Platform Tying and its Effects

Leonardo Madio
University of Padua

Fabio M. Manenti
University of Padua

Massimo Motta
ICREA-Universitat Pompeu Fabra
& Barcelona School of Economics

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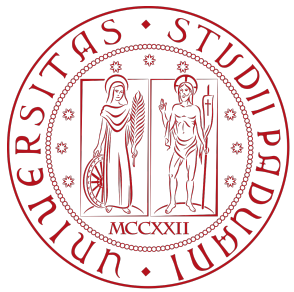

Tying in Digital Markets

Widespread practice: dominant digital platforms frequently integrate specialized services with their core, dominant service.

- **Google Comparison Shopping Service:** created in Dec. 2002, integrated in Google search in 2007;
- **Microsoft Teams:** bundled with Office 365 suite, making it a more convenient choice over competitors like Slack or Zoom.

Integration

Provides immediate benefits to users as they can more easily access the service (lower search/inconvenience costs).

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When service of the dominant platform is in competition with independent services

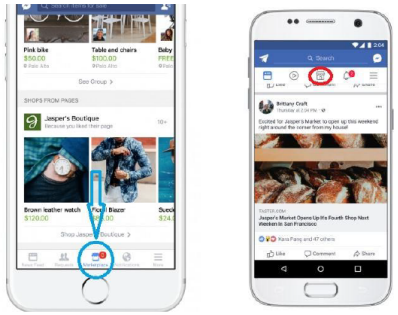
↪ Better integration: also referred to as "self-preferencing" or "platform envelopment"

- Google displays its CSS in a systematically prominent way on its SERP, making it more visible to users than rival CSSs

↪ Has attracted the attention AAs as it may represent an abuse of dominance

Motivating case: FB *Marketplace* antitrust case

- In 2016 Facebook launched *Marketplace*
  - ↪ Deeply **integrated** into the core FB app, granting it visibility advantages over standalone classifieds services
  - ↪ **Tying:** users on FB have automatic access to FB *Marketplace*.



- **Rivals:** competing Online Classified Ads Services (e.g. *Subito*, *Vinted*, *eBay*) operate their own independent platforms (aka *direct* channel)
  - ↪ they can also rely on FB to reach its vast user base.
- **Anti-competitive concerns:** FB *Marketplace* integration into the core FB app grants FB *Marketplace* visibility advantages over standalone OCAS
  - ↪ the conduct allegedly extends FB's dominance in social networks into the market for online classified ads.

What we do

Short-run *vs* long-run effects

- **Short-run:** these practices may reduce users' search, switching, or inconvenience costs.

  ↪ pro-competitive effects

- **Long-run:** these practices may leverage market power from a core service to an adjacent market. This can deprive rivals of scale and profits, ultimately harming competition, innovation, and long-run consumer welfare.

  ↪ anti-competitive effects

Our research

Analyse the trade-off between short and long run effects: which net effect?

What we do

We develop a formal model to analyze this trade-off. Our key contribution is to identify a novel channel for consumer harm:

1. Tying (better integration) alters firms' incentives to **invest in quality**. The dominant firm invests more, but the rival invests less.
2. This creates a **negative externality** on users who access the rival platform through a **direct channel** (e.g., a dedicated app).
   - ↪ These users are harmed by the rival's lower quality but receive none of the convenience benefits of the tie.
3. Under certain conditions (e.g., direct channel important enough), this adverse effect **outweighs** the pro-competitive effect and determines a reduction in overall consumer surplus.
4. Tying might also lead to **entry deterrence** (**or exit**) of the rival platform.

Literature on Anti-competitive Tying

Three main streams of literature (Fumagalli, Motta & Calcagno, 2018)

1. **Imperfect rent extraction:**
   - A dominant firm ties to extract profits from a rival's complementary good when direct extraction is imperfect (Carlton & Waldman (2012), Choi & Jeon (2021)).
     - ↪ Our model shares this feature: tying is most profitable when the payment to the dominant platform is low.

2. **Commitment to aggressive competition:**
   - Tying serves as a credible commitment to compete fiercely, deterring rival entry (Whinston, 1990).
   - Can also commit to higher R&D, reducing rivals' innovation incentives (Choi & Stefanadis, 2004).

3. **Protect a monopoly:**
   - Tying is used to protect a monopoly by reducing the likelihood of long-run entry in complementary markets (Carlton & Waldman, 1998; Choi & Stefanadis, 2001).

Relation to the literature on Self-Preferencing

- The practice we model (better integration) can be seen as "self-preferencing" or "platform envelopment".
- This connects our work to a vast recent literature on how hybrid platforms may favor their own products and services. (De Corniere & Taylor (2019); Motta (2023), Padilla, Perkins & Piccolo (2022); Farronato, Fradkin & MacKay (2023); Waldfogel (2024), Chen & Tsai (2024))

The Model: Market Structure

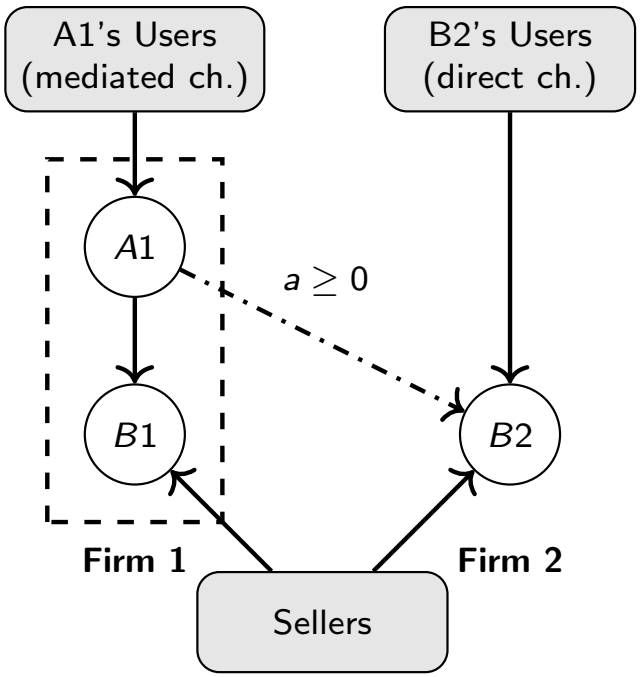


Figure: Market Configuration

- Two firms, **1** & **2**, and two markets, **A** & **B**.
- Market **A** (Primary): Firm 1 is a monopolist with platform $A1$ (e.g., Search Engine or a Social Network).
- Market **B** (Specialized): Firm 1 and Firm 2 compete with their specialized platforms ($B1$ and $B2$) (e.g., CSS, marketplaces).

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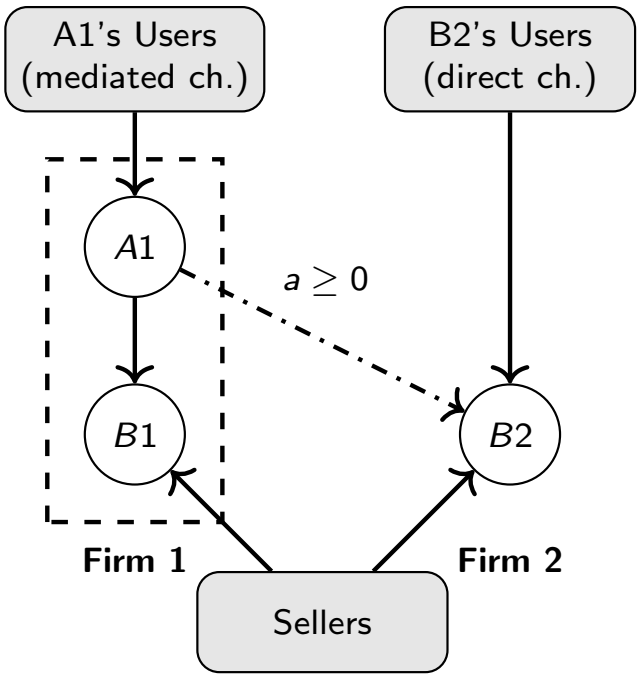

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Two access channels:

- **Mediated** channel: users on $A1$ can access both $B1$ and (if present) $B2$.
  - to appear Firm 2 pays an access fee $a \geq 0$ (exogenous).
- **Direct** channel: a separate group of users can access $B2$ directly (e.g., via app).

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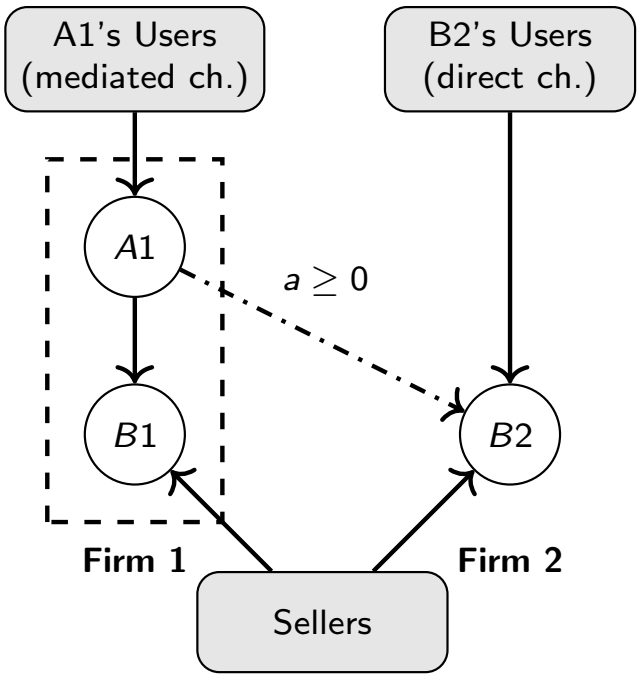

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Key Parameters:

- Firms' quality investments: x_1, x_2.
- Inconvenience costs on $A1$: σ_1 and σ_2.

The Model: Inconvenience costs and Tying

Inconvenience costs (σ_J)

- Users on the primary platform (A1) incur an inconvenience cost, σ_J, when accessing a specialized service, BJ, $J = 1, 2$.
  - ↪ i.e. when transiting from, say, $A1$ to $B2$: extra clicks, different interface, and so on...

Tying

We model tying as a **reduction** in the inconvenience cost for the dominant firm's own service, σ_1.

- ↪ This can be achieved through better integration, prominent placement, or default settings that make $B1$ easier to access for $A1$'s users.
- ↪ This provides a direct, short-run benefit to $A1$'s users who choose $B1$.

The Model: demands on the direct/mediated channels

We build a reduced-form model based on a set of standard assumptions.

Assumption 1: Demand on the direct channel, $q_{2D}(x_2)$

$q_2(x_2)$ increases and is concave with respect to Firm 2's quality investment, x_2.

Assumptions 2-4: Demand on the mediated channel, $q_{JM}(x_J, x_{-J}; \sigma_J, \sigma_{-J})$

- $q_{JM}(\cdot)$:
  - *i)* increases with own quality (x_J) and decreases with rival's quality (x_{-J}),
  - *ii)* decreases with own inconvenience cost (σ_J) and increases with rival's (σ_{-J}).
- **(Own effects dominate)** The absolute impact of a firm's own variables (x_J, σ_J) on its demand is stronger than the cross-effect.
- **(Separability & Concavity)** The marginal impact of investment on demand is independent of inconvenience costs; demands are concave.

The Model: Timing

1. Tying decision: Firm 1 decides whether to tie (i.e., reduce σ_1).
2. Investment stage: 1 and 2 simultaneously choose quality investments x_1, x_2.
3. Access decision: Firm 2 decides whether to be present on platform $A1$.
4. Pricing stage: platforms $B1$ and $B2$ set fees (r_1, r_2) for sellers (no users fees). Sellers observe and decide which platform to patronize.
5. Consumption: consumers make choices and demands are realized.

Note. We extent the model also at the case of **Demotion**:

$\hookrightarrow$ in stage 1, Firm 1 decides whether to increases σ_2.

Pricing stage

- In the last stage demands are realized; anticipating, $B1$ and $B2$ set per-transaction fees, r_1 and r_2:
  - ↪ Sellers wtp for platforms services is increasing in the number of customers; we assume: $\rho q_{1M}(\cdot)$ and $\rho[q_{2M}(\cdot) + q_{2D}(\cdot)]$, $\rho > 0$: network effect from buyers to sellers
  - ↪ In equilibrium
    - ★ platforms extract full surplus: $r_1 = \rho q_{1M}(\cdot)$ and $r_2 = \rho[q_{2M}(\cdot) + q_{2D}(\cdot)]$
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- Assuming that each seller transact with each buyer on a platform, $\rho(q_{1M}(\cdot))^2$ and $\rho[q_{2M}(\cdot) + q_{2D}(\cdot)]^2$ are the platform revenues
- Hence, conditional on $B2$ being on platform $A1$, profit functions are
  - $\Pi_1 = \underbrace{\rho(q_{1M}(x_1, x_2, \sigma_1, \sigma_2))^2}_{\text{revenues from sellers}} + \underbrace{a q_{2M}(x_1, x_2, \sigma_1, \sigma_2)}_{\text{access revenues}} - \underbrace{C(x_1)}_{\text{inv. cost}}$
  - $\Pi_2 = \underbrace{\rho(q_{2D}(x_2, \sigma_2) + q_{2M}(x_1, x_2, \sigma_1, \sigma_2))^2}_{\text{revenues from sellers}} - \underbrace{a q_{2M}(x_1, x_2, \sigma_1, \sigma_2)}_{\text{access cost}} - \underbrace{C(x_2)}_{\text{inv. cost}}$

Investment stage

- In stage 3 firms choose x_1 and x_2:

$$\frac{\partial \Pi_1(\cdot)}{\partial x_1} = a\,\frac{\partial q_{2M}(\cdot)}{\partial x_1} + 2\rho\; q_{1M}(\cdot)\frac{\partial q_{1M}(\cdot)}{\partial x_1} - \frac{\partial C(x_1)}{\partial x_1} = 0$$

$$\frac{\partial \Pi_2(\cdot)}{\partial x_2} = 2\rho\;\left[q_{2D}(\cdot) + q_{2M}(\cdot)\right]\left[\frac{\partial q_{2D}(\cdot)}{\partial x_2} + \frac{\partial q_{2M}(\cdot)}{\partial x_2}\right] - a\frac{\partial q_{2M}(\cdot)}{\partial x_2} - \frac{\partial C(x_2)}{\partial x_2} = 0$$

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Lemma 1

A sufficient condition for an equilibrium $(x_1^\star, x_2^\star)$ to exist is that

$$a \leq \rho\left[\min\{2q_{2D}(0) + q_{2M}(0, x_1), 2q_{JM}(0, x_{-J})\}\right], \qquad \forall\; x_J \geq 0,\; J = 1, 2.$$

That is a should not be too high:

1. as otherwise $B2$ may have no incentive to invest or to be present at all on $A1$;
2. as high revenues from hosting $B2$ may reduce Firm 1 incentive to invest in its own product.

Tying and Investments

If $\sigma_1 \downarrow$, $B1$ services in the mediated channel are more attractive and:

- **Firm 1:**
  - Demand for $B1$ increases.
  - This raises the marginal return on its quality investment.
  - Firm 1 has an incentive to **invest more**.
    - $\hookrightarrow$ $x_1(x_2)$ shifts outwards.

- **Firm 2:**
  - Demand for $B2$ on the mediated channel decreases.
  - This lowers the marginal return on Firm 2 quality investment (x_2).
  - Firm 2 has incentive to **invest less**.
    - $\hookrightarrow$ $x_2(x_1)$ shifts inward.
    - $\hookrightarrow$ Tying on the mediated channel has a negative effect on consumers on the direct channel as well

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Proposition 1

Tying leads to an **increase** in the equilibrium investment by Firm 1, x_1^*, and a **decrease** in the equilibrium investment by Firm 2, x_2^*.

Tying: Effect on Quantities

Tying has a direct effect on quantities

↪ on top of this is the indirect effect, which is transmitted through the effect on investments.

Proposition 2

- **Firm 1's quantity unambiguously increases**.
  - This is due to the direct effect of lower σ_1 and the indirect effects of its own higher investment (x_1^*) and its rival's lower investment (x_2^*).
- **Firm 2's quantity unambiguously decreases**.
  - This reduction occurs in **both** the mediated channel (q_{2M}) and, critically, the direct channel (q_{2D}).
    - ↪ The harm from reduced investment spills over to users outside the dominant platform's ecosystem.
    - ↪ This is a **negative externality** on users on the direct channel.

Tying: Effect on Firms Profits

- **Firm 2**: The combination of lower demand and reduced investment incentives directly impacts its profits.

Lemma 2: Rival's Profit

Tying leads to an unambiguous **decrease** in Firm 2's profit.

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Lemma 2: Rival's Profit

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- **Firm 1**: faces a Trade-Off
  - \+ Tying increases demand for Firm 1's own specialized service, $B1$
  - – Tying reduces demand for the rival service ($B2$): if Firm 2 pays an access fee ($a > 0$), this reduces Firm 1 revenue.

Proposition 4: Profitability of Tying

- If a is small, tying is **always profitable**. The gain in own-revenue dominates the negligible loss from access fees.
- If a is large, tying may **not be profitable**. Firm 1 is better off by collecting rents from Firm 2.

↪ **imperfect rent extraction**: tying is a tool to capture surplus that cannot be extracted through access fees alone.

An Illustrative Example: Hotelling Model

To evaluate consumer surplus and welfare, we use a specific microfoundation:

- Consumers on market B are uniformly distributed with unit density on the real line.
- Mediated channel (users on platform $A1$)
  - users access market B either through $B1$ (located at $l_1 = 0$) or $B2$ (located at $l_2 = 1$)
  - their utility is $U_{JM}(\theta) = 1 + x_J - \sigma_J - t \mid l_J - \theta \mid + \omega N_J$
    - ★ N_J: sellers on platform BJ, ω: network effect from sellers to buyers
- Direct channel:
  - their utility is $U_{2D}(\theta) = 1 + x_2 - t \mid l_2 - \theta \mid + \omega N_2$
  - the relative size of the direct channel is $\alpha \in [0, 1]$
- Mass 1 of homogeneous sellers:
  - they join BJ if $\pi_J^s \geq 0 \Rightarrow$ if $r_J \leq \rho Q_J$, where $\rho > 0$ is the network effect from buyers to sellers.
  - in equilibrium BJ sets r_J so that all sellers join and multi-home: $N_J = 1$.

Illustrative Example: CS and W ($a = 0.1$, $\omega = 0.2$, $\rho = 0.4$, $\sigma_J = 0.3$)

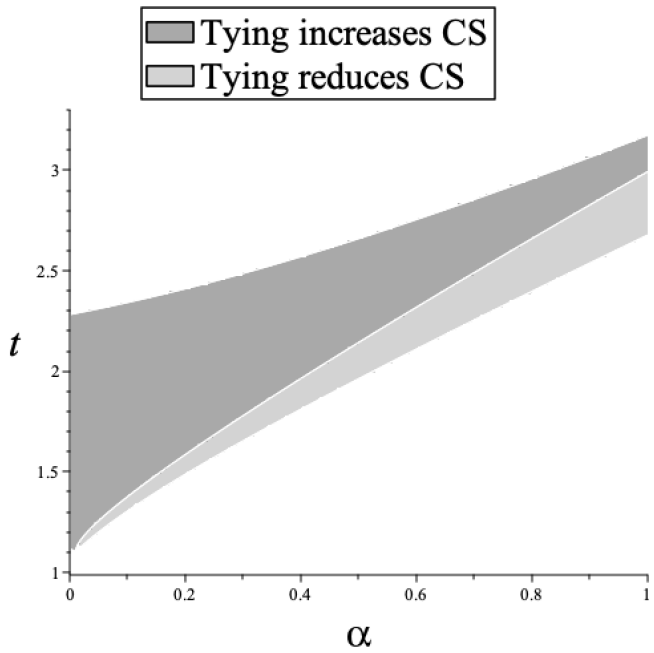

Figure: Effect on CS

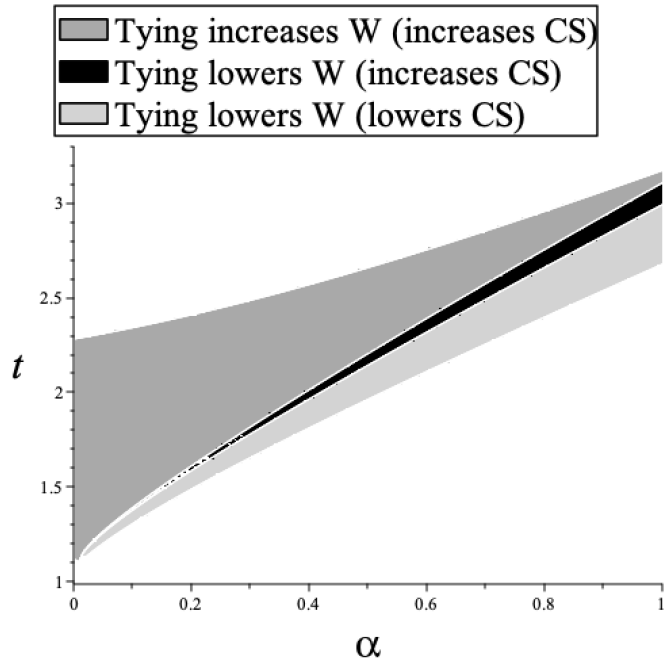

Figure: Effect on W

- Tying **decreases** CS and W when the direct channel is large (high α) and competition is intense (low t).
  - The negative externality on a large direct-user base can easily outweigh the convenience benefits for mediated-channel users.
  - If competition is strong, tying hurts $B2$ more; this induces it to decrease its investment even further exacerbating the negative effect of tying.

Extension: Demotion of Rivals

We consider an alternative strategy: **Demotion**

↪ Instead of reducing its own inconvenience cost (σ_1), the dominant firm actively **increases the inconvenience cost for its rival** (raises σ_2).

- Example: Google demoting rival CSS links on its SERP.

Effects of Demotion

- Like tying, demotion leads to **higher investment by Firm 1** and **lower investment by Firm 2**.
- It unambiguously **reduces the quantity sold by the rival (Firm 2)** in both the direct and mediated channels.
- It is profitable for the dominant firm when a is low.

Extension: Tying vs. Demotion

Which strategy is more harmful?

Tying (Reduces σ_1)

- Provides a **direct benefit** to users choosing $B1$ (lower inconvenience cost).
- Indirect harm to $B2$ users via lower investment.
- Welfare effect is **ambiguous**.

Demotion (Increases σ_2)

- Imposes a **direct harm** on users who would choose $B2$ (higher cost).
- Indirect harm to $B2$ users via lower investment.
- Welfare effect is unambiguously **negative**.

Extension: Entry Deterrence

Tying can can also lead to **foreclosure**

1. Assume Firm 2 must pay a fixed cost $\kappa > 0$ to enter the market.
2. We know from Lemma 2 that tying reduces Firm 2's expected profits, Π_2^*.
3. If tying reduces profits sufficiently such that $\Pi_2^*(\text{with tie}) < \kappa$, Firm 2 will not enter.

Incentive to foreclose: Firm 1 again faces a trade-off:

- $\uparrow$ Foreclosure grants Firm 1 a monopoly position in Market B.
- $\downarrow$ Firm 1 forgoes any access revenue it would have earned from Firm 2.

In our linear model

Foreclosure is a profitable strategy for Firm 1 when the when competition is intense (low t) and the direct channel is not too large (low α).

Conclusion and Policy Implications

1. Platform tying creates a trade-off: short-run convenience benefit for some users *vs* long-run harm from distorted investment incentives.

2. The key mechanism for harm is a **negative externality on a direct channel**. Tying reduces the rival's quality investment, harming users who receive none of the tying's benefits.

3. This harm is the most severe when the rival's **direct channel is large** and when **competition is intense**.

4. Policy Implications
   - Antitrust analysis of tying should go beyond static price effects to consider **dynamic impacts on quality and innovation**.
   - Regulators should recognize the importance of **independent, direct-to-consumer channels** as a crucial source of competitive discipline that can be harmed by on-platform conduct.
   - A clear distinction should be made between ambiguous practices like tying and more clearly harmful practices like **demotion**.

5. Remedies (work in progress)

Thank You

Comments and questions are welcome.