Network Effects and Market Power: What Have We Learned in the Last Decade?

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SINCE THE EARLY YEARS OF PLATFORM and antitrust analysis, network effects have been an important consideration when analyzing potential market power. This is because the competitive advantage bestowed by network effects was thought to increase as the size of the firm increased. This article describes three recent advances in the analysis of network effects and, in particular, how our understanding of network effects has evolved in the digital economy. These new findings suggest that network effects are not the guarantor of market dominance that antitrust analysts had initially feared.

Back in the 1990s, network effects were looked to as a new source of potential market power, especially in digital markets. Economists use "network effects" to describe contexts in which a good or service offers increasing benefits the more users it has. Network effects can be direct—for example, a fax machine becomes more useful as other people also use fax machines. Network effects can also be indirect so that they flow across different sets of users. For example, Uber would not be a very useful app for a rider if there were no drivers using the platform. Similarly, drivers would not want to use the Uber app if no riders were using it.

The presence of network effects has implications for the strategies that firms deploy in such markets—for example, it might be attractive to subsidize initial users to help build critical mass. Network effects also were thought to potentially be a source of market power because larger firms would have stronger network effects as they had more users, which could help reinforce their incumbency and make it costly for small or new firms to challenge them.

The canonical antitrust case in which this argument was central to the legal pleadings was the antitrust action[1] against Microsoft.[2] The argument was that Microsoft used its large user base to encourage software developers and computer hardware markets to focus their efforts on Windows. This led to a positive feedback loop that rendered competing operating systems' products unattractive.

Similarly, it was argued that Microsoft succeeded in making MS Office (spanning Word, Excel, and PowerPoint) the dominant suite of office productivity applications, encouraging users to standardize on MS Office for both business and personal use. The direct network effects for these applications were based on easy file sharing across users—users had little incentive to switch to another word processing software application if none of their colleagues were using it. Microsoft also benefited from indirect network effects, because developers had large incentives to develop software for operating systems that had the most users. Microsoft used these dual network effects (in operating systems and productivity applications) to its advantage, becoming one of the most profitable corporations in the world.

However, even the seemingly unassailable advantage Microsoft appeared to have in the 1990s has started eroding in recent years as the pace of technological innovation has quickened and new paradigms like cloud computing have started to emerge at increasing rates. The world of digital technology has moved on from the era of Microsoft's dominance, and Microsoft no longer commands an impressive market share of computing devices by any definition.[3] It is also no longer a top-5 company in terms of profitability (Apple and Google, among other digital platforms, have leapfrogged Microsoft in recent years). This article discusses how, as the use of digital technologies and their reliance on digital data (rather than hardware standards) have expanded and become more fluid, the nature of the network effects that underlie many digital platforms has also changed.

Specifically, this article describes three recent advances in the analysis of network effects and, in particular, how our understanding of network effects has evolved in the digital economy as the usefulness of technology has become less dependent on the particular hardware it uses and more dependent on digital interactions. First, network effects do not imply entrenchment and can actually lead to quicker destabilization of a market leader position. Second, network effects tend to be quite localized, meaning that they tend to be less a function of an entire user base than a function of the scope of a user's interactions in a digital ecosystem. Third, in some instances the addition of certain users to an ecosystem can have negative effects for the relative attractiveness of that platform. These shifts mean that it can no longer be assumed that the mere existence of network effects will lead to entrenchment.

Network Effects in Digital Platforms May Imply Rapid Instability Rather Than Entrenchment

These changes reflect the changing nature of technology platforms. First, the evolution of multiple different devices, such as smartphones, tablets, and digital assistants, means that network effects no longer are intertwined with a particular definition of hardware, as was the case with the desktop computer in the 1990s.

Instead, platforms that exhibit network effects may be completely virtual. Nowhere is this more striking than in

the world of purely digital platforms (such as social networks, ride-sharing apps, or digital marketplaces), which do not depend on any one type of hardware and, as a consequence, have low learning costs and require few direct investments from users.

The Instability of Platform Dominance Means that the Number of Users in a Platform Is Not Necessarily Predictive of Market Power. In my previous work, I discussed the instability that has been the hallmark of social networks.[4] On the face of it, a social network should have strong network effects. The only purpose of visiting LinkedIn or Facebook is to connect with others, and if no one else is there, they serve little purpose. However, the history of social networks has suggested anything but entrenchment. Launched in 2002, Friendster is often considered the first real social network. However, it was quickly replaced by MySpace, and by 2006, MySpace surpassed Google as the most visited website in the United States.

The subsequent decline of MySpace, and the speed with which users switched to Facebook, was also startling, and has attracted much academic inquiry. In particular, what is striking is that one might have expected MySpace to exhibit switching costs, due to the time that users had invested in setting up and personalizing their profiles and establishing their networks. However, that "sunk cost" was rendered negligible when MySpace users' friends migrated to Facebook. Parallel to these developments, other social network-type sites, such as Friends Reunited and Yik Yak, have sprung up quickly and then disappeared.[5]

In a similar vein, in the social networking space we have seen huge failures by products that, under traditional theories of network effects, should have been huge successes. The most obvious of these is Google Plus, which was one of Google's most salient attempts to compete in the social networking arena. Indeed, the executive in charge of the venture highlighted the huge strategic drive at Google behind Google Plus: "We're transforming Google itself into a social destination at a level and scale that we've never attempted—orders of magnitude more investment, in terms of people, than any previous project."[6] Google Plus enjoyed the support of over 1,000 employees (including top engineers), as well as CEO support. In theory, Google Plus should have had network effects and consequent critical mass on its side. This is because it was able to "seed" its initial social network with 90 million users through the integration of other Google services, such as YouTube, in its signup process.[7] However, Google plus failed to gain traction as a social network.

This failure is striking simply because early economic analysis often relates a platform's competitive advantage to its user base, but here, Google Plus quickly failed despite a huge installed user base because the features it offered did not provide any advantages over existing social networks.

Another earlier but similar failure was Google Buzz, which used data about Gmail's most-mailed contacts to seed contact information. In theory, this should have been a powerful tool, as it reduced the need for users who switched to the

platform to establish their social network. However, rather than encouraging users to embrace the platform, this use of email data to quickly build critical mass instead garnered criticism from a privacy perspective.[8] In neither instance was simply creating accounts for a critical mass of users or populating these accounts with information enough to sustain usage on the platform.

The Instability of Network Effects Also Frequently Leads Users to Use Multiple Platforms, Increasing Competitive Pressure. This analysis and the examples above suggest that simply having a large number of users is not sufficient for a modern platform to enjoy sustainable market power. Given this, it is natural to also consider another constraint on the importance of network effects in digital platforms, which is the extent to which users "multihome" or "singlehome."[9] This early work on two-sided markets, often stemming from litigation in the credit card industry, highlighted the point that, after establishing a certain market definition, one of the key subsequent questions is whether users multihome (use multiple platforms) or singlehome (use a single platform) within this market. Multihoming increases competition within that market, as platforms may use price reductions or quality improvements to try to entice users to spend more time on their platforms rather than on others. It is easy to see the importance of this consideration with credit card markets, where customers often carry multiple types of credit cards, and merchants often accept multiple types of credit cards.

Whether a market exhibits multihoming or singlehoming is closely related to the degree of lock-in that a user experiences when using a platform. In the Microsoft case, the idea that users would not multihome across operating systems, but instead would singlehome and only use a single operating system, was often used to explain Microsoft's the relative power of Microsoft's network effects. Here, technological standards made multihoming across platforms hard, as it would be difficult practically, for example, to switch from the word-processing environment in Windows to that of another operating system, given the learning costs associated with the switch. At the time of litigation, the promise of Java was that Java would enable seamless multihoming. However, as technology evolved it became apparent that what enabled multihoming were different types of uses for technology platforms where the application could be more easily ported and where communication or use did not depend on the application programming interface (API) to the operating system. As a striking example of this, the advent of cloud computing has provided users with easier ways to port documents across operating systems, muting such concerns.

By contrast to earlier cases surrounding platforms, which were often focused on particular hardware configurations, many new platforms are entirely digital and operate independently of hardware. This facilitates multihoming by users. Ride-sharing platforms are a useful example of this. From its inception, the ride-sharing industry has been characterized by fierce competition, since users can easily have (for example)

both Lyft and Uber apps installed on their phones and choose whichever service has the most available drivers, and consequently the best prices at that very moment. Furthermore, many drivers also have both the Lyft and Uber apps installed and choose to operate on whichever platform is currently has the most customers and consequently is offering the most profitable rides.

Even platforms characterized by direct network effects can exhibit multihoming in the new digital environment. Social networks such as LinkedIn and Facebook were founded with the intention of allowing an individual to reach out to very different audiences. Facebook was originally intended to allow easy connections across college friends and similar peers. LinkedIn, by contrast, was intended to provide an environment that allows users to connect with potential employers and professional contacts. As a consequence, often users multihome across these two platforms in order to reach separate audiences.[10] However, this highlights the difficulty of market definition in such a market. As a matter of technology, both platforms are similar. However, they may not be precise substitutes for some users who use them to reach different audiences, while other users would view them as substitutes because they use them to reach similar audiences. Such analysis is further complicated by the fact that these are two-sided platforms, and that advertisers may (or may not) view such platforms as complete substitutes on which to show ads.

Even if a user singlehomes when reaching a specific audience, the rise and fall of such platforms may also be more dramatic and renders such platforms far more vulnerable to a marginally superior competitor. The sudden decline of MySpace can be explained by the idea that given limited ability to spend time on two similar social networks, users switched far more quickly to a competitor.

Network Effects Are Localized and Therefore Less Powerful Than Previously Thought

Typically, the first models of network effects considered their strength to be a function of the number of total users of the technology or platform. However, my research has shown that this is not correct and that network externalities are often very local in a way that renders the general size of the platform unimportant.[11] This conclusion rests on two observations. First, in general, in a world of scarce attention, users tend to focus only on connections and interactions that matter personally to them when deciding what platform or service to use. Second, the evolution of platforms has led them to be more personalized and individualized in the services they offer. This, in turn, contributes to the localization of network effects. Of course, this has parallels in early antitrust cases in operating systems in which it was recognized that, rather than the number of software applications, what tended to matter was a handful of critical software applications. However, as digital technology has evolved and become broader in scope of users, personalization has perhaps made the identity of those critical applications vary more across users.

Take, for example, a restaurant review site. A naive view would be that a user starts using the website when the number of reviews across the website reaches a certain critical mass. However, that is unlikely to be the case. For example, if I am in Boston, I simply do not care if there are many versus few reviews about Seattle restaurants. Furthermore, even within Boston I may not care about restaurant reviews for cuisines I would never eat, or restaurants I could not afford. In other words, what matters for my decision to start using that platform is reviews of restaurants that I am conceivably interested in. All other reviews are irrelevant for my decision.

The effects of personalization can also be seen in digital advertising markets. An advertiser may be very unconcerned about the total number of users on a particular platform, but instead interested in the presence of a few (otherwise hard to target) individuals. The entire value of digital advertising, indeed, rests on the premise that it can be used to locally target individuals, rather than the same ad appearing to all users of a platform.

The only exception to this rule is that network effects become less limited in scope at times of instability and uncertainty. I have shown that, in uncertain times, people may take account of the "option value" of having a large critical mass of users using a product or platform.[12] However, if users are able to predict how they will use a platform, this naturally limits the scope of network effects.

Network Effects Are Not Always Positive, But Can Be Negative

Usually network effects in platforms are modeled as positive. This means that, from an antitrust perspective, a larger number of users is considered to potentially reduce competitive pressure. However, there are three reasons recent research has suggested that more users may not lead to a sustainable market dominance (or power).

First is for simple reasons of congestion. An individual user may prefer to avoid a platform that offers too much choice, and instead choose a platform that fulfills a curation function. For example, a platform such as Witchsy.com (a new platform that focuses on offbeat art) may sell many products similar to those one could find on a more general platform for handcrafted goods such as Etsy.com. However, in this instance a user may appreciate the benefits to them, in terms of both saving time and highlighting trends, of having a more limited selection of curated goods to choose from. Indeed, research has emphasized the importance of a well-designed curation system for encouraging users to engage with a platform due to lower search costs.[13] This means that there is no reason to think that "buyers" will always be likely to engage with a two-sided platform that has a larger number of "sellers" on the platform. My research has also shown that a large number of "sellers" can be off-putting to other "sellers" who are contemplating joining the platform holding the number of "buyers" constant.[14] This is because of more traditional concerns that sellers might face potential congestion and pricing pressure if they are competing with too

many other sellers on the platform.

Second, users' desires for privacy (or at least for control over their audience) can lead them to value the ability to have a smaller audience. In some sense, the rise of Facebook (and later Snapchat) can be explained by a very unintuitive set of features, which is that ultimately they allowed users to limit their potential audience. Facebook offered the ability through its privacy settings to restrict the accessibility of a user's data. Snapchat went even further and encouraged private (and ultimately disappearing) conversations between only two users. In both of these instances, the ability of users to restrict their audience and control the usage of the platform—and by consequence, limit the presumed benefits of network effects of the platform—enhanced their growth.

Third, there are often more socially and culturally grounded reasons at play that may lead a large number of users to be unattractive. One important concept in branding is that of a dissociative group. This is a group of people—perhaps "Nerds," perhaps "Soccer Moms"—who, for whatever reason, are deemed uncool or "dissociative." This leads people to spurn platforms or avoid digital ecosystems where such people can be found. Though the usual narrative is one of cool people avoiding those they deem as uncool on platforms and therefore pursuing platforms with a limited (but selective) audience, there are other narratives. For example, when I studied the spread of Bitcoin at MIT, one thing we observed is the need for those who ordinarily adopted technologies early on to be unique. They rejected the technology if they felt that those people who were not natural early adopters were also using it.[15] This is despite the fact that network effects would have predicted that more users would have led to more (or, at least, not fewer) users, regardless of the perceived social attractiveness of that user base.

Together, these three forces can lead users to choose platforms that exhibit lower levels of usage, or weaker network effects. This directly contradicts the earlier wisdom that a larger platform size is always competitively desirable and bestows sustainable market power.

Conclusion and Implications for Antitrust Enforcement

To summarize:

1. Shifts in the nature of technology away from hardware towards purely digital platforms reduce the likelihood of a positive feedback loop that can reinforce incumbency. Network effects no longer imply entrenchment but instead can lead to instability.
2. The shift to personalization and individualization in the provision of digital technologies means that network effects are often very localized and unlikely to be simply a function of the number of users or firm size.
3. Network effects may not always be positive. In some cases, having a large network may even act as a detriment, enabling differentiated competition from entrants.

All three of these developments have potential implications for antitrust enforcement in platforms. They suggest

that in general platform markets may still be competitive even if larger firms in these industries exhibit both sizable user bases and competitive dynamics which are driven by network effects. This implies a tempering of antitrust enforcement actions surrounding market dominance of digital platforms predicated simply on their relative size of user base. It also implies some (but not all) alleviation of concerns that antitrust authorities may have surrounding stances towards mergers that involve the combination of digital platforms. ■

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[10] However, this line is also blurring as LinkedIn has deliberately become more "social" and Facebook is now often used to reach across professional colleagues as well as college friends, potentially meaning that now some users may also singlehome.

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