REGULATING THE TECH GIANTS: COMPETITION POLICY AT A CROSSROAD

14.271, October 17, 2022

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I. INTRODUCTION: COOPETITION ECONOMICS

- In the good old days
  - Regulation of utilities (“network industries”)
  - Competition policy: rest
  - Industrial policy: source of shame for the family.
- Technology (e.g. platforms) + many heretofore neglected topics challenge our research.
  - Blurring of lines between regulation and antitrust. Platforms: resemble public utilities, with a vengeance (high investment costs and/or network externalities; zero MC).
  - Comeback of industrial policy.
- Many of (certainly not all) the challenges are related to agreements among firms that may otherwise compete.

Too much cooperation?

Cooperating to procure a public "good":

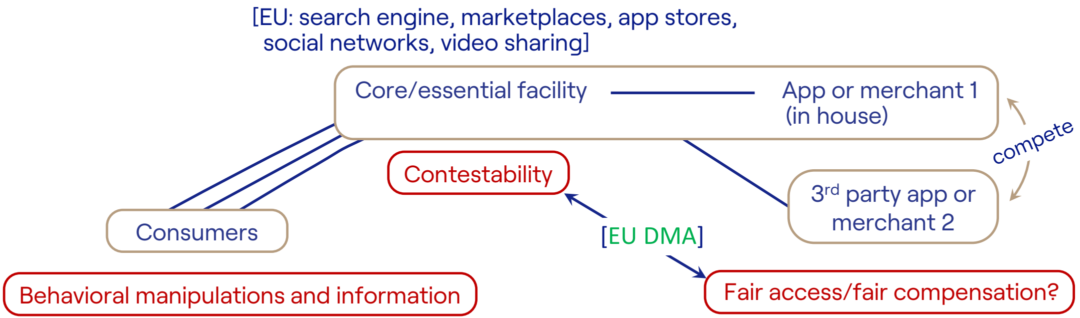
(1) *IP* (patent pools, cross-licensing)
(2) *R&D:* directly (RJVs) or indirectly (industrial policy)
(3) *Standard setting*
(4) *Data pools*
(5) *Collective negotiations* (wallet provider controls NFC)
(6) *Common ownership*
(7) *Algorithmic collusion*

Potentially legitimate practices (except last one), but may violate Section 1/Article 101. We need

- guiding principles
- if possible, information-light rules for screening in efficiency-enhancing and out anti-competitive practices.

Too little cooperation?

Natural monopoly (core/essential facility/bottleneck/upstream infrastructure) interacting with competitive segment (apps/complementary services)



[selection of recommendations: EU P2B; behavioral EU AI Act; content curation: EU DSA]

Chicago School: "Rich ecosystem allows platform to raise price of core service".

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What's wrong with Chicago School argument?

Core market

(1) Cannot raise price on core services if regulated. May not want to raise price if ZLB in core market.
(2) Contestability of core segment: want to erect barriers to entry in core market.
    a) Apps barriers to entry
    b) Preemptive mergers or exclusivity. Complementor may become a competitor.

Competitive segment

(3) *ZLB* in apps market implies supranormal profits for winner.

Limits to regulation: digital platforms vs. utilities

Platforms resemble traditional utilities, with a vengeance (MC most often 0) ⇒ regulate them as public utilities?

(1) *Asymmetric information*: worse for digital regulation

(a) Old-fashioned regulation not really an option for two reasons:

- *Global firms:* public utility regulation has been domestic ⇒ good data on firm's overall activity; and no free riding among jurisdictions to provide platforms with profits roughly in line with investment (no supranormal profit).
- *Evolving industrial landscape*: firms not monitored along their lifecycle ⇒ fair rate of return? What was the ex-ante probability of "success"? A bit like drugs in this respect.

(b) Rapidly changing products ⇒ cat-and-mouse game.

(2) *Lack of commitment*: worse for utility regulation

- regulator's opportunism
- firm's opportunism (SBC, holdup)

(3) *Capture*: worse for digital

- some dominant platforms have become media groups (see Digital Dystopia paper).

Digital market act (to regulate dominant platforms)

DMA (EU March 2022)'s two concerns:

- *contestability*: can a more efficient entrant enter the core market?
- *equity*: do users (consumers, business) receive fair share of their contribution to the ecosystem? Do they have equal access to core services?

The American Innovation and Choice Act (passed in Judiciary Committee on January 20, 2022) emulates DMA. Violations of equity:

- Self-preferencing
- Use of non-public data obtained from 3rd party business users to offer platform's own products
- Restrictions on uninstalling preinstalled software applications
- Bundling (conditioning access or preferred status on purchase of other products).

DMA APPROACH

(a) *Designated platforms*

- 9 specified core platform services
- Mechanical: 45 m users (active?), 10K business users
- Can appeal

Gatekeeper need not be large, though: suffices to have unique customers...

(b) *Obligations*

- 21 obligations (8 self-enforcing, rest may be further specified by EU)
- Heavy emphasis on self-execution (harness users & trusted flaggers as whistleblowers; algorithms) and self-reporting to regulator

(c) *Enforcement*

- DG Comp/Connect? Private enforcement in national courts, although Commission can put in brief
- Up to 10% of worldwide turnover.

▸ DSA

Coopetition and fairness: the economics of open ecosystems

Platforms operate markets, but also compete in them

Many shades of openness/closedness; location in spectrum is key business decision!

Pure broker
(Airbnb rental online marketplace)

Coopetition
(Amazon marketplace/ Amazon Basics or Whole Foods)

Vertical integration/ closed ecosystem
(*Apple's Macintosh personal computer* (closed) lost its lead to Windows (open) in 1980s. Apple has become more open over time. *Mobile phones*: Android more open than Apple's iOS)

Closed systems' business objectives

- Good aim: Control consumer experience [quality control, seamless operations]
- Anti-competitive behavior.

DMA: wants open and fair ecosystems.

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Protecting contestability: DMA view

Beyond prohibition of tying between core services and other services:

- Multihoming: no exclusivity requirements (fictitious Uber/Lyft example)
  - Variant: business users can indicate other channels to their users (disintermediation- sometimes unavoidable- is facilitated)
  - Facilitation of switching (data portability: static & dynamic).
- Do not combine data from different services or obtained from 3rd parties (Google): data silos
- Interoperability (say, of social networks)
  - Clash with privacy (WhatsApp end-to-end encrypted)? DMA: APIs must guarantee same level of protection (open-source bridges for encrypted data?)
  - Governance for interoperability/APIs? SSO? Apple? Regulator?
- Ban on MFNs ⇒ encourage multihoming.

Contestability

Baumol-Panzar-Willig book 1982: "hit-and-run" entry (entrant can invest rapidly and undercut, taking market before incumbent can adjust its price) ⇒ (Ramsey version of) average-cost pricing. Efficient.

Dynamic version (Fudenberg-Tirole *JIE* 2000 model, with network benefit and lack of interoperability; OLG structure for consumers with inertia): welfare effects are more complex:

- Lack of interoperability makes entry more difficult, but also socially more costly: stranded consumers
- Benefit from contestability: (1) superior-technology entrants bring technological spillovers; (2) threat of entry forces low prices and innovation by incumbent.

▸ Contestability

What’s is the issue with contestability?

Efficient entrant

- may not be able to enter
- may be able to, yet not enter (buyout).

Challenges for economists

II. FAIRNESS

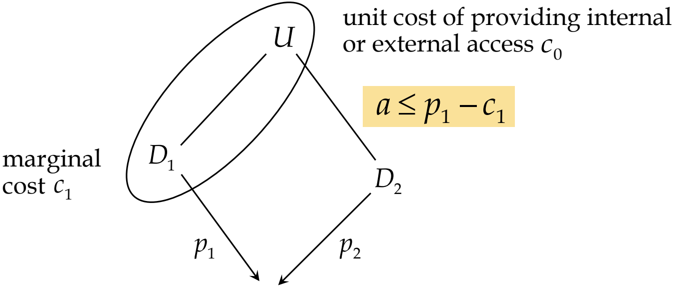
1. Current debate

- Terms and conditions of access to core service (access charge level + non-price conditions of access/absence of self-preferencing)
- Is reminiscent of debate on regulation of access in network industries. Considered an essential facility (local loop in telecoms; rails, signaling and stations for railroads; transmission grid for electricity;...) and the conditions of access of competitors in a competitive complementary segment (long-distance calls, train operators; power generators; ...) to this essential facility.

What did we learn (Laffont-Tirole *EER* 1994)? 5 conclusions:

1. *Need for the regulation of access:* vertically integrated incumbent has little incentive to provide access to competitors
2. *ECPR* (access price < lost margin in retail segment) is not a bad rule, but a) is information intensive and b) is partial (does not solve the level issue)

Let U be an upstream monopolist (⇔ core, platform) and D_1 and D_2 two potentially competitive services (⇔ apps, merchants).



3. *An access markup ($a > c_0$) does not necessarily mean that competitors are disadvantaged*: opportunity cost of VI firms if 1-for-1 substitution $= c_0 + (a - c_0) = a$
4. *Marginal-cost pricing of access is not the right benchmark*:
   - No fixed-cost recovery for the essential infrastructure owner (there is a good reason why the infrastructure is essential!)
   - Incentivizes foreclosure ("self-preferencing") and requires heavy investment in regulatory capacity: VI firm cannot make money by selling access and therefore must make its money on the competitive segment!

5. *Useful to think of intermediary services as final ones*. Optimal access charge $a^* = MC$ of giving access + Ramsey markup to cover essential infrastructure owner's fixed cost.

   Can be implemented via a global price cap. Ramsey formula, say with multiple independent and competitive final segments (indexed by k, so $p^k = a^k + c_1^k$), a shadow cost of the budget constraint (or public funds as the case may be) λ, and demand elasticities η^k:

$$\frac{a^k - c_0^k}{a^k + c_1^k} = \frac{\lambda}{1+\lambda}\frac{1}{\eta^k}$$

Platform companies: can we just relabel "essential infrastructure owner" as "platform"?

2. 2sms

For one thing, in the case of platforms, no regulation of overall RoR!

3 possible issues with access charges:

1. Under a single, dominant platform, is a too high?
2. With multiple platforms, is a too high? Who is responsible for enabling the financial viability of sellers?
3. Non-price access decisions: if a is too low, does VI firm have incentive to foreclose?

   [Already in the debate in the 1990s]

Remark: Antitrust not at ease with setting access price (NZ telecoms in 1990s).

What's different relative to the access debate in regulation, besides transaction costs?

Chicago school applied to 2sms: "rich seller ecosystem allows platform to raise price to consumer $\Rightarrow$ limitation of access must be efficiency enhancing".

Problems with Chicago argument:

1. May not be able to, or may not want to raise the price to the consumer: regulated price in old literature, ZLB in 2sms one.
2. Competing sellers may enjoy undissipated rents: advertising, data, repeat sales not competed away because of ZLB
3. [Contestability of core market: apps barrier to entry story]

Access charge level: Little guidance so far. Most interventions are structural (MFN prohibition), but do not work well.

Current concerns about platform fees and access

High fees

- **App stores**: *Apple* App Store and *Google* Play: 30% standard commission on apps and in-app purchases of digital goods and services (menu actually: 15% under certain conditions). *Galaxy* Store: 30% standard commission on purchases through the app store, but it can be negotiated with Samsung. *Amazon* App Store: 30% standard commission on apps and in-app purchases (again lower rates available).
- Other platforms charge similar commissions to digital content providers: commissions on subscription revenues (e.g., Patreon, OnlyFans, Tumblr, Substack), and/or ad-revenues (YouTube, Twitch). Commissions on sales are also charged by games marketplaces (e.g., Steam, Epic, PlayStation, and Xbox).

- Enforcement through termination: in 2021, Apple removed Epic’s popular Fortnite game from the iPhone and iPad app store because it circumvented Apple’s 30% app-store fee by offering an external payment option (10%) for in-app purchases—a practice prohibited under Apple’s rules. Apple also faces antitrust investigations concerning the 30% rate (Spotify).
- Mobile platforms take a cut of up to 50% in China.

DMA surveillance of access conditions

- Surveillance of fees levied on sellers (app-stores/marketplaces, online travel agencies. . .)
- Surveillance of advertising fees: "The gatekeeper shall provide each advertiser a) the price and fees paid by that advertiser, including any deductions and surcharges, for each of the relevant online advertising services provided by the gatekeeper, (b) the remuneration received by the publisher, including any deductions and surcharges, subject to the publisher's consent; and (c) the metrics on which each of the prices, fees and remunerations are calculated." (Article 5 (9); same for publishers)

- FRAND requirements:

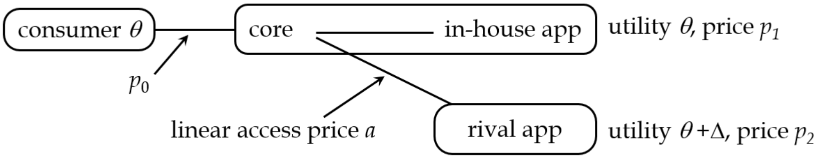
  “The gatekeeper shall provide to any third party undertaking providing online search engines, at their request, with access on fair, reasonable and non-discriminatory terms to ranking, query, click and view data in relation to free and paid search generated by end users on its online search engines.” Art. 6 (11).

  “The gatekeeper shall apply fair, reasonable, and non-discriminatory general conditions of access for business users to its software application stores, online search engines and online social networking services” Art. 6 (12).

3. Access pricing in the regulation of digital platforms

Model (with Michele Bisceglia)

- Single two-sided platform (baseline), gatekeeper for access to (a unit mass of) consumers



- App-providers (or sellers) have negative marginal costs: advertising revenues, merchant fees, data collection. Benefit $b > 0$ per consumer. $MC = 0$.

Examples of hybrid platforms: Spotify, YouTube, Apple TV, Netflix, Amazon, Zalando, Target, Walmart, Microsoft Azure marketplace, game platforms (Xbox, Nintendo, Playstations) also produce their own content or goods.

- Third-party sellers pay a unit access fee $a \geq 0$. At this stage, access fee can be set by platform or by a regulator.
- Hybrid market-place: platform operates market and competes in it. [Search engine operates information/recommendation market and is a player in recommended services.]
- ZLB: $p_0, p_1, p_2 \geq 0$.

$$\begin{cases} p_1 \geq 0: & \text{“app ZLB”} \\ p_0 \geq 0: & \text{“core ZLB”} \end{cases}$$

Why are ZLBs important?

They are realistic: lots of prices of core services (search, marketplaces…) are equal to 0. Many apps are free as well.

More important:

> In the absence of two ZLBs, the Chicago "rich ecosystem argument" would prevail.

The access charge is then neutral (has no allocative or redistributive consequences).

Recall the two reasons why a ZLB changes the platform's incentives:

1. App supranormal profit: The 3rd party app developer obtains supranormal profit for its (even slightly superior) app, as he does not feel the full competitive pressure from the in-house (or other) app, and receives more than the value it creates. The relevant ZLB here is $p_1 \geq 0$.
2. Impossibility to cash in on a rich ecosystem: The Chicago school argument states that the platform will be able to raise its core price if it offers a rich ecosystem. However, a binding ZLB on the core product price means that the latter is already too high, so the platform may not want to raise it to reflect a richer ecosystem. The relevant ZLB here is $p_0 \geq 0$.

These two ZLBs don't play out in the same circumstances. The former operates for low access fees, when the platform's opportunity cost in the app market is negative. The latter arises when the access charge, and therefore the app prices are high, making it necessary for the platform to stop charging for the core product in order to maintain the consumers on the platform.

Interesting case: *third-party app offers a superior service*: consumer's total WTP is $\theta + \Delta$ rather than θ (in-house). Good 0 and (choice between 1 and 2) are perfect complements.

- Consumers vary in their WTP: distribution $F(\theta)$, with $\frac{1-F(\theta)}{f(\theta)}$ decreasing.
- $\begin{cases} x = 1 & \text{if consumers buy 3rd party app.} \\ x = 0 & \text{if consumers buy in-house app.} \end{cases}$
- θ^* = consumer cutoff type.

Payoffs

$$\begin{cases} \text{Platform:} & \pi_1 = [1 - F(\theta^*)][p_0 + a + (1 - x)(p_1 + b - a)] \\ \text{3}^{\text{rd}} \text{ party app:} & \pi_2 = [1 - F(\theta^*)]x(p_2 + b - a) \end{cases}$$

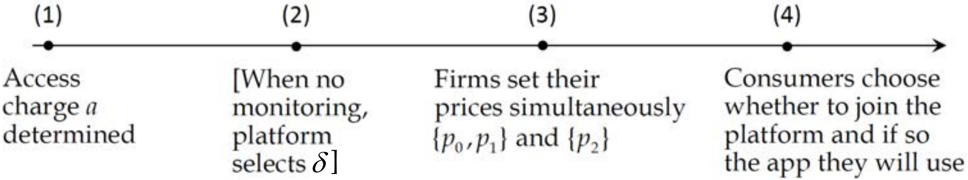
where $x = 1$ iff $p_1 \geq p_2 - \Delta$.

Non-price foreclosure

If unmonitored, the platform can freely reduce attractiveness of rival. Latter's comparative advantage becomes $\delta \leq \Delta$ (possibly negative). In contrast, $\delta = \Delta$ if regulatory prevention of foreclosure.

Traditionally: denial of (or limited) access, degraded quality, incompatibility. In digital industry, may also be rankings/de-listing, selective access to

f



- *ZLB*: Fixing a
  - Core ZLB binds if $p_0^*(a) = 0$
  - App ZLB binds if $p_1^*(a) = 0$.
- ECPR: $a \leq p_1 - (-b)$.
- Simplify model: *(almost) homogenous preferences*: Sequence of distributions converging to homogenous WTP θ (taking the limit allows equilibrium selection): $F_\tau(\theta)$ with density $f_\tau(\theta)$, where $\tau \to +\infty$.

  Why? Nash demand games have a continuum of equilibria. To select, do as Nash (1953): introduce a bit of uncertainty.

ABSENCE OF FORECLOSURE

Either effective regulation or platform does not benefit from foreclosure.

$$\theta^* = p_0 + \min\{p_2 - \Delta, p_1\}$$

For given a and p_0, both apps have marginal opportunity cost $a - b \Rightarrow$ Bertrand competition gives

$$p_1^* = \begin{cases} a - b & \text{if } a \geq b \quad \text{and then } \; p_2^* \leq p_1^* + \Delta \\ 0 & \text{if } b \geq a \quad \text{and again } \; p_2^* \leq p_1^* + \Delta \end{cases}$$

$$\Rightarrow \quad \theta^* = p_0 + p_1.$$

(1) *Willingness to engage in non-price foreclosure?*

Bertrand outcome: in-house app

- out of the market de facto,
- but exerts competitive pressure on 3^{rd} party app

$$p_1 = \min\{\underbrace{a - b}_{\text{opportunity cost}}, 0\}$$

Question: does in-house app exert its full competitive pressure?

- *No incentive to foreclose.* If so: 3^{rd} party app enjoys "normal" rent Δ, no reason to foreclose. Happens when p_1 unconstrained by ZLB:

$$a \geq b$$

- *Incentive to foreclose.* If not: 3^{rd} party app enjoys "supranormal" rent (above Δ). Platform wants to foreclose. Happens if $p_1 = 0$ or $a < b$: app ZLB binds. Then $\pi_2 = \Delta - a + b > \Delta$.

Note that ECPR does not hold with equality when $a < b$ (access charge is too low):

$$a < p_1 - (-b).$$

(2) *Competitive neutrality region*

Suppose that $a \geq b$ (no foreclosure).

Then

$$\begin{cases} p_1 = a - b \geq 0 \\ p_2 = (a - b) + \Delta \end{cases} \Rightarrow \pi_2 = \Delta$$

Obtains as long as

$$p_0 \geq 0 \text{ where } p_0 + p_2 = \theta + \Delta \Leftrightarrow p_0 = \theta + b - a \text{ or } a \leq \theta + b$$

- The access charge a is *neutral* in this region: Prices adjust and profits remain constant when a varies.
- ECPR holds with equality: $a = p_1 - (-b)$
- Chicago-school-like:
  - efficient outcome (no foreclosure)
  - 3^{rd} party app "gets its just desert", i.e. its value creation Δ.

Squeeze region: $a \geq \theta + b$

(i) In that region, platform makes money solely from giving access as $p_0 = 0$: core ZLB binds. This implies that *pivotality switches to 3rd party app*, which is forced to lower its price to keep consumers on the platform:
$p_2 = \theta + \Delta \quad \Rightarrow \quad \pi_2 = p_2 + b - a = \Delta - [a - (\theta + b)] < \Delta.$

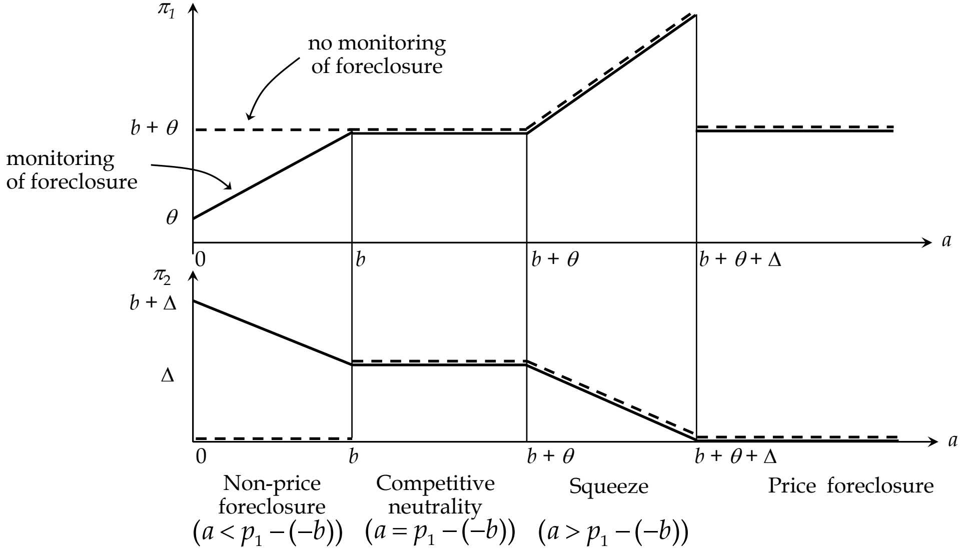
$$\textit{ECPR violated}: a > p_1 - (-b)$$

(ii) This region ends when the access charge is so high that the 3rd party app exists the market ("*price foreclosure*").

$$\pi_2 < 0 \iff a > \theta + b + \Delta.$$

Bad for both 3rd party app and for the platform, which would then want to lower the access charge.

Summarizing



0 — b — $b + \theta$ — $b + \theta + \Delta$ — access price a

Non-price foreclosure (access provider does not have sufficient skin in the game)	• **Competitive neutrality** (no foreclosure)	• **Squeeze** (π_2 falls from Δ to 0)	**Price foreclosure**
• a below ECPR level • Supranormal app profit $\pi_2 = \Delta + (b - a)$	• a satisfies ECPR with equality • Fair reward ($\pi_2 = \Delta$)	• a above ECPR level • Infranormal profit $\pi_2 \in [0, \Delta)$	
	Efficient allocation		
Self preferencing if no monitoring	a neutral	a squeezes third-party app	

Optimal access charge regulation

Ex-post efficiency requires $a \in [b, b + \theta + \Delta]$

Introduce additional desiderata to pin down optimal access charge:

a) App investment incentives(invest iff $c \leq \pi_2$)

To have proper incentives to invest (develop the app iff development cost is smaller than the contribution to the ecosystem), the 3rd party app developer must receive its fair contribution Δ to the ecosystem

- $\Rightarrow$ no squeeze
- $\Rightarrow$ access charge must belong to more circumscribed range:

$$a \in [b, b + \theta]$$

b) Avoidance of double marginalization (elastic consumer demand: θ heterogeneous)

- If $p_0 > 0$ (core ZLB does not bind), the higher the access charge, the larger the negative externality of the 3rd party app developer's pricing decision onto the platform owner. Because free access is not an option when non-price foreclosure is feasible, $a = b$ is optimal in the above range.
- If $p_0 = 0$ (core ZLB binds): no externality/double marginalization, welfare-neutrality over range (for $a \in \left[b, b + \frac{[1-F(0)]}{f(0)} + \Delta\right]$).
  Either way $a = b$ best addresses the double marginalization issue.

Efficient choice of app

Heterogeneous preferences about advantage of 3rd party app over in-house app

- the lower the price difference between the two apps, the more consumers will use the 3rd party app, and so the more efficient the allocation

- $p_2^* - p_1^*$ is increasing with the access charge
- $a < b$ is not an option when non-price foreclosure is feasible
- Hence $a = b$ is optimal.

Combining all the desiderata requires that the access charge be at at the Pigouvian level: $\hat{a} = b$.

Pigouvian rule: the 3rd party app pays the value of the "stolen" benefit b.

Other benefits of the Pigouvian rule

d) Competition among multiple high-quality 3$^{\text{rd}}$ party sellers: Optimal access charge is still b : $\hat{a} = b$

e) Platform competition: multihoming apps and single-homing consumers ⇒ platforms are gatekeepers for their unique consumers ⇒ almost same analysis as for a monopoly platform (but core ZLB binds). Again $\hat{a} = b$.

Implementation

$\hat{a} = b$. Can ancillary benefits be measured?

- Merchant and advertising fees maybe (requires information sharing among regulators, etc)
- Data or value of consumer lock-in even harder

Cannot elicit from platform even if know the distribution of app ancillary benefits

Can elicit from app (sets an access charge, platform can refuse and foreclose $\Rightarrow$ app developer selects $a = b$): information light, but must be the case that platform cannot use repeated play to de facto demand higher access charges.

BONUS SLIDES

Other considerations

(1) Ad valorem fees

Like for excise taxes, platform fees are often approximately linear in the value of the transaction. Two-part tariffs:

TABLE 1 Platform Fee Schedules

Amazon		Visa	
DVD	15% + \$1.35	Gas station	0.80% + \$0.15
Book	15% + \$1.35	Retail store	0.80% + \$0.15
Video game	15% + \$1.35	Restaurant	1.19% + \$0.10
Game console	8% + \$1.35	Small ticket	1.50% + \$0.04

[Table from Wang-Wright (*RJE* 2017)]

(a) *Ad valorem fee in paper with Michele Bisceglia*

Ad valorem fee τp_2, where $\tau \in [0,1]$

Analysis generalizes. Consider an equilibrium $\{p_1^*, p_2^*\}$ in app market.

- Let $a \equiv \tau p_2^*$, and assume no non-price foreclosure.

  Either

  - $p_1^* = 0$ and $p_2^* = \Delta$ if $a \leq b \quad \Rightarrow \tau\Delta \leq b$

  or

  - $p_1^* = a - b$ and $p_2^* = p_1^* + \Delta$ if $a \geq b \quad \Rightarrow \tau\Delta \geq b$
    $(\Rightarrow p_1^* = (\tau\Delta - b)/(1 - \tau))$

- Wants to foreclose iff $\tau\Delta < b$.

- Analysis of pivotality generalizes.

However model sets aside

- double marginalization (here 3rd party app market power is not distortive)
- price discrimination (platform knows value of each app, if multiple apps)

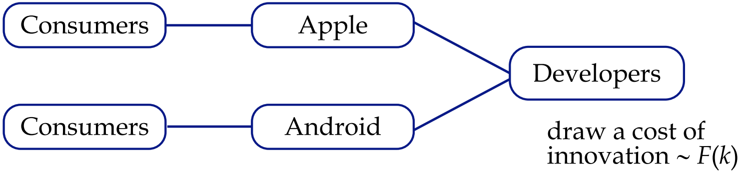
issues.

These issues are studied in other papers.

(b) *Two forms of double marginalizations*

- *Across*

  Assum



Important feature: k is across platforms (not cost of porting to a given platform) ⇒ Choice of access policy creates a free-rider problem (who is in charge of garanteeing developers a sufficient overall income?)

- *Standard vertical double marginalization.* In their works, as in some other works, ad valorem fees eliminate a second marginalization: Developer chooses price p so as to maximize

$$\begin{cases} \text{wholesale:} & (p-a)D(p) \\ \text{ad valorem:} & (1-\tau)pD(p) \quad \Rightarrow \text{ no double marginalization} \end{cases}$$

Less clear if investment in quality (tax does not increase with quality when a).

(c) *Price*

- Each app is perfectly competitive (no double marginalization); so if an app's unit cost is c, price is $p = MC = c +$ access fee.
- Apps are similar, except for the scale σ of their market
  - cost = σc
  - valuation = $\sigma\theta$, where $\theta \sim F(\cdot)$ with density $f(\cdot)$.

Let p_σ denote the price for app with market size σ. Demand is

$$Q_\sigma(p_\sigma) = Q\left(\frac{p_\sigma}{\sigma}\right) = 1 - F\left(\frac{p_\sigma}{\sigma}\right)$$

[Stretch parameterization of Weyl-Tirole (*QJE* 2012).]

Key assumption: Access to platform is free ("$p_0 = 0$").

Imagine, first, that platform observes σ. Then chooses a_σ so as to induce a price $p_\sigma = a_\sigma + \sigma c$

$\max \pi_{\text{platform}} \Rightarrow$ letting $\hat{p} = p_\sigma / \sigma$,

$$\max (p_\sigma - \sigma c)\left[1 - F\left(\frac{p_\sigma}{\sigma}\right)\right] = \sigma(\hat{p} - c)[1 - F(\hat{p})]$$

$$\Rightarrow \quad \frac{\hat{p} - c}{\hat{p}} = \frac{1}{\eta} \quad = \frac{p_\sigma - \sigma c}{p_\sigma} \quad \text{and} \quad \eta \equiv -\frac{f(\hat{p})\hat{p}}{1 - F(\hat{p})}.$$

Given limited instruments (a or τ), what is the best one?

- Can be implemented through *ad valorem fee* $\hat{\tau}$: $\hat{p} = c/(1 - \hat{\tau})$

  Then Bertrand in the σ-app market implements

$$p_\sigma = \sigma c + \hat{\tau} p_\sigma \quad \Rightarrow \quad p_\sigma = \sigma \hat{p}.$$

- Cannot be implemented with a wholesale fee a.
- Affine fees are preferable if platform faces a fixed cost for handling trades.
- Same results with Ramsey regulation.

(2) Should the hybrid platform model be prohibited?

Multiple interesting recent papers on the topic: Anderson-Bedre-Defolie (2022), Etro (2022), Hagiu-Teh-Wright (*RJE*, forthc.), Zennyo (*JIE*, forthc.).

Also recent work by Wang and Wright on the level of prices set by platforms.

▸ Prohibition of hybrid platforms