CPI's Europe Column Presents:

Software is Eating Competition

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"Software is eating the world."[2] Software is also eating competitors and potential competitors. Nowadays, firms not only use software and the internet to deliver products and services to their customers. They use it to understand the market, crush the current competition, and implement potential barriers to entry. Software underlying digital products and services enables changing prices and product attributes in a targeted way, at a quicker rate than ever, and at a fraction of the cost. This brought a lot of value to consumers by making the platforms and apps they rely on more responsive and tailored to their needs, but it also brought in new ways to restrict consumer choice, increase consumer switching costs, and new venues for predatory behavior.

The EU Commission opened an inquiry into the software of Google in the *Google Shopping* case in 2010. In the same vein, antitrust authorities ought to inquire more about software features and changes platforms implement in their apps and websites. However, the time frame of antitrust enforcement is not adapted to the time frame at which the software changes take place. It used to be that firms had to engage in lengthy product changes or negotiations and deal-making to restrict competition. Software, however, increased the speed and scale of pricing, design, and product positioning that can restrict competition. Compounded with the concentration of markets in Europe and the U.S., and the network effects in platform economies, anti-competitive software can seal the market power of large tech platforms before antitrust authorities take action. Competition authorities can learn from the tech firms themselves and adapt their own toolbox: A/B testing, online experiments, and open-data policies can be adopted and used more regularly by antitrust authorities.

What is Anti-Competitive Software?

Tech firms offer software-based products, and incrementally alter them at quick pace: Airbnb and sellers on Amazon Marketplace resort to algorithmic pricing to change listing prices without human input, Uber offers targeted discounts, and the value and timing of price discounts can be modified algorithmically. Automated changes in other product attributes are also possible: design, interface, search, ranking, diversion, salience… On top of that, the effects of these software changes can be tested online and quickly: companies like Optimizely, Inc. for instance offer automated online testing of design changes in websites and apps. Some of these algorithms can lead to anti-competitive outcomes: they increase consumers' engagement, their switching costs, or restrict their choice, steering them away from competitors, and sealing the dominance of a platform.

The speed and scale of restricting competition through software has been brought by the prevalence of computed-mediated transactions, electronic record keeping, and improved computational power. Software features vary in their level of automation, however as per the touted culture of Silicon Valley, they are tested and implemented quickly. For instance, a food-delivery app starts offering you discounts through phone notifications: company employees made the decision to give these discounts; however, the targeting, the amount, and the timing is all automated. Take for example a marketplace app that demotes the ranking of some products on its search engine in order to increase traffic towards its own affiliated products: implementing the feature by teams at the company, and testing its effects online takes only weeks.[3]

Software features on a platform's app and website can help regulate the platform: surge pricing on Uber matches the demand and the supply through automatic price increases of rides; Airbnb recommends personalized prices to its sellers to help them understand demand; and most platforms have a ranking algorithm that directs consumers to good matches in whatever it is they are looking for. These algorithms are innovative and create value for the consumer. However, others such as the one implemented by Google to promote Google Shopping, or targeted discounts offered by Uber if the user has Lyft installed on their phone intentionally serve to undermine the competition.[4,5] These software changes also have outsized direct or indirect external effects on the product shopping market, or the ride-hailing markets. Take the following examples:

- The *Google Shopping* case led by the EU Commission in 2010 concerns a software change in the search engine of Google. Google entered the comparison-shopping space with Froogle (a play on the word Frugal). Froogle was initially a separate tab in the general search page, and it did not take off initially.[6] Google revamped it as Google Shopping, and placed it in a top banner above the general search results. Google changed its Google Search ranking software to allow two things: first, to show its own shopping results on top; and second, to demote competing comparison-shopping websites to lower rankings or second or third pages of search results. By doing so, Google leveraged its dominance in the search engine market to monopolize the comparison-shopping market. The EU Commission fined Google in 2017.
- Another example is a ride-sharing platform that recently started promoting entrant drivers by ranking them on top of search results. This small change makes it easier for new drivers to build a reputation, all the while allowing them to sell at a higher price than they would have otherwise. Making it easier for new sellers to shop is essential for the survival of a platform, particularly due to high turnover and low retention rates on sharing economy platforms.[7]

However, this same dynamic would result into a locked-in base of sellers. Sellers, like buyers, have switching costs. No viable competing ride-sharing platform exists now, but a locked-in driver base does not increase the chances of it emerging anytime soon: drivers have already established a reputation on the incumbent platform; it will take quite some innovation for a new platform to attract them, and even that is unlikely to attract investor money. Airbnb, the sharing economy rental platform, has also a policy of promoting entrants, by increasing their ranking; sharing economy platforms generally have incentive schemes for new sellers on them, some of them informational, i.e. software-based.

Why Should Antitrust Authorities Care?

In the examples above, small software changes may have outsized anti-competitive effects on markets. Comparison shopping websites suffered enormous losses due to Google's demotion. The contrast between the speed of implementation and the scale

of the effects of software changes are specific to the tech sector, and do not show up – yet – in other industries like drug development for instance. Antitrust authorities should look deeper into them and adapt their own pace when they do.

First, the high concentration in the tech sector compounds the effects of the speed in software changes. In each business line, a large platform or two dominate the market. If a platform changes its software to increase search or switching costs for its users, a large user base is directly impacted. Second, these platforms are concentrated due to network effects: You want to lease your house in Toulouse when you are away on the platform that attracts the most buyers. You are more likely to sign up to the social network on which your friends are already signed up. A software change that increases the switching costs of users today acts as a barrier to entry for competitors and potential competitors tomorrow: not only the change will affect the current – already large – user base of the platform, but network effects will increase the size of the user base over time, and make it harder for smaller competitors to compete or raise funds.

Restricting competition by software changes in platforms has a predatory flair. Pricing below cost for multi-homing consumers or aggressively demoting competitors of an affiliated product can drive less deep-pocketed competitors out of business, or delay competitors' entry until network effects on the platform are high enough to fend off entrants by themselves. The innovative value of these software changes for the consumer is also debatable. Classical predatory pricing is argued to be unlikely to arise because its cost is high and current, while the reward through future recoupment is highly uncertain and quickly dissipated by future entrants. Software-enabled predation however has lower current costs: targeted discounts allow pricing below cost to be sustained for longer since they are offered for a subset of consumers; aggressively promoting entrant sellers on a platform only harms incumbent sellers who are not likely to exit, demoting competitors of an affiliated brand does not seem to drive consumers away, and online experimentation allows companies to test and implement these changes gradually.

Additionally, the network effects and tipping dynamics in platform markets make the threat of entry less credible once a critical mass is attained by a platform. It is true that software makes the adjustment of product attributes quicker and less costly for new startups as well, but not to an extent that enables them to catch up with platforms that already dominate the market. In fact, changing a digital product successfully relies on having a large user base: larger platforms can draw more precise insights about the behavior of consumers, and can experiment with new features on a very small fraction of their users and risk losing only those, whereas a startup platform has fewer margins of maneuver in terms of size.

Lastly, antitrust authorities should look into these software changes and features early on and swiftly: even if anti-competitive software is retracted, its effects on market structure may not be reversible. The comparison-shopping market now is dominated by Google Shopping, and it is unclear whether it would revert to a more competitive one. Antitrust is law enforcement, and thus it tends to be slow. But restricting competition by software is systematized for speed, and speed is encouraged by the tech company culture, e.g. "Move fast and break things" [8]… With the possible irreversibility of

markets, the possible dangers of market power in digital sectors for competition, democratic processes, and labor markets, and the branching of the digital behemoths in more regulated sectors such as healthcare, the speed of regulators becomes more important.

How can Antitrust Authorities deal with Fast Software Changes?

Promoting entrant sellers on the platform is likely to increase welfare, and ought not be stopped, but enforcing cross-platform portability of reputation, and tools to facilitate multi-homing for sellers would avoid the anti-competitive effects. Great! Now that is only a potential solution for one specific software change. What can be done when these changes happen on a weekly basis? The regulator ought to learn from the regulated: the court decision may still take a long time, but the antitrust watchdogs can open their toolbox to quicker processes and adopt not only the metrics the companies use, but also the tools. Two elements stand out as useful and rather easy to adopt: A/B testing and Open Data.

A/B Testing

In a nutshell, A/B testing consists of showing a randomly selected subset of users a version of the platform with an experimental feature and comparing their behavior to the rest of the *control* users. Tech companies routinely resort to these quick, scalable, and cheap experiments to test out new features. Web publishers also have access to pre-packaged or bespoke services to implement online experimentation and testing.

Google for instance could have implemented the downgrading of the competing comparison shopping services in its "organic" search results, tracked the behavior of the searchers for 100, then 1000, then 100,000 searches, and measured the effect on key metrics: e.g. the number of consumers who clicked on a Google Shopping product suggestion, the number of consumers who clicked on a competing comparison shopping suggestion, and the number of consumers who were dissatisfied with the Google Shopping suggestions and exited. This information can be invaluable for the competition authorities for two reasons: first, by analyzing the results of past A/B tests ran by the company the regulator can identify effects better; second, by looking at the metrics used in past A/B tests it can also better identify intent.

Competition authorities ought to have the mandate to analyze the results of past A/B tests or request new ones to be made. Imagine a world where the regulator asks Facebook to actually increase the price of ads randomly on its platform in an experiment and see how advertisers substitute to alternative channels; or to actually increase the levels of salient privacy and observe the effect on the behavior of users, and assess whether Facebook can successfully degrade the privacy quality of its product due to its monopoly power.[9]

Open Data

Open Data diversifies the sources of analysis authorities can rely on, tapping into the human capital of researchers capable and willing to derive insights from the data. It is becoming commonplace for governments to publish aggregate datasets on their Open Data portals, and to allow access to anonymized samples or even administrative datasets to researchers under a review process. Competition authorities can follow suit.

Even in law enforcement, it is not uncommon to publish data related to lawsuits and settlements after they are done. In the U.S., the Enron Email Dataset was made public and posted to the web by the Federal Energy Regulatory Commission during its investigation. It contains half a million email records from top management of Enron prior to the scandal. Several research projects in information economics, computer science, and machine learning were made possible thanks to that data being public.

Another example is the Open Payments dataset: Since the Sunshine Act in 2010, pharmaceutical companies are required by law to declare any payment to a healthcare provider. Initially however, that data became public in the course of several legal actions against pharmaceutical firms. Releasing the data was part of the legal settlement with a number of firms, including Pfizer and AstraZeneca. Research based on this dataset has allowed us to better understand the effects of the physician-industry payments and sparked a debate about healthcare provider incentives, and the welfare and competitive effects of these payments.[10]

The EU Commission could consider releasing aggregate or engineered data in the context of its digital sector-level inquiry for instance. Privacy is an issue, but the authorities can follow existing best practices from governmental Open Data initiatives, or restricted access data initiatives such as healthcare records data used for research.

Some Final Considerations

Antitrust authorities can leverage their unique position as the market watchdog and look into software changes that platforms use to impose monetary or non-monetary switching costs for users, thereby driving their competitors out of business and creating barriers to entry. The speed at which software makes these changes possible and the concentration in the tech sector make these inquiries important.

What to do in practice? Within DG COMP or the FTC, a team of computer scientists, software engineers, economists, and behavioral scientists can request access to platforms' previous feature and design test results, and request that new one-time analyses be made by the platforms using the platform's own digital tools. They can also establish Open Data policies on ongoing inquiries. This setup has the advantage of fitting within the existing institutional framework: in a sense, only new forms of evidence would be collected in antitrust cases. The downside is that the time frame of enforcement can still be long. Adopting online experimentation as evidence, and open-data policies can also be accommodated within a separate digital authority that some scholars are calling for,[11] given that this authority gets the mandate to request information from the firms, and request tests being made by the firms.

These changes are not without cost, but this is not a call for blocking every single software feature that is implemented by a tech platform: not all software changes on a platform restrict competition. It is a call to make the assessment of whether a software change is anti-competitive, abusive or predatory, possible quicker and at a lower cost for the regulator and the regulated. In 2010, Andreessen predicted that: "Over the next 10 years, the battles between incumbents and software-powered insurgents will be epic." If antitrust authorities do not pick up the pace, in the next 10 years the battles between software-powered incumbents and insurgents may be quite boring.

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[2] Andreessen, M. (August 20, 2011), "Why Software Is Eating the World," *Wall Street Journal*, available at https://www.wsj.com/articles/SB10001424053111903480904576512250915629460.

[3] For anecdotal evidence, what became Google's AdWords engine was created and implemented over a weekend by a team in Google, and Salar Kamangar, former head of Youtube, decided to launch high-definition playback in YouTube the next day instead of in weeks when the prototyping and preliminary testing were done; respectively pp. 47-50 and pp. 85-86; from Schmidt, E. & Rosenberg, J. (2014), *How Google Works*.

[4] EUROPEAN COMMISSION - Competition. (2017), CASE AT.39740 *Google Search (Shopping), ANTITRUST PROCEDURE*, available at http://ec.europa.eu/competition/antitrust/cases/dec_docs/39740/39740_14996_3.pdf.

[5] Zingales, L. & Waldock, K. (2019), *Capitalisn't Podcast - Regulating Facebook and Google Pt 1: Markets*, available at https://simplecast.com/s/80db3816.

[6] Duhigg, C. (2018, February 20), "The Case Against Google," The New York Times Magazine, (February), 35, available at https://www.nytimes.com/2018/02/20/magazine/the-case-against-google.html.

[7] According to preliminary results from ongoing project "The Price is Right!" with Emil Palikot. For a theoretical discussion of the effects of promotion of new sellers on a platform, see Hagiu, A., Wright, J. (In Press). "Platforms and the exploration of new products", *Management Science*.

[8] "Move fast and break things" was Facebook's motto. "M0vefast" is the password to Facebook's HQ guest wifi. Thomson, N. & Vogelstein, F. (April 16, 2019), "15 Months of Fresh Hell Inside Facebook," *WIRED*, available at https://www.wired.com/story/facebook-mark-zuckerberg-15-months-of-fresh-hell/.

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