employer policies
Hvad er din arbejdsgivers politik ift. brugen af AI chatbots?

- Tilladt og tilskyndet
- Tilladt men ikke tilskyndet
- Ikke tilladt
- Ingen politik
- Ved ikke

10. In-house AI chatbot
Har din arbejdsplads sin egen AI chatbot?

- Ja, et specialdesignet produkt
- Ja, et standardprodukt
- Nej
- Ved ikke

11.a Training courses
Har du deltaget i kurser om brugen af AI chatbots?

- Ja
- Nej

11.b Training courses [if 11.a = 'Ja']
Var dit kursus i AI chatbots arrangeret af din arbejdsgiver?

- Ja
- Nej

Block 4: Effects of AI chatbots

12. Benefits from AI chatbots

Har du oplevet nogle af disse fordele ved brugen af AI chatbots i dit arbejde?
Markér gerne flere

- Sparet tid i arbejdet
- Forbedret kvalitet af arbejdet
- Øget kreativitet
- Højere arbejdsglæde
- Har ikke oplevet fordele
- Ved ikke

13. Time savings from AI chatbots [if 12='Sparet tid i arbejdet']

Tænk tilbage på de dage, hvor du har brugt AI chatbots til dit arbejde. Hvor meget tid sparede AI chatbots dig i gennemsnit?

- Mindre end 15 minutter per dag
- Mellem 15 minutter og en time per dag
- Mere end en time per dag

14.a Earnings impact of AI chatbots

Har AI chatbots påvirket hvor meget du tjener i dag?

- Jeg tjener mere i dag som følge af AI chatbots
- AI chatbots har ikke påvirket min indtjening
- Jeg tjener mindre i dag som følge af AI chatbots

14.b Earnings impact of AI chatbots [if 14.a=' Jeg tjener mere i dag som følge af AI chatbots']

Hvor meget har AI chatbots øget din indtjening?

- Under 5 procent
- Mellem 5 og 15 procent
- Over 15 procent

14.c Earnings impact of AI chatbots [if 14.a=' Jeg tjener mindre i dag som følge af AI chatbots']

Hvor meget har AI chatbots reduceret din indtjening?

- Under 5 procent
- Mellem 5 og 15 procent
- Over 15 procent

15. Allocation of time savings from AI chatbots

Hvis AI chatbots sparer tid i løsningen af en opgave, forventer du så, at

- Løse flere af samme opgaver
- Bruge mere tid på andre opgaver
- Tage flere pauser
- Tage mere fritid

16. Workloads from AI chatbots

Oplever du, at AI chatbots har øget din arbejdsmængde?

- Ja, flere af de samme arbejdsopgaver
- Ja, nye slags arbejdsopgaver
- Nej

17. New job tasks [if 16='Ja, nye slags arbejdsopgaver']

Hvilke slags nye arbejdsopgaver oplever du at have fået efter brugen af AI chatbots?

- [Fritekstfelt]

17. End of survey

Mange tak for at deltage i undersøgelsen.

Hvis du vinder en af præmierne, vil du få direkte besked i din e-Boks.