

Strategic Responses to Technological Change: Evidence from ChatGPT and Upwork

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How do freelancers adjust in response to advances in AI technologies?

- Our focus is understanding how these new technologies affect **supply-side** (i.e., worker) behavior.
 - Build on top of demand-side questions
 - Focus on incumbents
- How do workers adapt? What is the heterogeneity in these adaptations?
- Study these questions by examining changes in activity by freelancers on the Upwork platform following the launch of ChatGPT in Dec. 2022.

Findings Preview

- More selective in bidding: increased concentration
- Re-positioning:
 - New *primary* specialties
 - Differentiation relative to prior distribution of bids across specialties
- Increased adoption of AI-forward positioning

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Similarity to peers	Captures the extent to which a freelancer changes positioning relative (i.e., differentiates) to their peers	Cosine similarity constructed based on the distribution of bids across specialties relative to all other sample freelancers

Empirical Strategy

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- Use an adjusted DiD approach that uses data from previous year as a pseudo-control
 - Placebo dataset constructed using “control” period from June 2021 through May 2022
 - Relies on parallel trend assumption

$$Y_{it} = \beta_1 \text{treated}_i + \beta_2 \text{post}_t + \beta_3 (\text{treated}_i \times \text{post}_t) + \gamma X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

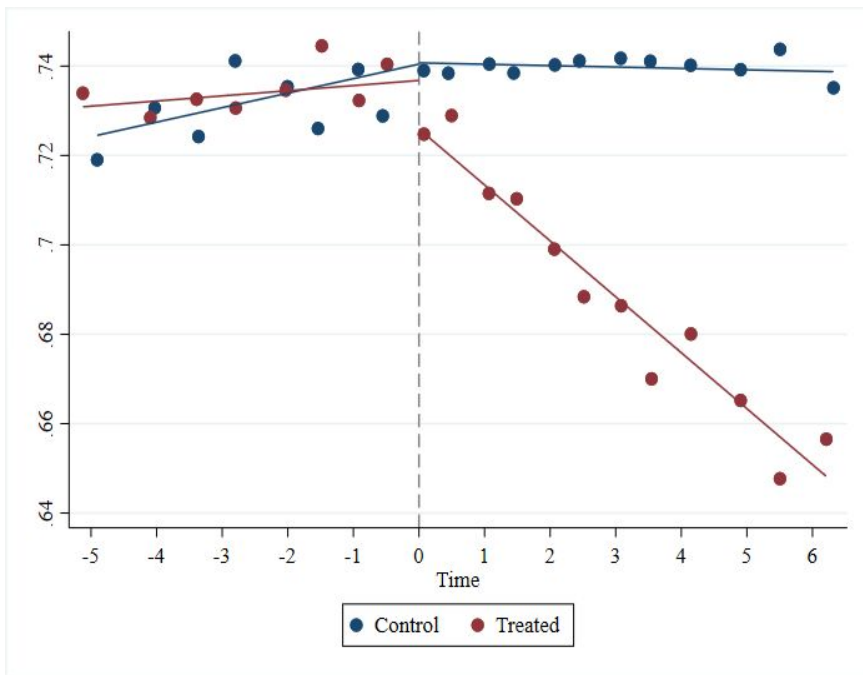
- Includes control vars, freelancer FE, and month FE

Changes in behavior

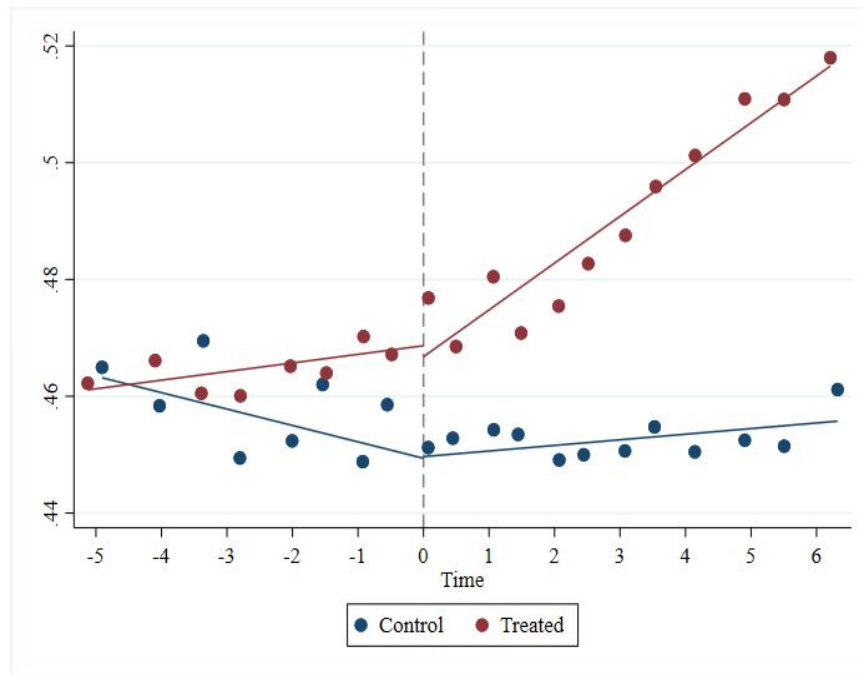
Table 1: Baseline Results

	(1) Specialization HHI	(2) New Modal Specialization	(3) AI Profile	Similarity relative to ...	
				Prior Behavior	Population
Post x Treated	0.021*** (0.001)	0.012*** (0.001)	0.002*** (0.000)	-0.027*** (0.001)	-0.000 (0.000)
Freelancer fixed effects	Yes	Yes	Yes	Yes	Yes
Calendar month fixed effects	Yes	Yes	Yes	Yes	Yes
Controls	Bid volume	Bid volume	Bid volume	Bid volume	Bid volume
Mean DV	0.524	0.469	0.009	0.720	0.247
No. of freelancers	309,885	299,944	243,768	299,944	309,885
R-squared	0.600	0.330	0.798	0.493	0.740
Observations	4,602,481	3,999,792	4,742,171	3,999,792	4,602,481

Changes in behavior

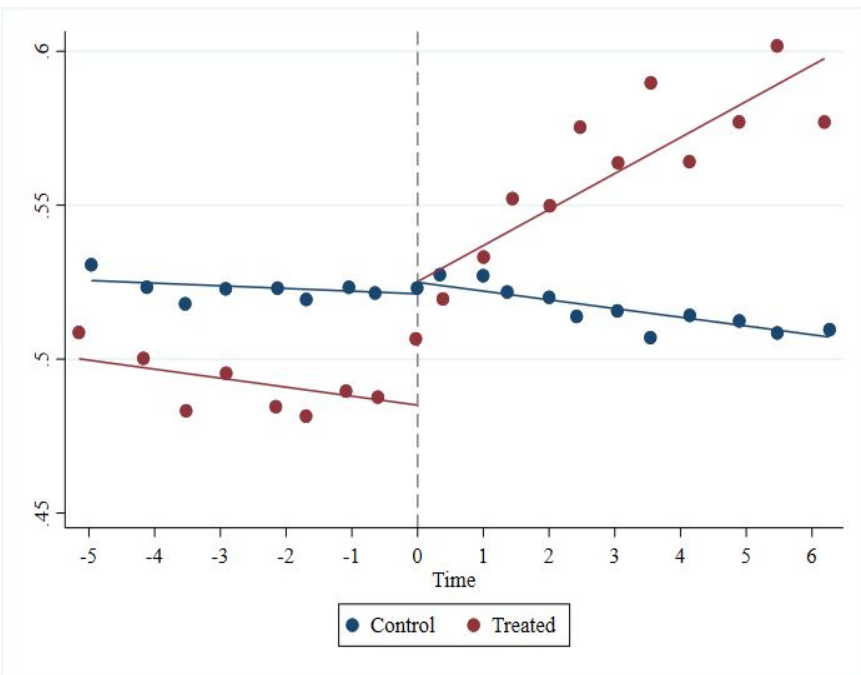


Cosine similarity to prior behavior

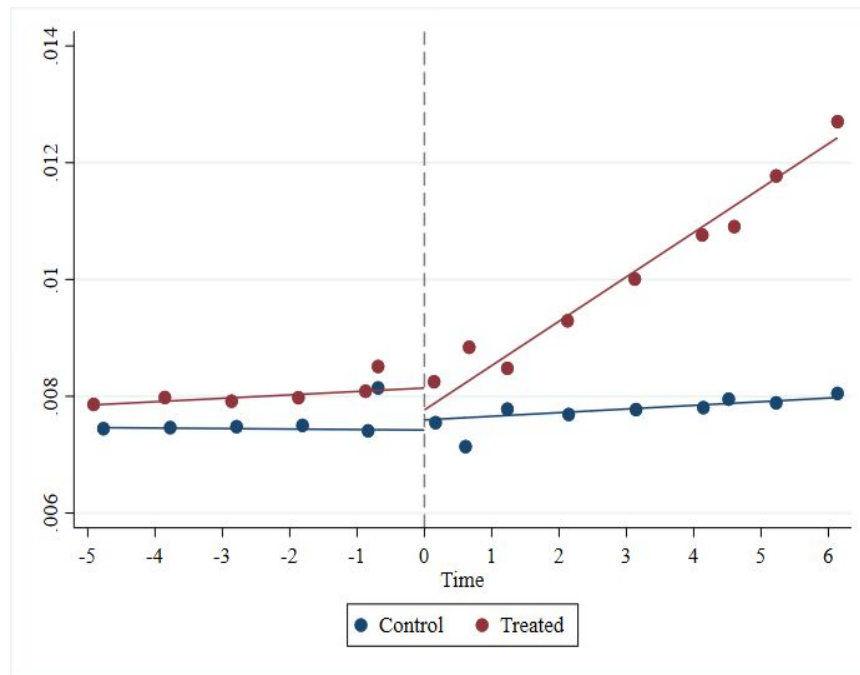


New modal specialization

Changes in behavior



Specialization HHI



Profile contains AI

Empirical Strategy

- Use a continuous DiD to examine heterogeneity based on FL experience and skill:
 - Skill: Measured by required skill (input by clients) of completed jobs.
 - Experience: Measured using the number of jobs completed pre-treatment.

$$Y_{it} = \beta \text{Characteristic}_i \times \text{Post}_t + \alpha_i + \Gamma_i \times \tau_t + \epsilon_{it}$$

- Adds specialty-by-month FEs to account for domain-specific, time-variant effects

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 - These freelancers showed less differentiation in the distribution of bids across specialties, both relative to their prior behavior and to other sample freelancers.
 - They were more likely to embrace AI post-ChatGPT within their existing work domains

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 - Consolidation where they have an advantage and abandoning positions where they do not (concentration).
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 - Consolidation where they have an advantage and abandoning positions where they do not (concentration).
 - Differentiation relative to prior behavior and peers.
- Experience and skill shape responses.
 - Greater ex-ante investments may make changing work specialties less appealing; instead embrace AI tools to maintain portfolio. Humlum and Vestergaard, 2024