FTC Panel on Algorithmic Collusion (Nov 14, 2018)

Opening Remarks by Joseph Harrington

Setting

Suppose managers at competing companies independently decided to let AI determine the prices they charge. Due to the complexity of AI, these managers are unable to foresee what prices will result. As it turns out, these AI programs have learned to collude as reflected in prices above competitive levels. Algorithmic collusion has emerged and it is harming consumers.

Legal Challenge

The legal challenge in prosecuting those companies is that the law is rooted in "conspiracy" but there is no conspiracy here. To be more specific, what is unlawful is an "agreement" between competitors where an agreement is, according to the U.S. Supreme Court, a "meeting of minds in an unlawful arrangement" (*American Tobacco Co. v. United States*, 1946) and a "conscious commitment to a common scheme" *(Monsanto Co. v. Spray-Rite Serv.*, 1984). This legal perspective is also present in European Union jurisprudence where an agreement means that companies have "joint intention" (*ACF Chemiefarma NV v Commission of the European Communities*, 1970) and a "concurrence of wills" (*Bayer AG v Commission of the European Communities*, 2000). In other words, companies have an unlawful agreement when they have mutual understanding to restrict competition.

The courts have laid out various paths toward proving that there is an unlawful agreement. Common to them is an overt act of communication between companies intended to coordinate their conduct. There must be evidence of communication.

However, neither mutual understanding to limit competition nor communication to facilitate that mutual understanding is present with algorithmic collusion. The AI programs are simply setting prices, recording prices and sales and other relevant data, and adapting the pricing rule in a manner to yield higher profits. There is no overt act of communication between the managers, nor between the AI programs. There is no mutual understanding to restrain competition between the managers as they acted independently and did not foresee that collusion would emerge. And

there is no mutual understanding among the AI programs unless one is prepared to attribute "understanding" to AI. According to the law, algorithmic collusion is legal because there is no agreement. Still, prices are above competitive levels and consumers are harmed.

Why communication is unlawful and not collusion

In developing a legal approach to prosecuting algorithmic collusion, it will prove useful to first ask: Why is it that the courts have made *communication to limit competition* unlawful rather than *limiting competition*? It is the practice that facilitates collusive pricing which is unlawful rather than collusive pricing itself. To elaborate on this point, suppose company A verbally expresses to company B that company A will raise price, and goes on to say that it will keep price at that high level only if company B matches it. Otherwise, company A will return price to its original low level. After company A conveys this message to company B, suppose company A raises price and company B matches it. Based on their communications and their pricing conduct, companies A and B would be convicted of violating Section 1 of the Sherman Act. Now suppose companies A and B use those same pricing rules, whereby company A raises price and keeps it there if company B matches the price and otherwise drops prices back down, while company B's pricing rule has it match company A's price increase. If the companies used those pricing rules *but did not communicate*, the result is collusive prices but they will have not violated the law. There is collusion – by which I mean the use of pricing rules to support supracompetitive prices – but no communication.

The reason that collusion without communication is lawful is because of an evidentiary hurdle. Collusion is about the use of a reward-punishment scheme. If you price high then I will reward you by pricing high; and if you price low then I will punish you by pricing low. One can think of it as a contractual arrangement among competitors for sustaining prices above competitive levels. The evidentiary challenge is that we observe prices but not the reward-punishment scheme that may be sustaining them. The reward-punishment scheme resides in the heads of the colluding managers. If we see one company raise price and the other match it, we cannot be sure that it's a collusive deal or that these price increases are driven by, say, a common rise in cost. We cannot get inside the heads of the managers to know what is underlying their conduct. Did a manager

raise price with the intent that its competitors match that price increase and putting an end to incessant price competition? Or is there a legitimate competitive rationale for companies to have raised their prices?

With AI, we can make collusion, not communication unlawful

Returning to our discussion of algorithmic collusion, here's the critical observation. While we cannot get inside a manager's head, we can get inside the head of an AI program. At any moment, the program's code includes a pricing rule which it uses to set price. We can engage in testing to learn the properties of that pricing rule and, in particular, whether those properties are collusive. Is the pricing rule designed to punish competitors with low prices should they seek to undercut price? Is the pricing rule designed to raise price but maintain it there only if rival companies match that price? More generally, is the pricing rule "collusive" in the sense of using a reward-punishment scheme to sustain higher prices and eliminate price competition?

The realization that we can, in principle, determine the pricing rule that an AI program is using is the basis for a radically different legal approach designed to deal with algorithmic collusion. This approach makes limiting competition illegal rather than *communicating* to limit competition.

My proposal is to have a per se prohibition on pricing algorithms that limit price competition. Liability would be determined by dynamic testing, which means entering data into the pricing algorithm and monitoring the output in terms of prices to determine whether the algorithm is unlawful. Having established a set of prohibited pricing algorithms, the burden would be on companies to monitor their AI programs to ensure that their pricing algorithms comply with the law.

Implementation of this legal approach will require research by economists and computer scientists to identify a set of prohibited pricing algorithms. This set should include pricing algorithms that promote collusion, while at the same time not including pricing algorithms that promote efficiency (e.g., algorithms that adjust prices in response to demand information). I believe this is feasible because the properties that enhance efficiency seem quite distinct from those that promote collusion.

Towards identifying a class of prohibited pricing algorithms, I propose the following three-step research program.

Step 1: Create a simulated market setting with AI programs that produce both competitive and collusive prices as outcomes.

Step 2: Investigate the resulting pricing algorithms in order to identify those properties that are present when collusive prices emerge but are not present when competitive prices emerge. Those properties serve to define a candidate set of prohibited pricing algorithms.

Step 3: Test a candidate set of prohibited pricing algorithms by assessing the impact on market outcomes from restricting pricing algorithms to not lie in the prohibited set.

Concluding

Let me conclude with the following cautionary comment. Should, at some future time, algorithmic collusion occur and become ubiquitous, existing jurisprudence would offer no legal recourse to stopping it. Consumers are currently unprotected from algorithmic collusion. To my knowledge, a per se prohibition on collusive pricing algorithms is the only available approach to preventing algorithmic collusion. While implementation of this legal approach faces some significant technical challenges, they are not insurmountable. But more daunting than those technical challenges is the alternative, which is leaving a massive loophole in the law that would allow companies to limit competition through algorithmic collusion.