

Network Effects: March to the Evidence, Not to the Slogans

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Abstract

Though network effects are important for multisided platforms, the simple winner-take-all notion that they always give larger platforms an insurmountable advantage over smaller rivals has been disproven by numerous counterexamples. It is now being argued that big data is power, so that a firm that has more customer data than its rivals has an insurmountable advantage over them. This argument has no theoretical or empirical support, and it, too, has been disproven by numerous counterexamples.

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Economists began developing the theory of network effects in the 1970s. Significant progress was made through the 1990s, just in time for the birth of the new economy.

The basic idea was simple and powerful. In some cases a service is more valuable if more customers are using it because customers want to interact with each other. Then, if a firm moved fast and got some customers, those customers would attract more customers, which would attract even more. Explosive growth would ensue and result in a single firm owning the market forever. The winner would take all.

These interrelated customers are called a network, and the positive feedbacks between customers are called network effects. It looked like the theory was made to order for the Internet firms that flooded the economy in the mid 1990s, as well as some older high-tech firms.

Business gurus, venture capitalists, and the tech media soon treated network effects as the magic elixir for making quick billions. And a few people did in fact make billions from firms powered by network effects. All this seemed to justify the huge market caps of dot-coms that aimed to exploit network effects.

Competition authorities, however, with support from some dismal scientists, saw the dark side of network effects. Firms could rig the race to become the winner and thereby “tip” the market to make themselves monopolies. And even if a firm won fair and square, network effects would result in insurmountable barriers to entry and would be the font of permanent monopoly power.

Network effects are now central to a debate about whether online platforms are “unstoppable.”¹ A recent argument in this debate is that online platforms have troves of data that make network effects even more potent.

¹ The Economist, “Regulating the Internet Giants: The World’s Most Valuable Resource Is No Longer Oil, But Data,” May 6, 2017, <http://www.economist.com/news/leaders/21721656-data-economy-demands-new-approach-antitrust-rules-worlds-most-valuable-resource>.

Unfortunately, this view of network effects evolved from a seminal economic contribution to a set of slogans that don't comport with the facts.

The Economics of Network Effects

Jeffrey Rohlfs wrote the pioneering paper on network effects.² He focused on the early days of landline telephone service. A telephone was useless if nobody else had one. A telephone was more valuable if a user could reach more people. Economists called this phenomenon a *direct network effect*; the more people connected to a network, the more valuable that network is to each person who is part of it. Telephone companies tried to persuade households to subscribe to their new communication service. If enough did, if it attained what's known as critical mass, explosive growth would ensue, and the phone companies could make a lot of money.

Economists started applying the network effects theory to "high tech" back when that included fax machines. Several economists wrote influential papers on the most visible high-tech battle of the time: over the standard for videocassette recorders (VCRs). They argued that if two standards were roughly comparable in cost and performance, consumers would find the video-recording standard used by more people more attractive. That's because content providers, such as movie studios, would release more shows that consumers could watch on the VCRs based on the more popular standard. Because of this network effect, they theorized, the standard that got a head start, for whatever reason, and no matter how small, would ultimately win the race.

It didn't take long for a powerful empirical refutation of the simple version of the network effects theory. Venture capitalists poured money into Internet startups in the late 1990s and many set

² Jeffrey Rohlfs, "A Theory of Interdependent Demand for a Telecommunications Service," *Bell Journal of Economics*, 1974.

off on a race to become the winner-that-took-all. Many of the winners, however, with enormous market caps, folded or shriveled following the dot-com bust, while followers leapfrogged winners in the 2000s, and are still doing so. In 2001, for instance, *Industry Standard* described eBay as “unstoppable.”³ While eBay did survive the dot-com bust, its net revenue in 2016 was only about 7 percent of that of Amazon.

Still, the concept of network effects is important for online markets. It just needed some refinement. Much of that came from the work on multisided platforms that began around 2000. Three critical points have emerged.

(1) Network effects are usually indirect, between different kinds of customers rather than direct for the same kind of customers. As Rochet and Tirole realized in their pioneering paper, “[M]any, if not most markets with network externalities are characterized by the presence of two distinct sides whose ultimate benefit stems from interacting through a common platform.”⁴ That’s obvious in the case of two distinct groups of customers, like smartphone users and app developers, but may still be true even when the customers all look the same.

When YouTube started, for instance, ordinary people used it both to upload videos and to watch videos. A mom might upload a video of her child’s first birthday party and then watch a cute cat video that someone else had put up. People played different roles at different times. Since some people are more likely to upload videos and others are more likely to watch videos, YouTube had to court both types of people to make the network successful and couldn’t count on the fact that many people did both.

Recognizing that network effects are often indirect is important for understanding platform businesses including those that prop up the new economy. Multisided platforms can’t come

³ Miguel Helft, “What Makes eBay Unstoppable,” *The Industry Standard Magazine*, August 6, 2001. Available at <http://www.siliconinvestor.com/readmsg.aspx?msgid=16151691>

⁴ Jean-Charles Rochet and Jean Tirole (2003), “Platform Competition in Two-Sided Markets,” *Journal of the European Economic Association*, 1(4): 990-1029.

galloping out of the gates as envisioned by simple winner-take-all stories. They have to figure out how to get all sides on board in order to create any value at all. Starting a new platform is more like trying to solve a hard math problem than running a 5k.

YouTube didn't win the race to become the leading video sharing platform because it was first or because it got a nose ahead and vaulted to victory. It won because it figured out, over a very difficult start-up period when it could well have failed, the right formula for getting people to upload videos and getting people to view them.⁵

(2) Network effects result from getting the right customers, and not just more customers.

Platforms create value when customers find good matches and enter into exchanges. Density trumps scale for most platforms. That's because most customers on most platforms are not very good matches for each other. Scale helps, of course, because if there are more customers, the chance that any particular customer will find a good match increases. But for any particular customer a smaller platform with many good matches is more attractive than a bigger platform with fewer good matches.

Simply building share is a naïve, and generally unsuccessful, strategy for most online platforms. Take OpenTable, which is now the leading platform for making reservations at fine dining establishments in the U.S. and a few other countries. When it launched in the late 1990s, its investors focused on signing on as many consumers and restaurants in the U.S. as quickly as possible. That was a losing strategy. What diners care about is finding the right restaurant nearby, and nearby diners the people that restaurants care about. A Thai restaurant in Chicago isn't valuable to us if we want to go out to dinner at an Italian restaurant in Boston. OpenTable, which almost failed, pivoted and focused on creating dense demand for people and restaurants in individual cities.⁶

OpenTable also illustrates how platforms can succeed by specializing. It didn't strive to get all restaurants or all diners on its platform. It has concentrated on relatively high-end restaurants.

⁵ For a detailed discussion see *Matchmakers*, Chapter 5.

⁶ See *Matchmakers*, Chapter 1, for further discussion.

(3) Network effects can work in reverse. Networks can have exponential growth when every additional customer attracts more customers. Unfortunately, the same principle can lead to exponential decline. Each lost customer induces other customers to leave, which induces more to leave. We see the physical manifestations of reverse network effects all across America in the form of dead or dying malls. Fewer people come to a mall, stores pull out of the mall, leading to even fewer people coming.

The early literature on network effects didn't pay much attention to the potential for this reversal of fortune. Economists initially focused on physical networks, such as telephones, where physical connections and equipment made it harder for people to switch networks. It is much easier for people to switch online platforms. They can typically try a new platform without dropping the old one, probably for free, and gradually shift over if they like it. Adding or dropping a platform often just involves a few clicks.

The history of communications platforms—messaging apps and social networks—over the last two decades illustrates the importance of reverse indirect network effects as well as the data that comes along with users. People value communications platforms that have more of the people with whom they want to interact. A naïve view of indirect network effects implies that a successful communications platform would be secure from competition because people wouldn't join or use a platform that didn't include most of their personal network.

The flaw in that reasoning is that people can use multiple online communications platforms, what economists call multihoming. A few people in a social network try a new platform. If enough do so and like it, then eventually all network members could use it and even drop their initial platform. This process has happened repeatedly. AOL, MSN Messenger, Friendster, MySpace, and Orkut all rose to great heights, and then rapidly declined, while Facebook, Snap, WhatsApp, Line, and others quickly rose.

Competition is far more complex, and interesting, when we account for these three economic

aspects of network effects. Doing so is essential for conducting antitrust analysis that is grounded in business realities.

Confronting Slogans with Fact

Unfortunately, the simple network effects story leads to naïve armchair theories that industries with network effects are destined to be monopolies protected by insurmountable barriers to entry, and media-friendly slogans like “winner-take-all.”⁷ The basic empirical flaw in the simple network effects theory, and the associated slogans, is that it focuses on successful firms, at a point in time, observes they benefited from network effects, and concludes that they won it all and won’t be displaced. Those facts, even if true, don’t show that network effects are the source of their success or provide a moat around them. The “winner” could just be a lot more efficient or innovative than other firms. A true test of the theory would examine whether markets that have network effects have winners that can’t be dislodged.

It only takes one counterexample to disprove a theory, but in the case of simple network effects our counterexample cup “runneth over.” Systematic research on online platforms by several authors, including one of us, shows considerable churn in leadership for online platforms over periods

⁷ The following is a collection of relatively recent examples. The Economist, “Regulating the Internet Giants: The World’s Most Valuable Resource Is No Longer Oil, But Data,” May 6, 2017, <http://www.economist.com/news/leaders/21721656-data-economy-demands-new-approach-antitrust-rules-worlds-most-valuable-resource>. Jonathan Taplin, “Is It Time to Break Up Google?” New York Times, April 22, 2017, <https://www.nytimes.com/2017/04/22/opinion/sunday/is-it-time-to-break-up-google.html>. Farhad Manjoo, “Tech’s Frightful Five: They’ve Got Us,” New York Times, May 10, 2017, <https://www.nytimes.com/2017/05/10/technology/techs-frightful-five-theyve-got-us.html>. Jonathan Taplin, “Is It Time to Break Up Google?” New York Times, April 22, 2017, <https://www.nytimes.com/2017/04/22/opinion/sunday/is-it-time-to-break-up-google.html>; Richard Straub, “Managing in an Age of Winner-Take-All,” Harvard Business Review, April 7, 2015, <https://hbr.org/2015/04/managing-in-an-age-of-winner-take-all>. Allen P. Grunes and Maurice E. Stucke (2015), “No Mistake About It: The Important Role of Antitrust in the Era of Big Data,” Antitrust Source, 14(4), https://www.americanbar.org/content/dam/aba/publishing/antitrust_source/apr15_full_source.authcheckdam.pdf; Maurice E. Stucke and Allen P. Grunes (2016), Big Data and Competition Policy, Oxford: Oxford University Press.

shorter than a decade.⁸ Then there is the collection of dead, or withered platforms, that dot this sector, including Blackberry and Windows in smartphone operating systems; AOL in messaging; Orkut in social networking; and Yahoo in mass online media.⁹

The winner-take-all slogan also ignores the fact that many online platforms make their money from advertising. As many of the firms that died in the dot-com crash learned, winning the opportunity to provide services for free doesn't pay the bills. When it comes to micro-blogging Twitter has apparently won it all. But it is still losing money because it hasn't been very successful at attracting advertisers, which are its main source of income. Ignoring the advertising side of these platforms is a mistake. Google is still the leading platform for conducting searches, for free, but when it comes to product searches, which is where Google makes all its money, it faces serious competition from Amazon. Consumers are roughly as likely to start product searches on Amazon, the leading e-commerce firm, as on Google, the leading search-engine firm.¹⁰

The Big Data Slogan

The winner-take-all slogan can claim to be based on the simple theory of network effects. One can't claim any theoretical foundation for the new slogans around "big data." The *Economist* proclaims that, "The world's most valuable resource is no longer oil, but data." It then links data to network effects. "With data there are extra network effects. By collecting more data, a firm has more scope to improve its products, which attracts more users, generating even more data, and so

⁸ David S. Evans, "Attention Rivalry Among Online Platforms," *Journal of Competition Law & Economics*, Volume 9, Issue 2, 1 June 2013, Pages 313–357, <https://doi.org/10.1093/joclec/nht014> and Andre Boik, Shane Greenstein, Shane M. and Jeffrey Prince, "The Empirical Economics of Online Attention," (June 2017). Kelley School of Business Research Paper No. 16-57. Available at SSRN: <https://ssrn.com/abstract=2807046>.

⁹ For more details see David S. Evans, "Why the Dynamics of Competition for Online Platforms Leads to Sleepless Nights But Not Sleepy Monopolies," (July 25, 2017). Available at SSRN: <https://ssrn.com/abstract=3009438>.

¹⁰ Greg Sterling, "Survey: Amazon Beats Google as Starting Point for Product Search," *Search Engine Land*, June 28, 2016, <http://searchengineland.com/survey-amazon-beats-google-starting-point-product-search-252980>; Jason Del Rey, "55 Percent of online Shoppers Start Their Product Searches on Amazon," *ReCode*, September 27, 2016, <https://www.recode.net/2016/9/27/13078526/amazon-online-shopping-product-search-engine>.

on.” As far as we know there is no rigorous theoretical or empirical support for these statements.

Like the simple theory of network effects, the “big data is bad” theory, which is often asserted in competition policy circles as well as the media, is falsified by not one, but many, counterexamples. AOL, Friendster, MySpace, Orkut, Yahoo, and many other attention platforms had data on their many users. So did Blackberry and Microsoft in mobile. As did numerous search engines including AltaVista, Infoseek, and Lycos. Microsoft did in browsers. Yet in these and other categories, data didn’t give the incumbents the power to prevent competition. Nor is there any evidence that their data increased the network effects for these firms in any way that gave them a substantial advantage over challengers.

In fact, firms that, at their inception, had no data whatsoever sometimes displaced the leaders. When Facebook launched its social network in India, in 2006, in competition with Orkut, it had no data on Indian users since it didn’t have any Indian users. That same year Orkut was the most popular social network in India, with millions users and detailed data on them.¹¹ Four years later Facebook was the leading social network in India.¹²

Spotify provides a similar counterexample. When Spotify entered the U.S. in 2011, Apple had more than 50 million iTunes users and was selling downloaded music at a rate of one billion songs every four months.¹³ It had data on all those people and what they downloaded. Spotify had no users, and no data, when it started. Yet it has been able to grow to become the leading source of digital music in the world.

In all these and many other cases the entrants provided a compelling product, got users, obtained data on those users, and grew. The point isn’t that big data couldn’t provide a barrier to

¹¹ Alexa, “Top Sites in India,” August 30, 2006, https://web.archive.org/web/20060830074546/http://www.alexacom:80/site/ds/top_sites?cc=IN&ts_mode=country&lang=none.

¹² Caitlin Fitzsimmons, “Facebook Overtakes Orkut in India,” Adweek, August 25, 2010, <http://www.adweek.com/digital/facebook-overtakes-orkut/>.

¹³ Leena Rao, “Apple: iTunes Now Has 20M Songs; Over 16B Downloads,” TechCrunch, October 4, 2011, <https://techcrunch.com/2011/10/04/apple-itunes-now-has-20-million-songs-over-16-billion-downloads/>.

entry, or even grease network effects. As far as we know, there is no way to rule that out entirely. But there is no empirical support, at this point, that this is anything more than a possibility, which one might explore in particular cases.

March to the Evidence

Nothing we've said here is intended to endorse a "go-easy" policy towards online platforms when it comes to antitrust enforcement. Indirect network effects could result in some categories being natural monopolies with high barriers to entry. It is even possible that having mounds of data could help. Our point is that this is far from inevitable.

Moreover, online platforms, whether they have won a category or not, could certainly engage in anticompetitive practices. There's no particular reason to believe these firms are going to behave like angels. Whether they benefit from network effects or not, competition authorities ought to scrutinize dominant firms when it looks like they are breaking the rules and harming consumers. As always, the authorities should use evidence-based analysis grounded in sound economics. The new economics of multisided platforms provides insights into strategies these firms may engage in as well as cautioning against the rote application of antitrust analysis designed for single-sided firms to multisided ones.

It is time to retire the simple network effects theory, which is older than the fax machine, in place of deeper theories, with empirical support, of platform competition. And it is not too soon to ask for supporting evidence before accepting any version of the "big data is bad" theory.

Competition policy should march to the evidence not to the slogans.