Growth Mechanisms Analysis

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1 Growth Mechanisms Analysis

This analysis examines how firm growth moderates the remote work productivity effect. Define:

- $\text{var3} = \text{Remote}_i \times \text{Post}_t$

- $\text{var4} = \text{Post}_t \times \text{Startup}_i$

- $\text{var5} = \text{Remote}_i \times \text{Post}_t \times \text{Startup}_i$

We estimate three specifications:

Baseline: The standard remote work effect without growth interactions:

$$y_{it} = \beta_1 \text{var3}_{it} + \beta_2 \text{var4}_{it} + \beta_3 \text{var5}_{it} + \alpha_{i,j} + \delta_t + \varepsilon_{it} \tag{1}$$

Endogenous Growth: Adds controls for high-growth firms (above median growth):

$$\begin{aligned} y_{it} =& \beta_1 \text{var3}_{it} + \beta_2 \text{var4}_{it} + \beta_3 \text{var5}_{it} \\ &+ \beta_4 \text{Post}_t \times \text{HighGrowth}_j + \beta_5 \text{Post}_t \times \text{HighGrowth}_j \times \text{Startup}_i \\ &+ \alpha_{i,j} + \delta_t + \varepsilon_{it} \end{aligned} \tag{2}$$

Exogenous Growth: Uses growth residualized on industry/MSA trends, rent, and market concentration:

$$\text{Growth}_j = \pi_1 \text{IndGrowth}_{-j} + \pi_2 \text{MSAGrowth}_{-j} + \pi_3 \text{Rent}_j + \pi_4 \text{HHI}_j + \nu_j \tag{3}$$

Then adds controls for high residualized growth ($\hat{\nu}_j > \text{median}$) in the same form as endogenous growth.

The analysis compares two fixed effects specifications: (1) worker-firm interacted fixed effects ($\alpha_{i,j}$) that absorb time-invariant match quality, and (2) separate worker (α_i) and firm (α_j) fixed effects that estimate firm-level heterogeneity.

2 First-Stage: Growth Residualization

Table 1: First-Stage Regression: Firm Growth Residualization

	Dep Var: Firm Growth Rate
Industry growth (leave-one-out)	0.635***
	(0.057)
MSA growth (leave-one-out)	0.314***
	(0.064)
High rent (above median)	0.045***
	(0.005)
High HHI (above median)	0.034***
	(0.004)
Constant	-0.143***
	(0.011)
Observations	3,189
R-squared	0.124

Notes: Growth rate is average post-COVID employment growth.
*** p<0.01, ** p<0.05, * p<0.10

3 Worker-Firm Fixed Effects

Table 2: Worker-Firm Fixed Effects

	Dep Var: Total Productivity		
	(1)	(2)	(3)
Panel A: OLS			
Remote × Post	-1.23**	-1.21**	-0.64
	(0.50)	(0.50)	(0.52)
Remote × Post × Startup	6.21***	6.24***	3.58***
	(1.27)	(1.29)	(1.27)
N	224,708	224,708	214,151
Panel B: IV			
Remote × Post	-9.26**	-3.68	-9.64*
	(4.01)	(3.88)	(5.02)
Remote × Post × Startup	12.45**	6.88	10.87*
	(5.39)	(5.65)	(6.46)
N	224,708	224,708	214,151
KP rk Wald F	123.43	134.89	78.08
Endogenous growth		✓	
Exogenous growth			✓

Notes: Worker-firm interacted fixed effects with time FE. Raw firm growth is the average post-COVID employment growth rate (above/below median). Residualized growth is predicted by industry/MSA trends, rent, and HHI. Standard errors clustered by user in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

4 Separate Fixed Effects

Table 3: Separate Fixed Effects

	Dep Var: Total Productivity		
	(1)	(2)	(3)
Panel A: OLS			
Remote × Post	-1.03**	-1.01**	-0.50
	(0.48)	(0.48)	(0.51)
Remote × Post × Startup	5.18***	5.17***	2.51**
	(1.24)	(1.25)	(1.24)
N	229,862	229,862	218,909
Panel B: IV			
Remote × Post	-7.15*	-2.08	-6.92
	(3.90)	(3.79)	(4.80)
Remote × Post × Startup	9.94*	4.63	7.42
	(5.37)	(5.67)	(6.39)
N	229,862	229,862	218,909
KP rk Wald F	140.60	153.28	91.62
Endogenous growth		✓	
Exogenous growth			✓

Notes: Separate user, firm, and time fixed effects. Raw firm growth is the average post-COVID employment growth rate (above/below median). Residualized growth is predicted by industry/MSA trends, rent, and HHI. Standard errors clustered by user in parentheses. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.