Common Ownership, Innovation and the Labor Market

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Introduction

- Two major economic trends in the last 40 years
  1. Wages have stagnated (Bivens and Mishel 2015 EPI)
  2. Institutional investors have replaced retail shareholders in equity markets (Backus et al. AEJ:Micro 2021).
- Adoption of new technologies is not universal across firms, "frontier" firms vs "laggard" firms (Song et al. QJE 2019)
- CEO performance related pay has declined (Anton et. al JPoIE 2023)
- Many studies attribute wage stagnation, decline of labor market share and increase of market power to common ownership (i.e. competing firms within the same industry have a common shareholder, usually index fund)
- This study focuses on the effects of common ownership in technology adoption in a simple model with a labor market.

Literature

- **Product market:** CO softens product market competition via executive pay, voice in meetings, "quiet life" (Azar et al 2018, JoF, Schmalz 2021, Antitrust Bulletin)
- **Labor market:** CO decreases wages and labor share (Azar Vives 2019 AEApp, Azar et al. 2022 WP, Azar Vives 2021 Ectra)
- **Innovation:** CO increases innovation under technological spillovers (Vives 2020 IJIO, Lopez Vives 2019 JPolE) in a symmetric model of cost-reducing R&D investments where firms internalize technological spillovers and countervail the reduced incentives to compete. (also Anton et al. 2025 MS). Papadopoulos et al 2019 EL free technology transfer to rival.
- **This paper:** Cost reducing technology adoption without spillovers but with a labor market.

Findings

- **Focus:** How common ownership (CO) influences technology adoption when firms compete for labor.
- **Question:** Does CO facilitate or hinder the transition to labor-saving technologies (e.g., AI/Robots)?
- **Key Finding 1:** In a duopoly, increasing CO facilitates **partial** adoption but impedes **universal** adoption. It also limits universal non-adoption.
- **Key Finding 2:**The labor market is a crucial channel through which CO harms economic outcomes—lower technology adoption leads to lower productivity, lower output and lower wages.

The Model

- There are two firms indexed by $i = 1, 2$. A firm can produce quantity q_i according to the following **production function**

$$q_i = A_i L_i \tag{1}$$

where L_i denotes labor hours and A_i is a coefficient of **labor productivity**.

- Consumers are represented by an inverse **demand function**

$$p(Q) = 1 - Q, \tag{2}$$

where p is the price and Q the total quantity.

The Firm

- The **profit of firm** i is

$$\Pi_i = q_i(p - \frac{w}{A_i}) - F \tag{3}$$

  - w is the **wage** paid to the worker for the supply of one unit of labor
  - w/A_i stands for the cost of production per unit.
- We assume that $A_i \in \{1, B\}$,
- $F > 0$ **fixed cost of technology adoption**/non-drastic innovation or R&D investment with certain outcome , if $A_i = B > 1$
- $F = 0$ when a firm stays with the **status-quo technology**, $A_i = 1$.

Ownership

- If there is a common owner, then there is a "degree of sympathy" $\lambda_i \in [0,1]$ that the manager of firm i attaches to the profits of firm j. The **objective function** of manager of i is

$$V_i = \Pi_i + \lambda_i \Pi_j$$

$$= (1 - q_i - q_j - \frac{w}{A_i})q_i - F + \lambda_i[(1 - q_i - q_j - \frac{w}{A_j})q_j - F].$$

- If $\lambda_i = 0$, firms are independent.
- If $\lambda_i = 1$, firms form a cartel.

The Labor Market

- Each worker chooses labor supply L to maximize utility

$$U(L) = wL - \tfrac{1}{2}L^2,$$

where wL is labor income and $\frac{1}{2}L^2$ is the disutility of labor.

- The first-order condition $w = L$ yields the **aggregate labor supply**

$$L_s = w.$$

- The demand for labor by firm i is given by

$$L_{d_i} = \frac{q_i}{A_i},$$

therefore the **total labor demand** is $L_d = L_{d_1} + L_{d_2}$.

- Consumers and workers are different groups. We may think of consumers as being located in a remote market while workers are local suppliers of labor that do not consume the good produced by the firm they work for.

Timing

1. At $t = 1$, firms chose A_i simultaneously, i.e. they choose whether to adopt the new technology, $A_i = B$, at cost $F > 0$ or keep the old one, $A_i = 1$, $F = 0$.
2. At $t = 2$, firms and workers decide the demand $L_{d_i}, i = 1, 2$ and supply L_s for labor respectively. The market clears competitively at wage w.
3. At $t = 3$, firms' managers make production choices $q_i, i = 1, 2$ (Cournot) so as to maximize the objective function V_i.

Equilibrium: Symmetric CO $\lambda_i = \lambda, i = 1, 2$

- **Stage 3 (Cournot Equilibrium):** Outputs are

$$q_i(A_i, A_j, w, \lambda) = \frac{\frac{2w}{A_i} - \frac{(1+\lambda)w}{A_j} + \lambda - 1}{\lambda^2 + 2\lambda - 3}$$

- **Stage 2 (Labor Market):** Market clearing wage w is

$$w(A_1, A_2, \lambda) = \frac{A_1 A_2(\lambda - 1)(A_1 + A_2)}{A_1^2[A_2^2(\lambda - 1)(\lambda + 3) - 2] + 2A_1 A_2(\lambda + 1) - 2A_2^2}$$

- **Stage 1 (Technology Choice):** Four possible outcomes:
  - **NN:** None adopts ($A_1 = A_2 = 1$)
  - **TT:** Both adopt ($A_1 = A_2 = B$)
  - **NT / TN:** Partial adoption ($A_1 \neq A_2$)

Equilibrium: Symmetric CO $\lambda_i = \lambda, i = 1, 2$

	T	**N**
T	$\Pi_1^{TT} - F, \Pi_2^{TT} - F$	$\Pi_1^{TN} - F, \Pi_2^{TN}$
N	$\Pi_1^{NT}, \Pi_2^{NT} - F$	Π_1^{NN}, Π_2^{NN}

Lemma 1: Candidate Equilibria

Depending on the adoption cost F, all outcomes are candidate equilibria:

- $0 \leq F < F_{LOW}(\lambda)$: Full adoption (TT).
- $F_{LOW}(\lambda) < F < F_{HIGH}(\lambda)$: Partial adoption (NT or TN).
- $F > F_{HIGH}(\lambda)$: No adoption (NN).

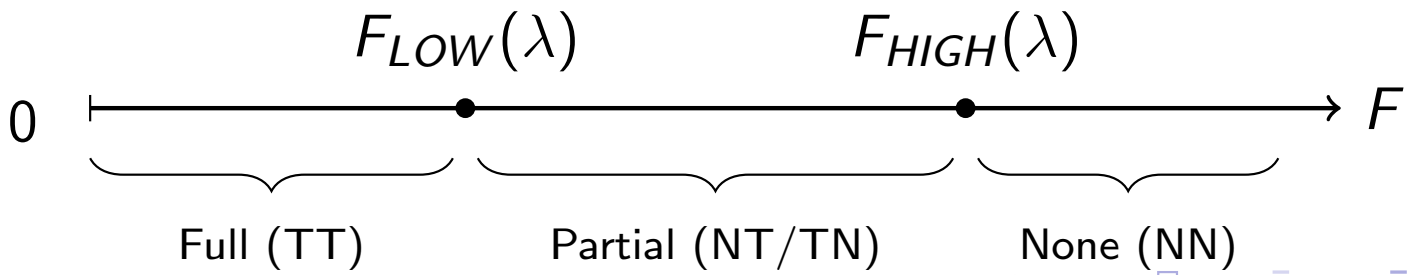
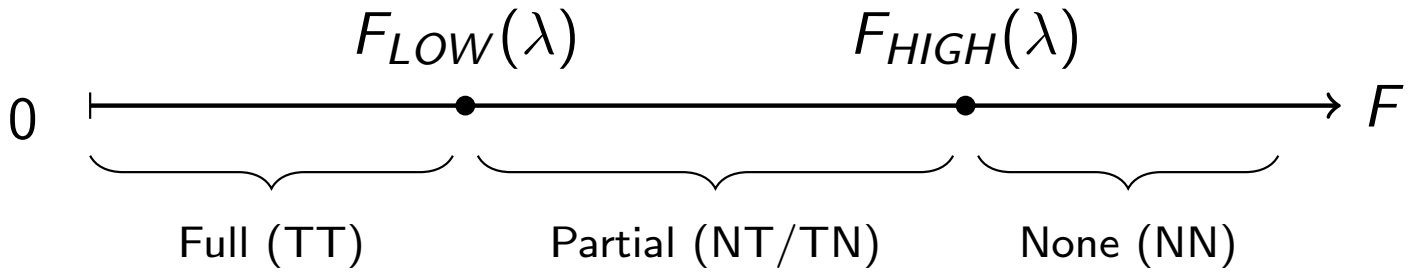


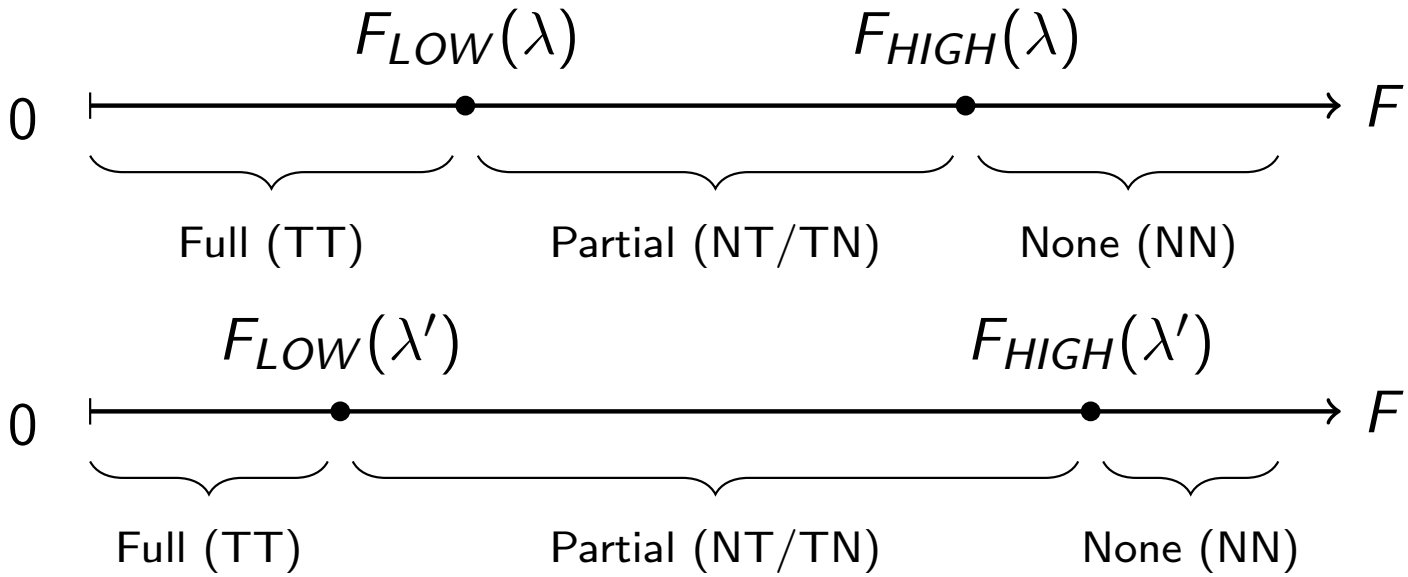
Figure 1: Equilibrium Regions (Symmetric Case)



Intuition: Market stealing effect vs F and status-quo profit

- **Full Adoption (TT):** Give the rival is adopting, best strategy is to adopt and pay $F < F_{LOW}$. Technology is cheap.
- **No Adoption (NN):** Given the rival is NOT adopting, technology is too expensive to adopt. Not worth it to pay $F > F_{HIGH}$.
- **Partial adoption (NT):** Given the rival is adopting, the extra profit from adopting is not high enough. Prefer to compete with status quo technology and save on $F_{LOW} < F < F_{HIGH}$.
- **Partial adoption (TN):** Given the rival is NOT adopting, the extra profit from adopting is high enough. Worth paying $F_{LOW} < F < F_{HIGH}$.

Effects of Common Ownership $\lambda' > \lambda \geq 0$



- As $\lambda \uparrow$, F_{LOW} moves **left** and F_{HIGH} moves **right**
- **Intuition:** If the interest of the common owner in rival firm 2 increases,
  - F such that TT$\rightarrow$ he wants firm 1 not to adopt (NT).
  - F such that NN$\rightarrow$ he wants firm 2 to adopt (NT)

  Why:
  1. The market stealing effect for firm 2 becomes higher
  2. Common owner will benefit more from it
  3. Loss for firm 1 moderated because firm saves on F.

Main Result

Proposition 1: Effect of Common Ownership

Symmetric common ownership **limits** universal adoption of a novel technology by all firms in the industry, while it **expands** partial adoption. It also **limits** universal non-adoption.

- Higher λ means a firm obtains higher profit from the rival's superior technology without paying the adoption cost.
- Thus, the motivation to *not* adopt when the rival adopts increases.
- If the rival does not adopt, the adopting firm has a higher motive to share the extra profit, making partial adoption more likely.

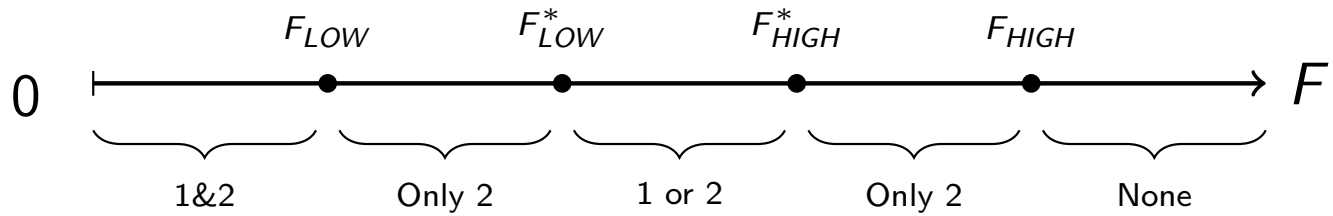
Asymmetric Common Ownership

- **Scenario** $\lambda_1 > 0, \lambda_2 = 0$**:** Owner 1 holds 100% of firm 1 and 30% of Firm 2. Owner 2 holds 70% of Firm 2. Firm 2 is multi-owner, Firm1 is single-owner.

Proposition 2: Asymmetric Common Ownership

As diversification λ_1 increases the multi-owner firm will adopt for a wider range of technology adoption cost than the single-owner firm.

- **Intuition:** Higher $\lambda_1 \rightarrow$ higher benefit for common owner from firm 2, $\rightarrow$ motive for firm 1 to adopt goes down.



The Role of the Labor Market

- **Exercise:** Eliminate the labor market by fixing wage w, $(c_i = w/A_i)$ and solve the model again.
- **Finding:** Ambiguous effects on technology adoption $\partial F_{HIGH}(\lambda)/\partial\lambda \lessgtr 0, \partial F_{LOW}(\lambda)/\partial\lambda \lessgtr 0 \rightarrow$ **labor market crucial**
- **Effects of λ on the labor market at equilibrium:**
  - $\partial w/\partial\lambda < 0$. Common ownership depresses wages.
  - $\partial L/\partial\lambda < 0$. Common ownership decreases labor quantity.
  - $\partial S/\partial\lambda < 0$. Common ownership depresses labor share $(S = wL/pQ)$.
- **Conclusion:** The labor market is a crucial channel through which CO harms economic outcomes—lower technology adoption leads to lower productivity and lower wages.
- High CO makes "free-riding" on the rival's technology more attractive (internalizing rival's profit), discouraging full industry-wide upgrades.

Symmary and Conclusion

- We analyzed the interaction between common ownership, technology adoption, and a competitive labor market.
- **Key Takeaway:** Increasing levels of common ownership make universal technology adoption more difficult but expand the range where partial adoption occurs ("status-quo bias").
- **Broader Impact:** Provides a mechanism linking CO to depressed wages, alongside higher product prices.
- Results are inline with
  1. Azar, Qiu, and Sojourner. 2022 : after a firm enters the S&P 500 index, the average annual earnings per employee of its local competitors decrease relative to the counterfactual.
  2. OECD 2023 : the correlation of productivity with intra-industry common ownership appears negative, but positive with inter-industry.
- **Welfare implication:** Common ownership can harm workers through lower wages and lower levels of technology adoption.
- **Policy implication:** Antitrust must look beyond product prices and consider how ownership structures depress innovation and wages.

Thank you!