Optimal Work-from-Home Policy Analysis

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Model Environment

Key Components

1. **Firm Productivity**:
   - A firm's output depends on the fraction of work done remotely (α) and its remote work efficiency (ψ).
   - **Production Function**:

$$Y = A\left[(1-\alpha) + \alpha(\psi - \psi_0)\right]$$

   - A: Total factor productivity (baseline productivity).
   - α: Fraction of work done remotely ($\alpha \in [0,1]$).
   - ψ: Efficiency of remote work ($\psi \in [0,1]$).
   - ψ_0: **Minimum efficiency threshold** for remote work to be viable ($\psi_0 \in [0,1]$).

2. **Worker Utility**:
   - Workers receive utility $x = w + \alpha^{\chi}$, where:
     - w: Wage paid by the firm.
     - χ: Parameter capturing worker preference for remote work ($\chi > 0$).

3. **Firm's Problem**:
   - The firm chooses α to **maximize profit**:

$$\pi = Y - w = A\left[(1-\alpha) + \alpha(\psi - \psi_0)\right] - (x - \alpha^{\chi}).$$

   - Subject to providing a fixed utility x to the worker.

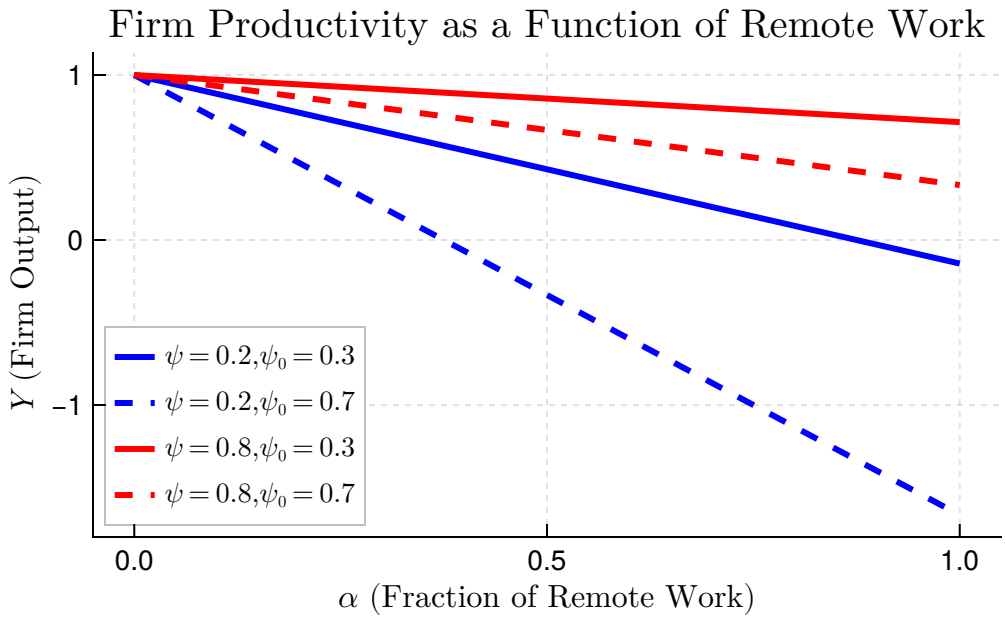

Figure 1: Firm productivity as a function of remote work

Derivation of Optimal Remote Work Fraction (α^*)

Step 1: Profit Maximization

Substitute $w = x - \alpha^\chi$ into the profit function:

$$\pi = A\left[(1-\alpha) + \alpha(\psi - \psi_0)\right] - x + \alpha^\chi.$$

Step 2: First-Order Condition (FOC)

Take the derivative of π with respect to α and set to zero:

$$\frac{\partial \pi}{\partial \alpha} = -A(1 - (\psi - \psi_0)) + \chi\alpha^{\chi-1} = 0.$$

Rearranging:

$$\chi\alpha^{\chi-1} = A\left(1 - (\psi - \psi_0)\right).$$

Step 3: Solve for α^*

Case 1: $\psi \leq \psi_0$

- Remote work is harmful or neutral ($\psi - \psi_0 \leq 0$).
- **Optimal Policy**: $\alpha^* = 0$ (no remote work).

Case 2: $\psi > \psi_0$

- Remote work is viable ($\psi_{\text{net}} = \psi - \psi_0 > 0$).
- **Interior Solution ($\chi < 1$)**:

$$\alpha^* = \min\left\{\left(\frac{\chi}{A\left(1-\psi_{\text{net}}\right)}\right)^{\frac{1}{1-\chi}},\ 1\right\}.$$

- Example: If $\chi = 0.5$, $A = 2$, $\psi_0 = 0.3$, and $\psi = 0.4$ ($\psi_{\text{net}} = 0.1$):

$$\alpha^* = \left(\frac{0.5}{2(1-0.1)}\right)^2 \approx 0.077.$$

- **Corner Solutions ($\chi \geq 1$)**:
  - If $\chi \geq A\left(1-\psi_{\text{net}}\right)$: $\alpha^* = 1$ (full remote work).
  - Otherwise: $\alpha^* = 0$.

Interpretation

Role of ψ_0

- ψ_0 acts as a **viability threshold**:
  - Firms with $\psi \leq \psi_0$ avoid remote work entirely.
  - Firms with $\psi > \psi_0$ face a trade-off between productivity loss and wage savings.

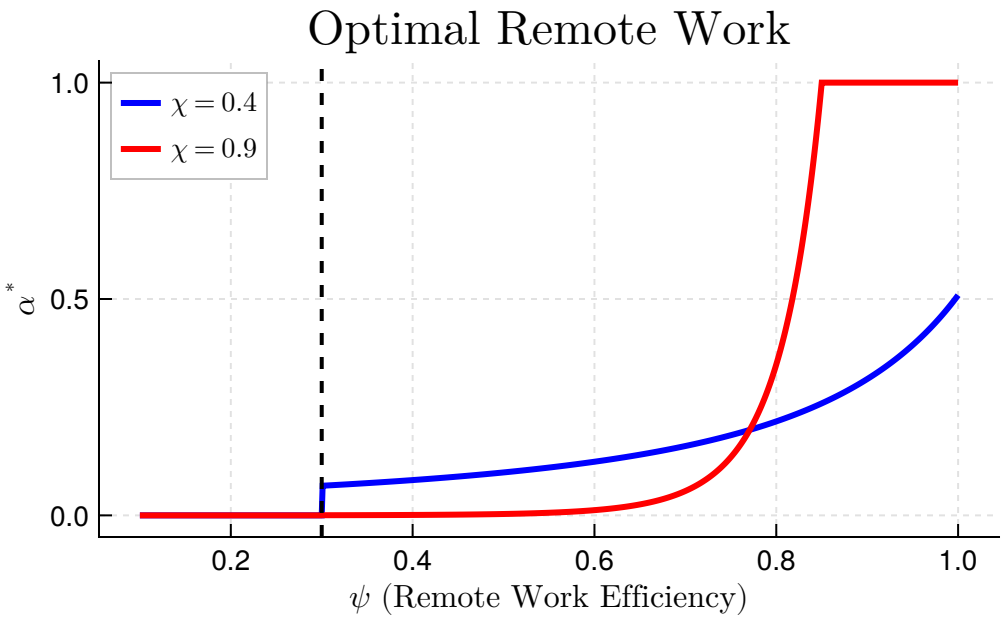

Figure 2: Optimal remote work fraction as a function of remote work efficiency

Worker Preferences (χ)

- **Low χ ($\chi < 1$)**:
  - Workers value remote work highly (slow diminishing returns to α).
  - Firms offer partial remote work ($\alpha^* > 0$) even for modest ψ.
- **High χ ($\chi \geq 1$)**:
  - Workers prioritize wages over remote work (rapid diminishing returns to α).
  - Firms adopt remote work ($\alpha^* = 1$) only if ψ_{net} is sufficiently high.

Policy Implications

1. **Adoption of Remote Work**:
   - Firms with $\psi > \psi_0$ adopt remote work, but the extent depends on χ and ψ_{net}.
   - Example: A tech firm ($\psi = 0.9$, $\psi_0 = 0.2$) with $\chi = 0.5$ chooses $\alpha^* \approx 0.69$, while a manufacturing firm ($\psi = 0.25$, $\psi_0 = 0.3$) sets $\alpha^* = 0$.
2. **Productivity vs. Wage Costs**:

- High-ψ firms leverage remote work to reduce wages without significant productivity loss.
- Low-ψ firms avoid remote work to preserve output.

Summary

The optimal remote work fraction α^* depends critically on:

1. **Remote efficiency threshold (ψ_0)**.
2. **Worker preference for remote work (χ)**.
3. **Firm-specific remote efficiency (ψ)**.

This model explains why firms in certain industries (e.g., tech) embrace remote work, while others (e.g., manufacturing) avoid it, even within the same economy.