The Generative AI - Gender Puzzle

Manuel Hoffmann* Sam Boysel* Frank Nagle* Kevin Xu‖

*Harvard Business School, Harvard University

‖GitHub Inc.

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Artificial Intelligence (AI) is predicted to substantially transform the economy and work processes. The rapid adoption of AI technologies is expected to affect productivity, skill requirements, and organizational structures across industries (Brynjolfsson, Rock, and Syverson, 2021). However, it is unclear how evenly distributed any potential returns to use of this new technology may be. As such, it is crucial to better understand the consequences of generative AI implementation on historically disadvantaged groups. In particular, women are typically underrepresented in science, technology, engineering, and mathematics fields and gender disparities are even more stark within the open source software ecosystem. The OECD, has identified closing gender gaps in the workforce as key to sustainable growth and innovation (OECD, 2020, 2024b) and with AI as one of the technologies with the most transformation potential (OECD, 2024a), it is an important question whether the effect of AI will be to reduce or increase pre-existing societal gaps across gender. While it has been well documented that women have lower adoption rates than men (Acilar and Sæbø, 2023; Otis et al., 2024; Humlum and Vestergaard, 2024), we particularly think that interlinking the adoption with the impact of generative AI, and, as such, any anticipated benefits and costs, can substantially enhance our understanding about technology adoption and usage, more broadly construed.

We study the use of generative AI in the context of GitHub's Copilot – a software development focused generative AI tool based on OpenAI's Generative Pre-trained Transformer (GPT) models, which also underlie ChatGPT. Copilot was developed jointly by OpenAI, an AI research organization, and GitHub, a subsidiary of Microsoft that offers a decentralized software development platform which represents the world's largest host of open source software (OSS) projects.

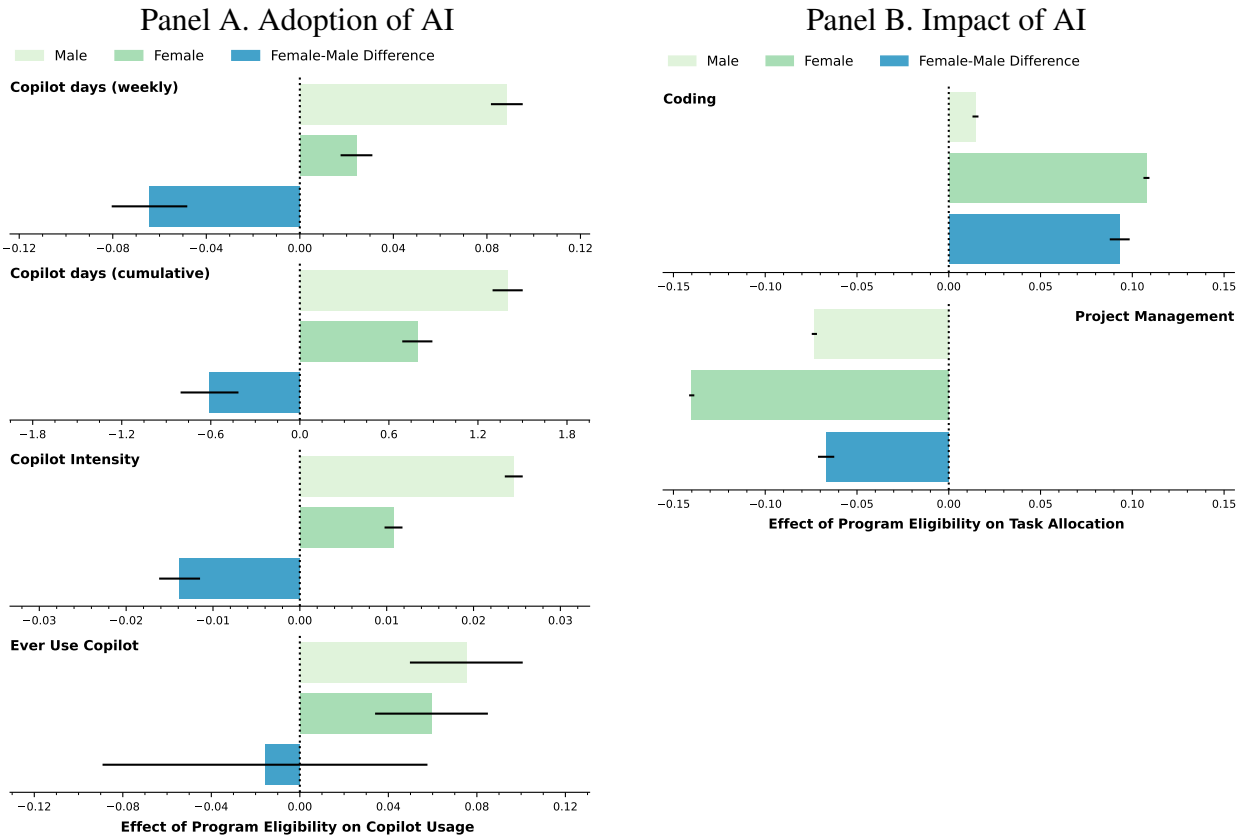
Copilot was trained on vast amounts of publicly available software code, including that hosted as OSS on GitHub itself, and assists software development with code completion and interactive chat features. Originally released under a limited access technical preview starting in June 2021, it became more broadly available as a full product in June 2022. As part of this roll out process, GitHub offered complimentary access to subsets of users, including developers of top OSS projects hosted on GitHub. The characteristics of this roll-out process assist us in identifying the causal effects of access to Copilot. By exploiting the introduction of Copilot during the general access period through a dataset of top developers, we compare those that were just eligible to receive access to GitHub Copilot for free to those that are not using a regression discontinuity design. We further identified women and men using the full names of those developers and we verified that the share of women we identified is nearly identical to the share of women when developers select their pronouns using a new feature on GitHub.

In the setting of the generative coding AI GitHub Copilot, we find at the threshold of AI eligibility that males are more likely to adopt and use generative AI than females. Figure 1 Panel A shows treatment effects at the threshold for males and females and the difference of the two groups for a range of outcomes from weekly and cumulative days of Copilot usage, the intensity of usage – the number of Copilot active days over the number of GitHub active days – as well as the extensive margin of adoption in terms of ever usage. It becomes evident across all usage and adoption measures that males (light green bar) are more active than females (dark green bar) which results in a negative female-male difference in usage and adoption (blue bar). In contrast, while women use and adopt generative AI slightly less than males, we can see a different pattern emerge on the consequences that generative AI has after receiving it quasi-exogenously. Figure 1 Panel B shows treatment effects at the threshold for males and females and the difference of the two groups on the core work of coding and the non-core work of project management.[1] We find that women (dark green bar) respond substantially stronger than males (light green bars) when they have access to Copilot and that they exhibit a larger relative increase in the share of coding and

[1]We define coding and project management for each project and developer on the GitHub platform as activities visible on the coding and issues tab, respectively. We follow the definitions established in Hoffmann et al. (2024).

a substantially larger drop in the share of project management (blue bars). While the usage and adoption differential are a puzzle in itself, taken together with the stronger behavioral response of women post adoption and usage creates the Generative AI–Gender Puzzle: why do women not use generative AI as much as men but when they do, they are the ones for a responds most strongly when a generative AI tool reduces their cost of core work?

Figure 1: Coding and Project Management Gender-Differences of Generative AI



Note: The figure on the left shows intent-to-treat treatment effects at the eligibility threshold across measures of GitHub Copilot generative AI usage and adoption. The figure on the right shows intent-to-treat treatment effects at the eligibility threshold across measures of core work of coding and non-core work of project management.

Our study makes three key contributions to the literature on artificial intelligence and its impact on work. First, we document a novel Generative AI–Gender Puzzle, in which men are more likely to adopt and use generative coding AI tools like GitHub Copilot, but women exhibit stronger responses when they adopt the technology. Specifically, we find that women experience

a larger increase in the share of time spent on the core work of coding and a more pronounced decrease in the non-core work of project management tasks compared to men. Second, by leveraging quasi-exogenous variation in access to generative AI, we provide causal evidence on the gender-differentiated effects of AI tools on task allocation, shedding light on how generative AI reshapes work patterns along gender lines. Finally, our findings suggest that the usage and impact of generative AI are not uniform across demographic groups, raising important questions about the factors driving adoption behavior and the downstream consequences of AI tools in workplace settings. These insights are crucial for policymakers and organizations aiming to promote equitable AI adoption and utilization while maximizing productivity gains.

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