4 Reasons We May Not See Colluding Robots Anytime Soon

By Ai Deng October 3, 2017, 1:00 PM EDT

Many concerns have been raised in the antitrust community about algorithmic collusions. I summarized some of the views and concerns in a recent article titled “When Machines Learn to Collude.”[1] In that article, drawing lessons from a recent artificial intelligence research, I highlighted several observations, including the lack of empirical evidence that the singular goal of profit maximization would lead to collusion by machines. Instead, to design successful colluding algorithms, learning to collude likely has to be an explicit design feature. If a firm adopts such a computer algorithm, however, the question of antitrust liability seems to be less complicated by the use of robots. In this note, I summarize some additional reasons why algorithmic collusion, even if possible, could be limited in its scope.

Algorithmic Asymmetry Could Hinder Collusion

Competing firms usually do not adopt a given technology at exactly the same time (unless that is part of a collusive agreement). Even if they do, they often invest in the technology to a varying degree simply because of their different strategic priorities. Both the timing of the adoption and the investment decision over time could lead to an asymmetric environment in which some firms are more efficient with their algorithms than others.

Economic literature has generally recognized that such asymmetry actually hinders collusion.[2] For example, in the context of cost asymmetry, Scherer (1980) states that “the more cost functions differ from firm to firm, the more trouble firms will have maintaining a common price policy.”[3] The U.S. Merger Guidelines also highlight a similar conceptual point by stating that “the extent of homogeneity may be relevant both for the ability to reach terms of coordination and to detect or punish deviations from those terms.”[4]
Algorithms Create Opportunities for Robust Compliance

Firms maximize their profit subject to various constraints (e.g., limited human capacity, limited financial resources). A computer algorithm would be useless to firms if it does not respect these same constraints. But if an algorithm can be trained to respect these constraints, there is no reason why, at least in principle, it cannot be trained to respect the constraints of antitrust law. As professor Nicolas Petit argues, “a reasonable assumption is that a profit-maximizing pricing algorithm will specify a fiduciary duty towards its vicarious governors, which will integrate constraints like antitrust compliance.”[5]

The implementation of algorithmic compliance, however, may not be straightforward. As I noted in my previous article, one way the AI research community could contribute to compliance is through the investigation into design features that lead to successful cooperation among machines. The debate could then focus on whether such features should be prohibited as part of algorithmic compliance.[6] Despite the challenges, it is not far-fetched to believe these powerful algorithms can create ample opportunities for robust compliance.

Collusive Outcomes Are Observable to Human Decision-Makers

Imagine you are the CEO of a firm that uses sophisticated computer algorithms for pricing and production decisions. You get up one day and realize that the algorithms have set a price or a production level that you do not understand. The demand has been rising rapidly, yet the algorithms ask that you maintain the current production level even though you have excess capacity. As you wonder what is going on, your staff reports to you that none of your competitors appears to be using their slack capacity either. Do you smell something fishy?

This is, of course, a highly simplified example. The point is that no matter how complicated and incomprehensible the computerized decision process is, the outcome is always observable and can be interpreted by human decision-makers.[7]

In a recent speech, Margrethe Vestager, European commissioner for competition, warned companies that they “can’t escape responsibility for collusion by hiding behind a computer program.” If this comment is to be taken seriously, intervening is probably a safe route to go when the responsible decision-makers sense something is off.

The fact that human decision-makers can intervene adds another hurdle to successful algorithmic collusion. Note that successful collusion typically requires the parties to sacrifice short-term gains in exchange for long-term profits. Unaware that the computer algorithms are colluding, the decision makers likely have a strong incentive to override the algorithms when profits are being sacrificed to maintain a collusion.[8]

Class Actions Are Another Deterrent

At least in the United States, class actions are a common way for plaintiffs to recover the damages they have suffered as a result of defendants’ conduct. To have a class “certified,” current U.S. law requires several criteria to be satisfied. Two closely related criteria are known as commonality and predominance. Commonality requires that there be questions of fact or law that are common to the class, and predominance requires that “questions of law or fact common to class members predominate over any questions affecting only individual class members.”[9]

Relevant to the discussion here is the fact that the use of computer system has been and could be seen by the courts as evidence of commonality and predominance.[10] In other words, firms that use AI algorithms to carry out collusion (autonomous or not) may have a harder time defending themselves against class actions. This higher risk resulting from the use of a computer algorithm should make a rational firm think twice and be extra careful with antitrust compliance.

Conclusion
It is important to emphasize that in a world where robots are sufficiently intelligent to be capable of autonomous collusion, none of the observations raised above by themselves preclude the possibility of algorithmic collusion in all markets. There will always be exceptions to the rule. Of course, there is still a long way to go before the technological advance could bring about such sophisticated AIs. I refer interested readers to my article “When Machines Learn to Collude” for more discussion on where we are.

As an economist who has been applying machine learning/AI methods to both my own research and client projects for the past several years, I find the ongoing debate particularly exciting. The discussion not only draws attention to the fascinating field of AI but also creates a wonderful opportunity for collaboration among the AI, the economics, and the antitrust communities.

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[2] Professor Nicolas Petit raised the same point in his excellent editorial for the Journal of European Competition Law & Practice. He went as far as saying, “[Algorithmic asymmetry should be baseline [emphasis added] hypothesis for antitrust policy.” In a related context, Paul Johnson also pointed out the potential of enhanced competition by the use of big data. See Paul A. Johnson, “Should We Be Concerned that Data and Algorithms Will Soften Competition?” Antitrust Chronicle. 2 (Spring 2017): 10.


[4] I thank Ales Filipi for the reference.


[7] This does not imply that every decision maker in the firm would know.

[8] Paul Johnson first raised this point to me.
