Productivity Effects of Remote Work

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Trends in WFH



Data from American Time Use Survey before 2020 and Survey of Work Arrangement and Attitudes since 2020. Similar results for Census Household Pulse Survey.

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Why are Firms Reluctant about Remote Work?

Could be worried about...

- Immediate productivity effects of remote work
- Or something else

My research aims to understand these factors using data from firms.

1. Study in call-centers

Data on call-centers at a Fortune 500 firm

- Firm hired both remote & on-site workers before Covid-19.
- Randomly routed calls between them

Emma Harrington & Natalia Emanuel, "Working Remotely? Selection, treatment, and the market for remote work," *AEJ: Applied*, Forthcoming.

1. Remote Work and Calls Per Hour



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WFH made people about 4% less productive and attracted 8% less productive people

1. The Firm's Pro/Con List

Pros of WFH	Cons of WFH			
	• Reduces productivity by 4%			
	• Attracts workers who are 8% less productive			
	→ Total reduction of 12%			

1. The Firm's Pro/Con List

Pros of WFH	Cons of WFH
• Reduces office rents, worth 6% of labor costs	 Reduces productivity by 4% Attracts workers who are 8%
• Reduces attrition, worth 0.8% of labor costs	→ Total reduction of 12%

For firms like this one, the reluctance around remote work was more about adverse selection into remote jobs rather than a negative productivity effect of working from home

2. How does WFH affect software engineers?

Data on mentorship in code reviews & programming output
 Variation in proximity
 Natalia Emanuel, Emma Harrington, and Mandy Pallais. "The Power of

Proximity to Coworkers." NBER WP # 31880







Driven by feedback to junior engineers from senior engineers



Driven by feedback to junior engineers from senior engineers

• Opportunity costs for the output of senior engineers

Piecing Things Together

Immediate productivity effects of remote work unlikely to be key deterrent

- Slightly negative effects in the call-center context
 - But outweighed by other savings
- Positive immediate effects for the programmers

Evidence of longer-term productivity costs in both settings

• Reduced investments in workers' skills & reduced promotion rates

These **longer-term consequences in turn impact selection into remote work**, further compounding costs to the firm and potentially leading to an underprovision of remote work

Thank you!

Feedback welcome in-person or online emma.k.harrington4@gmail.com Difference-in-Differences Design 👄

 $\begin{aligned} \mathsf{Calls}/\mathsf{Hour}_{i,t} = & \beta \text{ Initially On-Site}_i \times \mathsf{Post}_t + \\ & \phi \mathsf{Initially On-Site}_i + \rho \mathsf{Post}_t + X'_{i,t} \kappa + \epsilon_{i,t} \end{aligned}$

Observation: worker-day level and clustering by worker

Difference-in-Differences Design 📼

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Identifying assumption: remote and on-site workers face similar pandemic shocks

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Identifying assumption: remote and on-site workers face similar pandemic shocks

Relax identifying assumptions with controls in $X_{i,t}$

- Preferred: call-level x date x time-zone FE, gender x age x post FE, worker FE
- Additional: local Covid-19 cases & mother/father x post FE

Remote Work and Calls Per Hour -

Calls/Hour_{*i*,*t*} = β Initially On-Site_{*i*} × Post_{*t*} + $X'_{i,t}\kappa + \epsilon_{i,t}$

	Calls per Hour							
	(1)	(2)	(3)	(4)	(5)	(6)		
Initially On-Site × Post	-0.19*** (0.07)	-0.14** (0.07)	-0.16* (0.08)	-0.15** (0.06)	-0.15** (0.06)	-0.21*** (0.08)		
Initially On-Site	0.39*** (0.06)	0.45*** (0.06)	0.45*** (0.08)					
Post	0.79*** (0.06)							
County Covid Cases/10K					0.02 (0.01)	0.01 (0.02)		
Mother × Post						-0.04 (0.06)		
Father × Post						-0.14 (0.13)		
Pre Dependent Mean On-Site	3.8	3.8	3.8	3.8	3.8	3.8		
Initially On-Site ${\sf x}$ Post in %	-5.1% (1.80)	-3.6% (1.80)	-4.1% (2.20)	-3.9% (1.60)	-3.9% (1.60)	-5.5% (2.00)		

Pre-Covid Design 📼



Remote Work and Call Quality 🥌

	Decomp	osition		Call Quality			
	% On	<u>Min.</u>	Hold Min.	% Call Back	Satisfaction	Call Without Call Back	
	Phone	Call	Call	(2 Day)	Rating	Hour	
	(1)	(2)	(3)	(4)	(5)	(6)	
Initially On-Site x Post	-1.99***	0.37*	0.12**	0.40**	-0.002	-0.13**	
	(0.54)	(0.22)	(0.05)	(0.20)	(0.01)	(0.05)	
R ²	0.63	0.38	0.18	0.13	0.09	0.42	
Pre Mean On-Site	74.3	13.2	1.1	15.8	4.9	3.2	
Initially On-Site \times Post in $\%$	-2.7%	2.8%	10.6%	2.5%	-0.03%	-4%	
	(0.7)	(1.7)	(4.8)	(1.3)	(0.20)	(1.7)	

Career Consequences (=)



Career Consequences (=)



Fade-out in Selection (=)



Selection (=)

Calls/Hour_{*i*,*t*} = α Initially On-Site_{*i*} + $X'_{i,t}\kappa + u_{i,t}$

	Calls per Hour							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Initially Remote	-0.20*** (0.07)	-0.31*** (0.07)	-0.30*** (0.08)	-0.30*** (0.08)	-0.24*** (0.09)	-0.27** (0.11)	-0.21 (0.13)	
County Covid Cases/10K				0.01 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	
Base Pay					0.06 (0.04)	0.04 (0.04)	0.07 (0.05)	
Local Outside Option Pay in MSA						0.03 (0.03)	0.04 (0.03)	
Unemployment Rate in MSA						-0.01 (0.02)	-0.004 (0.02)	
Mother							0.07 (0.08)	
Father							-0.04 (0.15)	
Pre Dependent Mean On-Site	3.8	3.8	3.8	3.8	3.8	3.8	3.8	
Initially Remote in %	-5.3% (1.9)	-8.2% (1.9)	-7.8% (2.1)	-7.9% (2.1)	-6.4% (2.4)	-7.2% (2.9)	-5.6% (3.5)	
Age × Gender FE Call Queue FE		\checkmark	4 4	4	4	\$ \$	\ \	

By Gender 🥌



By Gender 🥌



Engineer's Team — One-Building - - - Multi-Building