



Technological advancement, algorithms and the challenges of competition law enforcement (against collusive conduct)

Prof. Ioannis Lianos

i.lianos@ucl.ac.uk

Cartels 1.0: the “plain-vanilla” cartel

- Adam Smith, Wealth of Nations, 1776: ‘People of the same trade seldom **meet together**, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or some contrivance to raise prices’
- OECD Recommendation of the Council concerning Effective Action Against Hard Core Cartels (25 March 1998)
 - a) "hard core cartel" is an anticompetitive agreement, anticompetitive concerted practice, or anticompetitive arrangement by competitors to fix prices, make rigged bids (collusive tenders), establish output restrictions or quotas, or share or divide markets by allocating customers, suppliers, territories, or lines of commerce;
 - b) the hard core cartel category does not include agreements, concerted practices, or arrangements that
 - (i) are reasonably related to the lawful realisation of cost-reducing or output-enhancing efficiencies,
 - (ii) are excluded directly or indirectly from the coverage of a Member country's own laws, or
 - (iii) are authorised in accordance with those laws. However, all exclusions and authorisations of what would otherwise be hard core cartels should be transparent and should be reviewed periodically to assess whether they are both necessary and no broader than necessary to achieve their overriding policy objectives.

Cartels 2.0.

- Uncover “reward-punishment schemes” among firms (Harrington, 2007)
 - Leniency programmes and the tip of the iceberg
 - Cartels and **facilitating practices**
 - **Information exchange** and cartels
 - mechanism for participants to signal price and output intentions to one another
 - EU takes a strict approach to information exchange
 - Invitation to collude & public announcements to investors (Section 5 FTC Act)

CARTELS: MAIN DECISION-PARAMETERS

Fixing price

Allocating Market Shares

Distributing Profits

Controlling Investment

Preventing Entry

Detecting cheaters

Punishing cheaters

Are Cartels unstable ?

How to make them more unstable ?

How to deter cartels ?

Algorithmic coordination

- Firms' pricing decisions are increasingly delegated to software programs that incorporate the latest developments of artificial intelligence
- Not the first time: Pricing algorithms have been used by airline companies for decades, recent expansion in other sectors (financial markets and the hotels and insurance industries)
- Algorithmic Pricing has become affordable even for small businesses, as off-the-shelf machine learning solutions and computing capability are now being supplied by tech giants such as Amazon, Google and Microsoft
- Rely on buyer's entire past purchasing history
- AP may lead to consumer poaching, or to the use of exclusivity or market-share discounts, both of which may have anti-competitive effects. – price discrimination issue
- Digital cartels as a new issue:
 - U.S. v. Topkins, 2015
 - CMA, Online Sales of Posters and Frames (2016)

Algorithmic coordination

From simple adaptive algorithms...

- ❑ Bruno Salcedo, *Pricing Algorithms and Tacit Collusion* (2015) found that when four conditions were met simultaneously, namely that firms set prices through algorithms that can respond to market conditions (1), these algorithms are fixed in the short run (2), can be decoded by the rival (3), and can be revised over time (4), then every long run equilibrium of the game led to monopolistic, or collusive, profits
- ❑ Zhou et al (2018): even **without explicit communication or coordination**, algorithms in a Cournot duopoly learned strategies that resulted in output levels similar to those seen in collusive agreements.
- ❑ Byrne & de Roos (2017): **empirical** data from **gasoline** market show that stations were able to converge on collusive outcomes
- ❑ Emilio Calvano et al., *Algorithmic Pricing: What Implications for Competition Policy?*, 55 REV. INDUS. ORG. 155 (2019): **three possibilities of algorithmic collusion**: (a) conventional collusion enabled by pre-programmed pricing algorithms that use strategies to facilitate collusion, (b) collusion through third party pricing, e.g. software companies providing competing firms with similar algorithms, and (c) algorithmic collusion facilitated solely through coordination by sophisticated pricing algorithms, without explicit communication from humans.

Algorithmic coordination

- **To self-learning algorithms...**

- ❑ Computer simulated experiments where pricing algorithms in controlled (synthetic) environments, were analysed in their ability to sustain collusive strategies, and their speed of convergence to above-competitive prices
 - ❑ Q-learning algorithms, where agents learn from interacting autonomously through trial and error with their environment
- ❑ Crandall et al. (2018); Leibo et al (2017): self-learning algorithms could solve the coordination problem through **trial- and-error** and with **no human intervention**
- ❑ Klein (2018): learning algorithms **gravitate toward conscious parallelism** in simple oligopolistic setting
- ❑ Calvano et al. (2019): the self-learning algorithms **identified** tacit collusion as an optimal strategy
- ❑ Ezrachi and Stucke (2016): Digital Eye: self-learning algorithms **independently learn** to maximize profits by observing competitors' actions through continuous data analysis

- **Incentives to Coordinate even in Non-Oligopolistic Markets!**

Algorithmic coordination

- **And Collusion by Large Language Models (LLMs)**
 - ❑ Emerging economic literature raises more important and distinct concerns regarding algorithmic collusion through Large Language Model (LLM) pricing agents, using simulations as an additional source of scientific evidence about algorithms
 - ❑ E.g. Sara Fish et al., Algorithmic Collusion by Large Language Models (2024)
 - ❑ Algorithms pre-trained on very large datasets but without explicit instructions, learn to play optimally by experience and have more “discretion” as to the possible interpretation of their prompts
 - ❑ The LLM becomes “a randomized, ever-evolving ‘black box’ whose intentions’ are opaque and largely uninterpretable, even to its users”
 - ❑ “(I)t is conceivable that LLM-based pricing algorithms might behave in a collusive manner despite a lack of any such intention by their users” even if the textual instructions they receive are “innocuous”
 - ❑ “*homo silicus*” collusion may look different!

Cartels 3.0.:Algorithmic collusion

- ❑ Can “intelligent” pricing algorithms learn to collude? Is AP collusion any different from collusion among humans?
- ❑ Concept of collusion in law as ‘meeting of minds’ – communications-based approach (the Posner-Turner debate)
 - Solutions?
 - Prohibition of algorithmic pricing
 - Regulate price algorithms *ex ante*
 - Regulate *ex post* with different antitrust standards – change the communications-based approach to ‘collusion’ (Harrington, 2017)

Cartels 3.0.: Competition law and algorithmic coordination

CL prohibits **explicit** collusion and **tacit** collusion only when no other plausible explanation available (see *Suiker Unie, Woodpulp II*)

It prohibits **collective dominance** (in theory!) (see *Airtours*) or mergers likely to have **coordinated effects**

It may prohibit **price signaling** behaviour that may facilitate algorithmic coordination

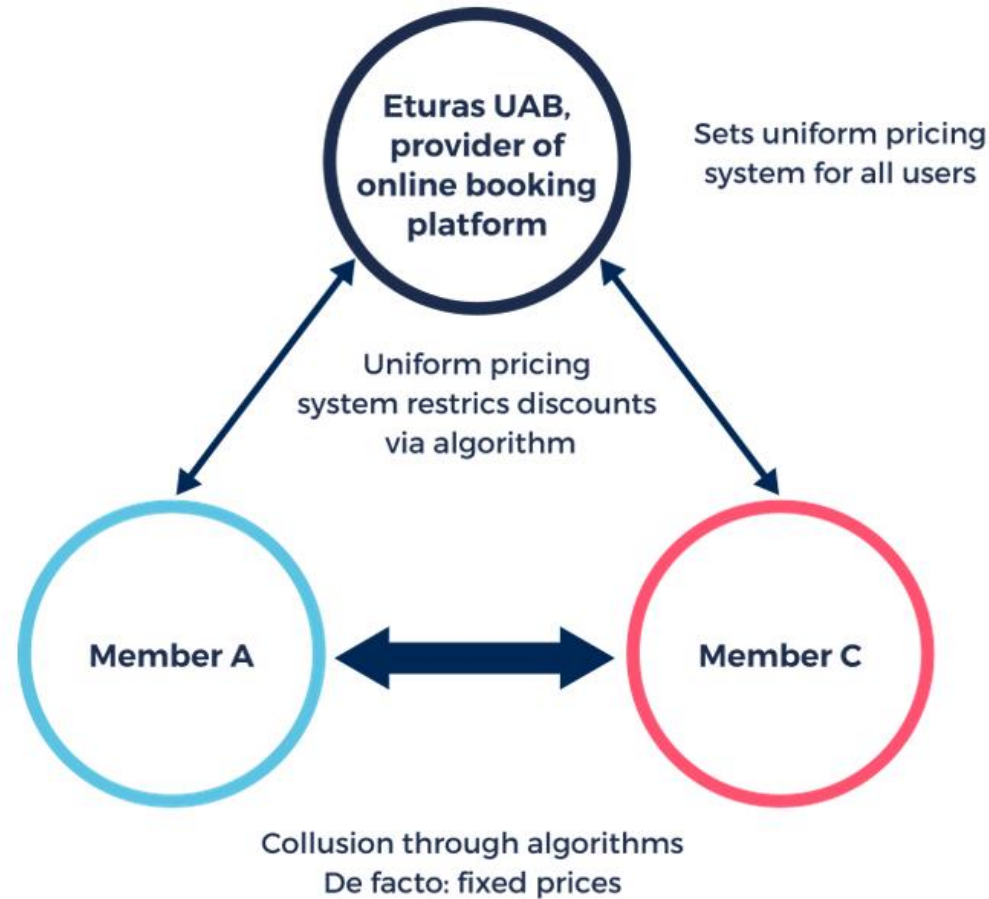
See, HCC Guidelines on the implementation of Article 1A (2023)

It may impose some **pre-commercialization auditing** of pricing algorithms (NCT) or **prohibit the use of some algorithms** (precautionary approach)

Computational antitrust and Surveillance/Screening technology

Eturas, Communications-based Approach and use of third-party services

Case C-74/14, "Eturas" UAB and Others v Lietuvos Respublikos konkurencijos taryba,
ECLI:EU:C:2016:42



Hub & spoke in the horizontal guidelines

➤ EU Horizontal Guidelines, paras 436-437

- “Certain indirect information exchanges are referred to as **hub-and-spoke agreements**. In such cases, a **common supplier or manufacturer** acts as a hub in order to relay information to different retailers but it may also be that a retailer facilitates coordination between multiple suppliers or manufacturers. An online platform can also act as hub in case it facilitates, coordinates or enforces anticompetitive practices among the users of its platform services. **Online platforms** may for example, enable information exchanges between platform users to secure certain margins or price levels. Platforms may also be used to impose **operational restrictions** on the system preventing platform users from offering lower prices or other advantages to final customers. Other **indirect information exchanges** may involve reliance between (potential) competitors on a **shared optimization algorithm** that would take business decisions based on commercially sensitive datafeeds from various competitors, or the implementation in the relevant automated tools, of aligned/coordinated features or mechanisms of optimisation. **Whilst using publically available data to feed algorithmic software is legal, the aggregation of sensitive information into a pricing tool offered by a single IT company to which various competitors have access could amount to horizontal collusion. A common agency, such as a trade association, may also facilitate exchanges between its members.**”
- “An undertaking that indirectly receives or transmits commercially sensitive information may be held liable for an infringement of Article 101(1). This may be the case on the condition that the undertaking that received or transmitted the information was **aware** of the anti-competitive objectives pursued by its competitors and the third party and intended to contribute to them by its own conduct. [...] . In addition, the condition would be met if the undertaking receiving or transmitting the information **could reasonably have foreseen** that the third party would share its commercial information with its competitors and if it was prepared to accept the risk which that entailed. On the other hand, the condition is not met when the third party has used an undertaking , without informing that undertaking, passed this on to its competitors.”

Cartels 3.0: Algorithmic collusion

- Complaint from DOJ and 8 States against RealPage Inc.
 - RealPage contracts with landlords who agree to share with RealPage nonpublic competitively sensitive information about their apartment rental rates and other lease terms to train and run RealPage's algorithmic pricing software
 - The software generates recommendations including on apartment rental pricing and other terms, for participating landlords based on their and their rivals' competitively sensitive information

PRESS RELEASE

Justice Department Sues RealPage for Algorithmic Pricing Scheme that Harms Millions of American Renters



Friday, August 23, 2024

For Immediate Release

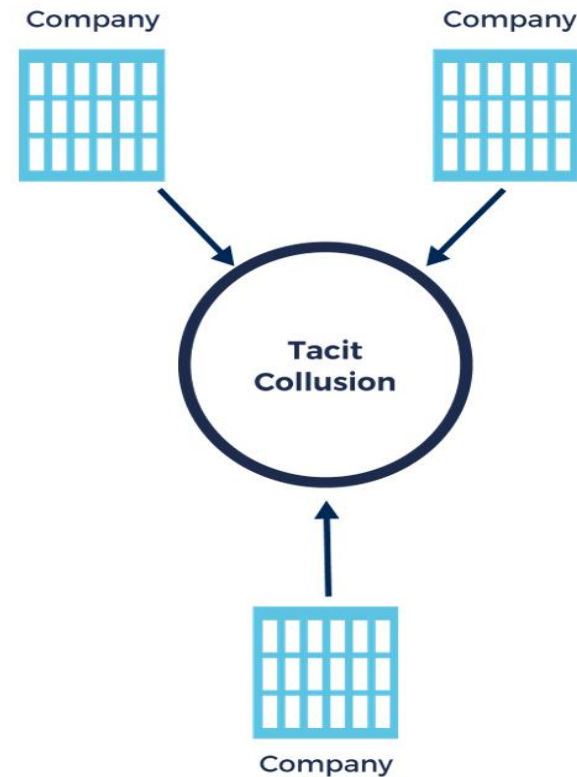
Modern cartel enforcement - cartel facilitators

- **Case C- 194/ 14 P, AC- Treuhand AG v Commission, ECLI:EU:C:2015:717**
- 39. In those circumstances, contrary to what is claimed by AC- Treuhand, even though those service contracts were formally concluded separately from the commitments entered into by the producers of heat stabilisers among themselves, and notwithstanding the fact that AC- Treuhand is a consultancy firm, **it cannot be concluded that the action taken by AC- Treuhand in that capacity constituted mere peripheral services that were unconnected with the obligations assumed by the producers and the ensuring restrictions of competition**
- **Case T- 180/ 15, ICAP v European Commission, ECLI:EU:T:2017:795**
- 120. In that regard, although it is apparent from the case- law [. . .] that it was open to the Commission to prove either (i) that **lcap was aware of the participation** of the other bank concerned in each of the four infringements at issue or (ii) that **lcap could reasonably have foreseen such participation**, that second possibility must be considered taking into account the context in which the exchanges between UBS, and then Citi, and lcap took place.
- 121. As the applicants essentially submit, the requests addressed by UBS, and then Citi, to lcap with the aim of manipulating the JPY LIBOR rates did not imply, by their very nature, the existence of prior concerted action with another bank. Such requests could be legitimately interpreted by lcap as being made by UBS, and then by Citi, for the purposes of manipulating those rates in pursuit of their interests alone. It must be held that that circumstance makes it harder for the Commission to prove that lcap should reasonably have inferred from the requests of UBS, and then of Citi, that those requests formed part of collusion with another bank. [. . .]

Cartels 3.0.:Algorithmic (tacit) collusion

Possible scenarios

- ☐ Monitoring algorithms
- ☐ Collusion by using the same algorithms
- ☐ Signalling algorithms
- ☐ Self-Learning algorithms



- ☐ **Preventing the Algorithmic Facilitation of Rental Housing Cartels Act. 2024 Bill:**
 - ☐ “[m]ake it unlawful for rental property owners to contract for the services of a company that coordinates rental housing prices and supply information, and designate such arrangements a per se violation of the Sherman Act.”
- ☐ **Preventing Algorithmic Collusion Act of 2024 S. 3686, 118th Cong. (2024)**
<https://www.congress.gov/bill/118th-congress/senate-bill/3686>

Innovation principle versus precautionary principle?



The precautionary principle

- **Functions of the precautionary principle:**

- (i) it may provide some **parameters to select a course of action** given specific circumstances of decision-theoretic risk,
- (ii) it may set some **epistemic standards** to provide insights as to what one should reasonably believe under conditions of uncertainty, and
- (iii) it may denote **procedural guidelines** to express requirements for decision-making.

- **Key Elements**

- 1. **Harm**

- 1. Some scientific evidence of threat
 - 2. Covers both uncertainty and ignorance

- 2. **Uncertainty**

- 1. Decision-theoretic
 - 2. Scientific
 - 3. Axiological

- 3. **Action**

- 1. Proactive avoidance
 - 2. Iterative process
 - 3. Regulatory learning



AI Act & Competition Risks

- Risk regulation for high-risk AI systems: horizontal regulatory approach to AI that is limited to the minimum necessary requirements to address the risks and problems linked to AI
 - Prohibited practices (e.g. placing on the market, putting into service or use of an AI system that deploys subliminal techniques beyond a person's consciousness in order to materially distort a person's behaviour in a manner that causes or is likely to cause that person or another person physical or psychological harm)
 - Record-keeping, transparency...
 - No competition risk considered in the AI Act

 - *Article 72(2) - Market surveillance and control of AI systems in the Union market*
- (2) As part of their reporting obligations under Article 34(4) of Regulation (EU) 2019/1020, the market surveillance authorities shall report annually to the Commission and relevant national competition authorities any information identified in the course of market surveillance activities that may be of potential interest for the application of Union law on competition rules. They shall also annually report to the Commission about the use of prohibited practices that occurred during that year and about the measures taken..

Application in competition law enforcement

Prohibitions and New Legislation?

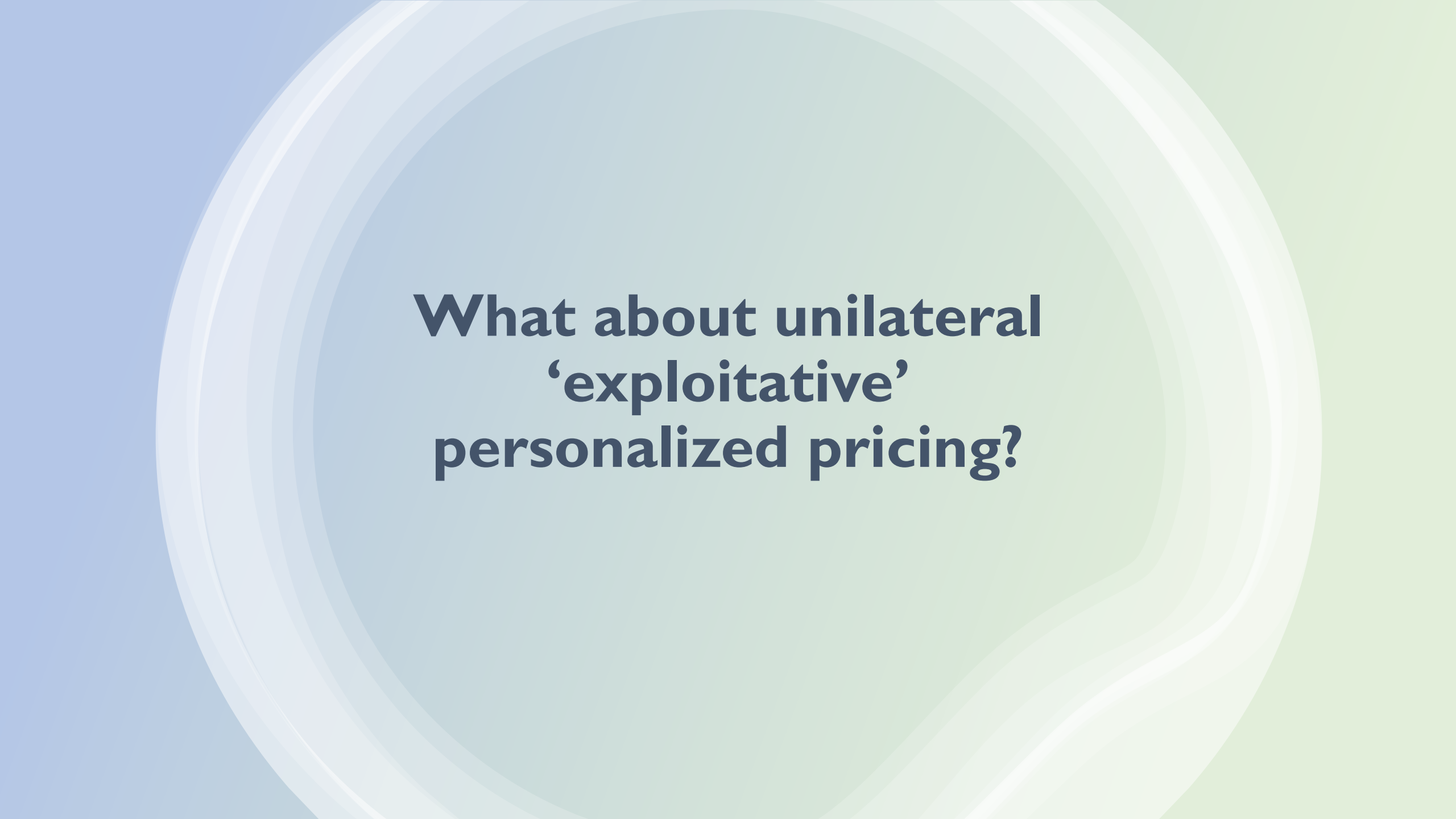
- Pre-authorization requirements
- Strict liability?
- Extensive auditing
- Licensing restrictions

Adjusting Competition Standards?

- Abandoning the communications-based collusion standard?
- Abuse of collective dominance?
- Price signaling and other facilitating practices (e.g. Art. 1A Greek law in 2022)
- NCT and Market Investigation References

Future-Gazing Tools

- Horizon scanning
- Super forecasting
- Regulatory sandboxes
- *In silico* competition law (Lianos et al., forth 2025)



**What about unilateral
'exploitative'
personalized pricing?**