Multinationals in the digital economy

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Modern digital services largely come from multinationals whose size and scope are literally without precedent. Yet it has not always been this way. Just a few decades ago, users typically turned to local firms for most kinds of information. And historically software was known for low barriers to entry and quick rise of startups and small firms. This article examines the forces contributing to the rise of digital MNCs, as well as the challenges they face.

Scope of digital multinationals

The digital revolution has affected substantially every business. For some, improved technology calls for adjusting supply chains and reworking operations to increase efficiency. For others, new technologies bring new competitors. In certain sectors, new technology effectively reworks an entire business which must now operate digitally.

As digital technologies permeate MNCs, the impacts in many respects match digital technologies at domestic firms. For most such firms, the fundamental benefits of digital technologies are better collection and processing of more information, and greater ability to find patterns and insights in that information. But these capabilities distinctively benefit large firms. For example, large firms typically must allocate inventory across multiple and distant facilities, necessitating collecting information that cannot be observed from any single location. One might imagine allocating inventory through a paper-based process, as firms did some decades ago, but digital tools bring massive efficiencies in speed and accuracy, as well as analysis to yield prudent business decisions. In parallel, large firms need to track customer purchases in order to predict demand and assure adequate supply. Here too, digital solutions offer major advances—tracking more data, more quickly, at lower cost, and with greater opportunity for analysis and insight. Meanwhile, large firms manage work forces spread across numerous sites, and digital methods bring efficiency to both assignments (how many staff will be needed at a given site on a given day and time) and operations (assuring that staff are properly paid for time worked). A mom-and-pop marketer often has an intuitive sense of what advertising strategies are most appropriate, but a large firm needs data and analysis to rigorously assess myriad marketing efforts over numerous regions. Ultimately, the size and scope of a large firm are a clear match for the breadth, accountability, and control provided by effective digital tools. MNCs being especially large, they tend to enjoy all these benefits in spades.

Indeed, large firms make striking investments in digital technologies. For example, in 2018, Walmart spent an estimated $11.7 billion on IT, including hand-held devices and advanced cash registers for store staff, as well as increased robotics for both warehouses and stores.[1] This amount totaled approximately 2% of company revenue, approximately four times what the company spent on new stores, expansions, relocations, and remodels.[2] Clearly Walmart views digital investments as important. While Walmart is distinctive in its overall size, other firms usually spent more on IT as a proportion of revenue. A survey of it spending found that, across a range of industries, even the 25th percentile IT spend systematically exceeded 1% of firm revenue, while top-spending financial services firms spent more than 11% of

[1] Kim Nash, "Amazon, Alphabet and Walmart were top IT spenders in 2018," Wall Street Journal, January 17, 2019.
[2] Walmart Inc. 10-K for the fiscal year ending January 31, 2019, section "strategic capital allocation."

revenue on IT, and top-spending health care firms spent more than 5% of revenue on IT. Figure 1 summarizes survey results.

It is easy to shrug off multinationals' digital functions as routine and unremarkable. But the firms gain significant advantages from faster or better implementations of digital technologies. Airlines' early use of IT offers multiple notable examples. Consider American Airlines' 1970s efforts to provide SABRE computer terminals to interested travel agencies. Participating travel agents could browse and confirm American flights nearly instantly, whereas booking another airline's flights required making a phone call and often waiting several hours for confirmation that the desired seats were available. American reported that its first 200 travel agent installations yielded a 500% return on investment.[3] American saw similar high benefit to its early efforts at yield management, employing digital technology to adjust prices so that each seat was sold for as much as possible. As of 1992, American estimated that yield management brought annual incremental profit of over $500 million.[4] (For comparison, American's operating profit averaged $168 million per year in the surrounding three years—so the loss of yield management would have swung the company from a modest profit to a larger loss.) For both travel agent connections and yield management, American enjoyed particularly large benefits because, at the outset, competitors lacked similar methods.

More recently, digital technologies are often most striking when they run amok. Continuing in airlines, consider the chaos when a reservation system fails, such as the 75,000 passengers stranded when a power outage disabled British Airways computers in 2017.[5] When Delta Air Lines' operations computers failed for five hours in 2016, two thousand flights were canceled, and the company said it incurred costs of some $150 million as a result.[6] Perhaps the most harmful digital failures are those that linger for months or years without significant attention. While Walmart touts its efficient supply chain that predicts inventory needs and avoids stockouts,[7] analysts criticized struggling retailers Kmart and Sears for, among other things, inventory mismatch that kept unpopular items on shelves despite stockouts of items customers were more likely to buy.[8] Clearly Kmart and Sears faced a range of operational and strategic challenges. But better IT—and better use of IT—offer the beginnings of a path forward.

One might not ordinarily think of airlines or retailers as core digital firms. But as these examples show, digital strengths can offer distinctive advantages, while digital failures can undermine a firm's value to customers. Nonetheless, the balance of this chapter will look at firms we might call "core digital MNCs," distinctive in that they build digital offerings as their primary product or service.

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[3] U.S. District Court, Central District of California, "Memorandum from T.G. Plaskett to A.V. Casey," American Airlines documents AA080713–AA080714, January 17, 1977.

[4] Barry Smith, John Leimkuhler, and Ross Darrow, "Yield management at American Airlines," *Interfaces* 22: 1, January-February 1992, pp. 8-31.

[5] "British Airways: Thousands disrupted as flights axed amid IT crash," BBC News, May 27, 2017.

[6] Chris Isidore, "Delta: 5-hour computer outage cost of $150 million," CNN Business, September 7, 2016.

[7] Christy Brooks, "Why smarter inventory means better customer service," Walmart, August 16, 2017, https://corporate.walmart.com/newsroom/business/20170816/why-smarter-inventory-means-better-customer-service . Charisse Jones, "What's killing Sears and Kmart?", USA Today, March 22, 2017.

[8] Jessica Tyler, "We went to a Kmart store and saw why the company is in danger of shutting down," Business Insider, April 8, 2018, https://www.businessinsider.com/kmart-store-photos-details-2018-3 .

Core digital multinationals

The obvious digital multinationals are the tech titans that have become established household names: Amazon, Apple, Facebook, Google, and Microsoft. These firms provide a range of partially-overlapping software and services that have transformed information, communication, and marketing. Figure 2 lists key offerings from these firms. Figure 3 presents selected milestones in digital technologies—reminding how far we have come and how quickly. Notice also a pronounced shift from business services (such as early computing for business and government operations) to leisure (such as media and entertainment).

The largest digital firms have enjoyed a striking rise in size, prowess, and overall power. Figure 4 lists the top worldwide firms by market capitalization, with core digital multinationals now occupying seven of the top ten spots. Figure 5 plots the market capitalization of selected firms fairly classified as core digital multinationals, showing extreme growth over time. These high valuations imply that capital markets think these firms have considerable staying power and are likely to remain profitable in the future, suggesting that these digital MNCs are here to stay. These high valuations are also striking because core digital multinationals tend not to employ large numbers of workers. Figure 6 ranks the top global employers, with only two digital firms present among the top ten. The only US digital MNC with both high valuation and high employment is Amazon. Amazon's presence on both lists results from its business model: Amazon not only runs a web site where customers make purchases, but also stores goods in its own warehouses and increasingly delivers goods via its own trucks—yielding significant employment in warehouse and deliver operations. In contrast, other digital MNCs tend to forego warehousing and delivery; for example, Google and Facebook hold no inventory and deliver no goods, instead leaving those tasks to their advertisers.

Factors causing the rise and persistence of digital multinationals

Multinational corporations dominate many parts of economy, but there are heightened reasons to expect powerful MNCs in software. Producing digital goods, they can ship their final products perfectly, instantly, and free of charge. Furthermore, their costs are mostly fixed with respect to quantity sold, with little to no cost for each additional customer. As a result, any local firm's effort to make its own version would be, in a certain sense, both duplicative and inefficient. Jointly, these factors provide reason to expect that the digital economy will remain, and increasingly be dominated by, multinational firms—with correspondingly less digital service for some reason confined by national boundaries.

Meanwhile, there are usually significant benefits to standardization across countries, including the ability to communicate with and interoperate with others. Standardization begins with hardware: Two decades ago, world travelers struggled with some dozen-plus different telephone sockets used around the world, but Ethernet connectors (for wired Internet) and WiFi are global standards that work equally everywhere. File formats have similarly been standardized: The Unicode character set lets a modern digital document present text in substantially any language used anywhere in the world.[9] At the dawn of the PC era, US firms focused their efforts on domestic customers and largely supported only English, leaving firms outside the US to devise software for other languages. For example, in 1978 Toshiba released the JW-10 word processor for Japanese users, including an innovative solution for phonetic entry of the 40,000-plus kanji characters in Japanese writing.[10] Fast forward two decades, and Microsoft

[9] Unicode Consortium, https://home.unicode.org/ , last checked September 23, 2019.

[10] "Historical Computers in Japan – Japanese Word Processors – Toshiba JW-10," IPSJ Computer Museum, http://museum.ipsj.or.jp/en/computer/word/0049.html , last checked September 23, 2019.

Office accommodated substantially all languages while serving as a de facto global standard. Users in Japan no longer needed a special "Japanese-compatible" computer or software, because standard global computers could do the job.

Online services similarly demonstrate the benefits of efficient global firms. In principle each community could devise its own classified ad marketplace, but the Craigslist goliath offers standardized taxonomy and functionality in 700 cities across 70 countries. As social networks began, some countries favored locally-developed versions of the "friend," messaging, and photo features now routine at Facebook, but Facebook ultimately subsumed those competitors almost everywhere. Multinational standard-bearers benefited from the cost-effectiveness of building their features once to deploy globally: A classified ad site that served a small city would struggle to justify building a complex category taxonomy, cross-linking, or neighborhood filters. But Craigslist can build these features once and offer them globally, so even small markets get them automatically and with near-zero cost. Furthermore, for general-purpose tools, there has usually been little difference in fundamental requirements across countries. The same features that make Craigslist useful in Chicago make it useful in Cairo. Local or national incumbents struggle to match these capabilities, which in turn encourages users to switch to the feature-rich offerings from multinational firms.

Factors limiting digital multinationals

While digital firms show a clear leaning towards multinationals, some offsetting factors encourage local production. Local firms sometimes have a materially greater unit revenues or lower costs, either of which can give local firms an advantage over multinationals.

A local firm's revenue advantage typically comes from better understanding of customer requirements, letting the firm generate greater revenue from the same users. Consider a local service distinctively tuned to local tastes or local requirements. We have seen some evidence of local customizations proving important. For example, Japanese users seem to prefer "full" screens (with more text including numerous advertisements) compared to US users often enjoying sparse screens. By all indications, this difference historically helped Japan's ecommerce platforms hold off global competitors. A multinational competing in Japan would miss the greater revenue from intensive advertising, putting itself at a perpetual revenue disadvantage.

A local firm's cost advantage can come from regulatory requirements, which local firms often find it easier to understand and comply with. Regulation was a particularly prominent factor in China, where the government banned various sensitive terms and subjects and required removing certain material. In many circumstances, China even required online services to link users' online activities to their offline identifies, for example by asking users to upload photos of themselves holding government-issued ID cards.[11] These requirements were distinctively difficult for global firms. First, these requirements differed from standard practice elsewhere, so complying would require building all manner of features for use solely in China. Despite the obvious appeal of China's huge market, global firms often viewed these features as a lower priority since they would not be used elsewhere. Second, employees and culture at global firms tended to find China's requirements distasteful—in tension with western norms of free expression and unfettered communication. Collectively, these factors helped preserve and

[11] "China," OpenNet Initiative, https://opennet.net/research/profiles/china-including-hong-kong , last checked September 23, 2019.

strengthen China's national services and prevent consolidation onto global platforms. Combining the limitations of MNC services with China's large market and the country's ample technical talent, China came to enjoy local firms that built their own versions of Internet standard-bearers. For example, Chinese users tend to turn to Baidu rather than Google, WeChat rather than Facebook, Taobao rather than eBay, and similarly to national replacements for most of the well-known services otherwise used worldwide. But Chinese services need not stop at mimicking MNC functions. In numerous areas, Chinese firms developed faster, better, or simply differently. For example, WeChat went well beyond features familiar to Facebook users; WeChat includes modules for paying bills, ordering food, and online shopping.

Local firms can also enjoy a cost advantage from local servers which in principle provide faster service than remote servers. Historically, this difference was most important for services with large files (especially video) or latency-sensitive functions (where speed of transmission from user to server and back was particularly important, such as when editing a document on a server). But global firms have found ways to address these needs. For one, improved software design reduces pressure on these technical requirements. Rather than send each keystroke to a remote server before it is shown on-screen (as was standard in early remote-computing services such as Telnet), edits can be made locally and synchronized to and from a server periodically (as Dropbox, Google Drive, and Microsoft OneDrive do). Furthermore, MNCs can arrange local servers where the performance difference is material. (Google says it has 14 datacenters in four continents.[12] Microsoft offers Azure cloud hosting in 50 datacenters on all six inhabited continents.[13]) Finally, "content distribution networks" such as Akamai and CloudFlare help even small sites get the benefits of local servers without the cost of placing servers in myriad locations around the world.[14]

One might also question the need for goliath MNCs because software has low barriers to entry. Proponents of this view emphasize that software tends not to be capital-intensive, giving startups some important advantages. There is some evidence in support of this perspective, including some large offerings that originated with small teams and little capital. (Facebook's founder-CEO personally coded much of the company's initial site from his dorm room—using his know-how in place of raising capital to pay professional developers. A decade later, communication service WhatsApp needed a staff of just 19 to provide communication service to 465 million users.[15]) Nonetheless, experience reveals that successful firms quickly evolve into MNCs providing global service from a centralized location. Simple as Facebook might have been at the outset, the company now employs approximately 40,000,[16] from engineers to product managers to sales staff, along with some 15,000 "moderator" contractors (who evaluate sensitive or disputed content).[17] This scale could hardly be more different from a dorm room

[12] "Google Datacenters," https://www.google.com/about/datacenters/ , last checked September 23, 2019.
[13] "Azure Regions," Microsoft Azure, https://azure.microsoft.com/en-us/global-infrastructure/regions/ , last checked October 8, 2019.
[14] "CloudFlare Plans," https://www.cloudflare.com/plans/ , last checked September 23, 2019.
[15] Reed Albergotti, Douglas MacMillan, and Evelyn Rusli, "Facebook to Pay $19 Billion for WhatsApp," Wall Street Journal, February 19, 2014. J. Clement, "Number of monthly active WhatsApp users worldwide from April 2013 to December 2017," Statista, https://www.statista.com/statistics/260819/number-of-monthly-active-whatsapp-users/ .
[16] "Facebook Newsroom," https://newsroom.fb.com/company-info/ , last checked September 23, 2019.
[17] Joshua Brustein, "Facebook grappling with employee anger over moderator conditions," Bloomberg, February 25, 2019.

hobby. Doing the job right—amply understanding requirements of users and advertisers in order to build services they value; evaluating processes and partners to protect privacy; examining and removing improper material—has proven difficult at every turn. If it can be done at all, it appears to require the scale that only an MNC can bring. (To be sure, there is no consensus that Facebook does it well.)

The bottom line is that the digital economy is more centralized than some might expect, and more centralized than some intuition might have predicted.

Labor and trade

MNCs in tech notably imply increased remote production. Of course remote production is nothing new; factories have long produced cars, electronics, and even prefabricated homes. But remotely-produced software portends remote production of an ever-growing share of value in economy. Previously, local advertising spurred the production of local news media. (Think a Cleveland car dealership advertising in a Cleveland newspaper or on a Cleveland radio station.) These days, remotely-produced advertising services yield funding for remote production of other online services. (Consider that same car dealership advertising on Google or Facebook.) Changes in advertising and media bring the loss of reliable middle-class jobs—reporters, radio announcers—along with weighty questions about future of journalism. But changes need not stop at the media. If a small business stores its financial records in online accounting software, it may prefer remote accountants rather than local accountants working on-site. Digital transformation similarly destabilizes the local loop that previously kept most advertising expenditures within a local economy: Canonically, a local car dealership paid a newspaper which hired a reporter who bought a car. But when a car dealership advertises on Google or Facebook, funds flow to software engineers in Silicon Valley who are unlikely to shop at that car dealership.

Historically, customer service jobs have appeared to be safe from transfer overseas, as face-to-face service was widely seen as fundamental. But this too is beginning to change via superior software and telecommunications. For some years, a call to a bank, credit card issuer, or airline could be answered by a representative half a world away. These days, the intercom at a fast-food restaurant's drive-through window may connect to a clerk in another state, or for that matter another country.[18] With cheap communications and an easy mechanism for that clerk to enter the order into reliable IT, the clerk need no longer be on site. Here too, the digital economy further expands what jobs can be outsourced, to where, and with what ease for firms.

A potential offsetting factor is that digital tools can facilitate local innovation and employment. Consider tech tools productively "assembled" in-country when they are used to make custom software. Historically, Microsoft embodied this model through its tools division, offering such systems as Visual Basic to let non-technical staff build software for their companies' idiosyncratic requirements. Historically, Microsoft's tools began with the basics—providing pre-built user interface components and standardized methods for file storage, so developers could focus on business logic. Google subsequently added higher-level services such as mapping functions to let developers present and analyze geographic data. Under this approach, firms seek to distinguish themselves through software and business processes embodied in software. For example, a mom-and-pop appliance repair shop could deliver superior service not just through friendly technicians but through custom software that helps the firm recognize repeat customers and recurring problems. More recently, Amazon, Google, and Microsoft all

[18] Matt Richtel, "The long-distance journey of a fast-food order," New York Times, April 11, 2006.

provide software libraries to help software developers harness the power of artificial intelligence—letting a developer get many of the advanced capabilities used by large firms without understanding the statistic and data science that support these methods.

Nonetheless, custom software seems to be an imperfect fit for most customers. By all indications, companies largely want prebuilt software. A goliath like UPS may want to schedule and dispatch its own trucks, and may perceive that it can gain competitive advantage from a better algorithm or from software uniquely tailored to its requirements. But a typical mom-and-pop appliance repair shop just wants a program to tell its half-dozen technicians which customers to visit each day. Rare is the small firm inclined to design and build this software itself. More often, a small firm prefers to license an off-the-shelf solution such as a standard suite for scheduling and dispatching field staff. The software—and the value-add it brings—thus end up being remotely produced.

Regulation

Initially, some companies and analysts thought that multinational tech companies might not be subject to local laws. If a company had no servers or staff within a country, it often felt little need to comply with that country's laws. In an influential early essay, political activist John Perry Barlow declared that not only were governments "not welcome" in cyberspace, but they would have no ability to enforce their rules there.[19]

An early dispute between Yahoo and French activists demonstrates the broad contours of such disputes. In 2000, complainant LICRA (the International League against Racism and Anti-Semitism) challenged Yahoo Auctions selling Nazi memorabilia. LICRA saw these sales as violating Article R645-1 of the French Criminal Code and, in LICRA's view, an attack on a terrible period in France's history. But Yahoo saw itself as a US company, noting that its servers were located entirely in the US, its services were primarily aimed at US residents, and that US courts would not enforce any judgment arising out of these facts. The French court ruled for LICRA, noting that French law was clear, that the auctions at issue were open to bidders from any country including France, and most of all that Yahoo was clearly aware that French residents used its auction site. In particular, the court noted that Yahoo showed French-language advertisements on its pages when they were accessed from computers in France. With Yahoo able to recognize French users for the purpose of showing targeted advertising, the court thought Yahoo should similarly restrict French users from accessing, not to mention bidding on, the offending auctions. Rather than continue to fight in France, Yahoo brought its own lawsuit in the United States, seeking an order that the French ruling was inapplicable and unenforceable in the US. The district court was receptive, finding the underlying French law to be inconsistent with the First Amendment to the US Constitution, but the US Court of Appeals for the Ninth Circuit pointed out that US courts lacked personal jurisdiction over LICRA, a French non-profit with no ties to the US.[20] Meanwhile, Yahoo chose to disallow the sale of Nazi memorabilia from its service worldwide, and in 2007 Yahoo shut most of its auctions site worldwide. These developments effectively mooted the dispute, yet the proceedings were nonetheless instructive in revealing the facts and methods of cross-border disputes about multinational tech firms.

More recently, MNC tech firms have come to recognize the power of national sovereignty. First, MNCs typically find they need significant resources in most countries in order to deliver the best possible

[19] John Perry Barlow, "A Declaration of the Independence of Cyberspace," Wired, June 1, 1996.
[20] *Yahoo! Inc. v. LICRA and UEJF*, 433 F.3d 1199 (9th Cir. 2006).

service. Often, MNCs want servers in-country in order to provide rapid and cost-effective data transmission. This is particularly important for services with high sensitivity to delay (such as online applications) and high data volume (like video).

Second, MNC tech firms increasingly employee staff within most countries. For example, as of 2019, Google reports 70 offices in 50 countries.[21] As online services have become more widely-used, sales efforts are correspondingly broader—calling for a larger sales staff including sales staff in most countries where advertisers reside. Selling advertising to car dealerships, dermatologists, lawn care services, and countless others, a large in-country sales force is far more effective in local knowledge, cultural connection, and language—effectively requiring MNC tech titans to employ at least sales staff worldwide. Google's UK team is instructive: Of 3,658 Google employees in the UK in 2018, 1,451 were in marketing and sales[22]—despite the company's substantial R&D and engineering offices. In countries where MNC tech firms lack R&D and engineering offices, sales staff represent an even larger proportion of in-country employees (often, substantially all).

National sovereignty has further grown in power because many countries have found ways to block access to MNC sites and services they dislike. At least 39 countries have blocked material they find unlawful or unwanted.[23] (Figure 7 presents a list.) Some of these countries have mixed records on freedom of expression. (15 of these 39 countries appear in the bottom 20% of the Reporter without Borders 2019 World Press Freedom Index.) Other countries are widely perceived to support freedom of expression but nonetheless block certain material. A third set of countries increasingly challenge the historic US norm of tech platforms hosting and distributing all manner of content, and seek restrictions to embody restrictions on information disfavored under national law.[24] The technology of blocking remains imperfect—often suffering false positives, such as blocking entire web sites in order to disable individual pages.[25] Furthermore, a country typically incurs an up-front cost to begin blocking—compelling all Internet services providers in the country to receive and process block requests, or redesigning the country's Internet infrastructure to send data through checkpoints where government equipment can block disfavored communications. But as more countries implement these changes, the path for others becomes increasingly clear. Today's MNCs cannot assume that their online presence is unblockable.

Indeed, governments have developed increasingly flexible and multifaceted strategies to impose their requirements on MNCs. As discussed above, governments can block access to disfavored sites. For a greater likelihood of imposing restrictions on a global basis, a country can seek to seize the domain name that makes a web site available worldwide. Best-known in this vein is the US's 2012 seizure of Megaupload, a filesharing site accused of copyright infringement.[26] The US is particularly well-positioned to take such actions because many domain names are registered in the US. (Indeed, the

[21] Our Offices, Google, https://about.google/intl/en_us/locations/ , last checked October 2, 2019.
[22] Mark Sweney, "Google's UK staff paid package of £226,000 on average in 2018," The Guardian, April 3, 2019.
[23] Author's calculations from OpenNet Initiative, Internet Filtering Data, https://opennet.net/research/data .
[24] See generally OpenNet Initiative Reports and Articles, https://opennet.net/reports .
[25] Benjamin Edelman, 2003, "Web Sites Sharing IP Addresses: Prevalence and Significance," https://cyber.harvard.edu/people/edelman/ip-sharing/ .
[26] *United States v. Kim Dotcom, Megaupload Limited, et al.* (E.D.Va. 2002).

registries for the largest top-level domains, including .COM, .NET, and .ORG, reside within the US, and US courts have heled that such domains can be seized at the location of their registry.[27])

A notch closer to longstanding processes, governments can pressure MNCs via the traditional legislative channels of political pressure, hearings, and potentially new laws. Dissatisfied with MNCs using material from Spanish publishers, Spain in 2014 effectively required search engines to make certain payments to news sites.[28] Such new laws do not always work perfectly. Indeed, Spain's 2014 approach let search engines avoid the payments by closing their news businesses in Spain, as Google did in response to the law. Nonetheless, when a MNC's tactics are viewed as sufficiently urgent that new legislation is within reach, the legislative power gives governments more power than skeptics initially thought.

Finally, governments can invoke traditional law enforcement mechanisms of fines and other enforcement actions. Figure 8 lists selected fines against digital MNCs. In important respects, these mechanisms work especially well against the largest companies. On one hand, MNCs have ample resources to fight the fines, including vigorous opposition on the merits as well as procedural wrangling designed to cause delay. But when legal avenues are exhausted, MNCs have little choice but to comply. In that regard, MNCs are importantly different from tiny firms that are more likely to change names and shift tactics. For example, when litigation led to demise of Napster,[29] copycats created Grokster and dozens more, and piracy continued unabated.[30] In contrast, large companies have much less ability to defy the law.

Nonetheless, many MNCs can avoid laws they do not like, and in a range of situations can largely do what they want, despite laws and regulations purportedly on point. Uber is an informative example, though in some respects an outlier. As it dispatched vehicles without the licenses and formalities some jurisdictions sought to require, Uber was repeatedly found to violate national or local law. A city or country seeking to rein in Uber could order the company to cease operations, but often Uber continued anyway,[31] correctly perceiving that governments would be ill-equipped to stop it. With most Uber engineers and systems in California headquarters or otherwise out of reach, local regulators could not attach Uber assets or directly enforce their rules as they might against an ordinary local firm. An aggressive jurisdiction could pursue criminal sanctions against local Uber managers, and indeed France briefly jailed two Uber regional managers in 2015.[32] But most jurisdictions seemed to consider such an approach excessive and disproportional—reinforcing Uber's sense that it could proceed without significant risks. In due course Uber was often able to push for revision to laws the company deemed unwelcome or ill-advised—and more often than not, Uber prevailed.[33] YouTube's experience is broadly similar: Despite controversial videos prompting partial or complete bans in at least 26 countries,[34]

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[27] *Mattel v. Barbie-Club.com*, 310 F.3d 293 (2nd Cir. 2002).
[28] Spain, Law 21/2014, Revising the Intellectual Property Act.
[29] *A&M Records, Inc. v. Napster*, 239 F.3d 1004 (9th Cir. 2001).
[30] See e.g. Brendan Koerner, "Why is Napster shut down but Grokster's still running?," Slate, March 8, 2002, https://slate.com/news-and-politics/2002/03/why-is-napster-shut-down-but-grokster-s-still-running.html .
[31]
[32] Romain Dillet, "Uber France leaders arrested for running illegal taxi company," TechCrunch, June 29, 2015, https://techcrunch.com/2015/06/29/uber-france-leaders-arrested-for-running-illegal-taxi-company/ .
[33] See e.g. Olivia Solon, "How Uber conquers a city in seven steps," The Guardian, April 12, 2017, https://www.theguardian.com/technology/2017/apr/12/why-everyone-hates-uber-seven-step-playbook .
[34] Author's tabulation based on Wikipedia, "Censorship of YouTube," https://en.wikipedia.org/wiki/Censorship_of_YouTube , last checked October 7, 2019.

YouTube retained its overall business model including receiving and distributing videos without advance human review. Courts may criticize aspects of this operation as improper, harmful, or unlawful, but so far they have found no practical way to significantly change YouTube's approach.

Tax

The tax questions posed by multinational technology companies are broadly similar to other tax questions for large firms. Often, the most fundamental question is where value is created and thus where it should properly be taxed. But large technology companies have a particularly clear opportunity to use transfer pricing to assign value to low-tax jurisdictions. Notably, for most technology companies, value results in large part from the underlying intellectual property which, as an intangible, can be placed almost anywhere. Compare classic manufacturing, where the location of a factory is usually importantly constrained by factors such as transportation costs, location of inputs, and location of customers.

[authors], in this volume, further explore questions of multinational tax.

Innovation and value

Analysts sometimes remark on both the high value of tech startups and the ease of starting such firms. Indeed, Hewlett and Packard in 1938 began developing their first product in a garage in greater San Francisco. More recently, Amazon and Google continued the tradition of reducing overhead by beginning in suburban garages. As mentioned earlier, Facebook's Zuckerberg personally wrote much of Facebook alone in his dorm room—making Facebook an instant hit across the Harvard campus before the company paid a dollar of rent. Capital requirements have dropped further because modern startups rent servers in the cloud, paying by the hour for compute capacity as needed, rather than needing to buy servers up-front. Collectively, these experiences and facts yield a widely-held understanding of the modest capital required to begin a tech firm.

Despite historic low barriers to entry, analysts subsequently observed that the greatest tech innovations now come from tech giants. One might cite self-driving cars, but also balloon internet, voice assistants, facial recognition, and cloud computing. Furthermore, a series of critics suggest that established tech firms tend to favor their own products—Google hesitating to link to other companies' review sites or travel tools[35]; Facebook trying to prolong users' sessions in its tool, rather than send users to publishers' sites.[36] On this view, the canonical startup in a garage increasingly fades into the past. Indeed, by some metrics, a declining share of tech firm value flows to startups, and a growing share to giants.[37] Investors increasingly counsel startups to design their products to stay out of the way of tech giants.[38]

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[35] Conor Dougherty, "Inside Yelp's six-year grudge against Google," New York Times, July 1, 2017. Foo Yun Chee, "Expedia Files google Complaint to EU Regulators," Reuters, March 30, 2012. The author historically wrote and spoke about a range of similar concerns.

[36] Alexis Madrigal, "When the Facebook traffic goes away," The Atlantic, October 24, 2017.

[37] See e.g. Pamela Parker, "Google, Facebook ad gains continue to shrink what's left for everyone else, says analyst firm," Marketing Land, March 28, 2019, https://marketingland.com/google-facebook-ad-gains-continue-to-shrink-whats-left-for-everyone-else-says-analyst-firm-259040 (finding a 7.2% year-over-year decline in ad spend available to all other online media).

[38] "American tech giants are making life tough for startups," The Economist, June 2, 2018.

The growing power of MNC tech giants shifts the tone of discussion as to regulation of tech. By all indications, countries increasingly perceive themselves as subject to the whims of tech giants, rather than vice versa, and some countries find that alarming. Where tech incumbents previously trumpeted low barriers to entry and new startups as reasons why governments need not fear incumbents' size and power, that argument increasingly rings hollow. For MNCs, these developments are a mixed bag. On one hand, governments' concerns result from large business opportunities that truly benefit from an MNC's scale. At the same time, these developments compel greater accountability to assure that changes truly advance shared values. Ultimately these developments set virtuous incentives – for MNCs both to set lofty goals, and then for them to deliver on those ambitions.

Looking ahead

MNC tech giants have brought undeniable advances. Not long ago, it would have been inconceivable to search the world's information with the scale and insight Google routinely brings. Self-publishing videos at YouTube, or almost anything on Facebook, gives unprecedented opportunities to an army of enthusiasts—whether a new band finding an audience, a handyman teaching do-it-yourselfers, or a teacher explaining elementary mathematics. And Amazon delivers an unmatched assortment of products at speed and cost that were, until recently, unthinkable. Consumers relish these offerings, and tend to clamor for them as they become available globally.

Yet the tech backlash is equally undeniable. Millions of users install special web browsers or plug-ins designed to impede advertising and tracking they see as inappropriate. A growing meme celebrates deleting a Facebook account. Regulators the world over identified a range of tech giant practices they seek to change, and every tech giant seems to carry a giant regulatory bullseye.

While regulators raise diverse concerns, questions of international boundaries loom large. Europeans regulators wonder why so few European companies are leaders in tech—and what it means if European consumers and firms are reliant on, and obliged to pay for, American technologies. Meanwhile American tech firms criticize European requirements for privacy, competition, and more. In parallel, China de facto built its own tech titans, making the country independent of global standards but hindering some kinds of cross-border communication and commerce. The international openness that allowed the rise of global tech titans—and the Internet itself—seems increasingly tenuous.

Separately, the growth of tech giants raises questions of firm boundaries and where MNC dominance will lead. Whatever their preferences, many critics seem to have made peace with computer software following global standards and disproportionately emanating from the United States. But notice Google's moves towards driverless cars (via its parent company Alphabet), Amazon's moves towards both movie production and logistics, and Facebook's moves towards Internet access, each among countless others. For these firms, these are logical extensions of their supply chain and distribution chain, and opportunities to continue to grow to meet investor expectations. Yet these expansions also bring new kinds of opposition and increasingly diverse incumbents. With these and other extensions, the next two decades of MNC tech firms may look quite different than the last.

Figures

Figure 1: IT Spending as a percentage of revenue by industry

Industry	IT spending range (25^{th} to 75^{th} percentiles)
Discrete manufacturing	1.4% to 3.2%
Financial services	4.4% to 11.4%
High tech	2.6% to 4.7%
Retail	1.2% to 3.0%
Health care	3.0% to 5.9%

Source: Frank Scavo et al, "IT Spending as a Percentage of Revenue by Industry, Company Size, and Region," Computer Economics – Metrics for IT management, 2019, https://www.computereconomics.com/article.cfm?id=2626 .

Note: Based on survey of 232 IT organizations in the US and Canada, stratified between small, midsized, and large organizations. Firms with less than $1 million of IT spending were excluded.

Figure 2: Selected offerings from digital titans

Amazon: Retail, marketplace, cloud, advertising services, streaming

Apple: Phone hardware and software, computer hardware and operating system

Facebook: Social networking, advertising services, communication tools

Google: Search engine, advertising services, phone software, communication tools

Microsoft: Computer operating system, productivity tools, developer tools, cloud

Note: Each firm has numerous additional offerings not listed.

Source: Author.

Figure 3: Selected milestones in digital technologies

1969 ARPANET, a predecessor to the Internet, begins operation with funding from the US government

1979 The VisiCalc electronic spreadsheet launches, demonstrating the benefit of personal computers in the workplace

1981 IBM releases its Personal Computer, with 16KB of user memory

1983 Cellular telephone service is introduced

1989 British computer scientist Tim Berners-Lee proposes a distributed information system that became what we now call the worldwide web

1994 Netscape releases version 1.0 of its Navigator web browser

1995 Microsoft releases Windows 95, with multitasking to run multiple programs simultaneously

1998 Ecommerce takes off in the United States, and as many as 50 million US households purchase products over the Internet

1998 Google begins public usage of its search engine

2000 Concerns about the new century and millennium spark upgrades to IT infrastructure, but few significant disruptions

2001 Struggling to sell programs that users install on their computers, software developer Concur reinvents itself as "software as a service"—running programs on Internet servers

2007 Apple releases the first iPhone, with a touch screen and support for viewing most web pages

2007 Netflix mails its billionth DVD, and announces its planned shift to streaming video delivery

2008 HTC releases the first smartphone running Google Android

2009 Airbnb begins its peer-to-peer booking service for overnight accommodations

2010 Google's YouTube reaches 1 billion video views per day and 24 hours of video uploaded per minute

2010 Apple releases iPad tablet, with larger screen and extended battery life

2013 Uber and Lyft launch electronic ride hailing with casual drivers driving their own cars

2017 Netflix achieves as many US subscriptions as all US cable TV networks combined

Source: Author

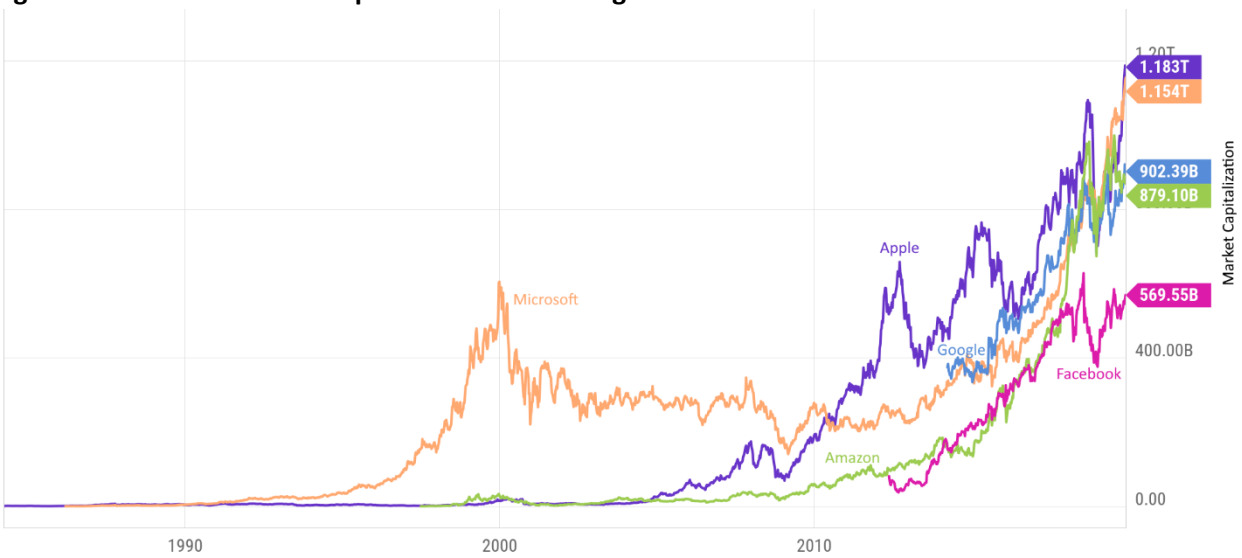
Figure 4: Largest global firms by market capitalization

Rank	Company name	Location	Sector	Market Cap ($b)
1	**Microsoft**	**US**	**Technology**	$905
2	**Apple**	**US**	**Technology**	$896
3	**Amazon**	**US**	**Technology**	$875
4	**Alphabet**	**US**	**Technology**	$817
5	Berkshire Hathaway	US	Financials	$494
6	**Facebook**	**US**	**Technology**	$476
7	**Alibaba**	**China**	**Technology**	$472
8	**Tencent**	**China**	**Technology**	$438
9	Johnson & Johnson	US	Healthcare	$372
10	Exxon Mobil	US	Oil & gas	$342
11	JP Morgan Chase & Co	US	Financials	$331
12	Visa	US	Financials	$314
13	Nestle	Switzerland	Consumer goods	$292
14	ICBC	China	Financials	$287
15	Walmart	US	Consumer goods	$280
16	Bank of America	US	Consumer goods	$266
17	Procter & Gamble	US	Consumer goods	$266
18	Royal Dutch Shell	United Kingdom	Oil & gas	$256
19	Novartis	Switzerland	Healthcare	$245
20	**Verizon Communications**	**US**	**Technology**	$244

Note: Market capitalization as of March 31, 2019. Technology companies shown in bold.

Source: Author, adapted from Bloomberg with PwC Analysis, "Global top 100 companies 2019" at section "top 100 global companies 1-20," July 2019, https://www.pwc.com/gx/en/audit-services/publications/assets/global-top-100-companies-2019.pdf .

Figure 5: Growth in market capitalization of core digital multinationals



Note: Chart shows each firm's market capitalization, beginning with its IPO. The labels in the right margin give market capitalizations of the respective firms as of November 25, 2019.

Source: Adapted from Ycharts.com

Figure 6: Largest global employers

Rank	Company name	Location	Sector	Employees
1	Walmart	US	Consumer goods	2,200,000
2	China National Petroleum	China	Oil & gas	1,382,401
3	China Post Group	China	Postal	935,191
4	State Grid	China	Energy	917,717
5	**Hon Hai Precision Industry**	**Taiwan**	**Technology**	**667,680**
6	Volkswagen	Germany	Automotive	664,496
7	**Amazon**	**US**	**Technology**	**647,500**
8	Sinopec Group	China	Oil & gas	619,151
9	Compass Group	US	Food	595,841
10	US Postal Service	US	Postal	565,802
11	Huaxia Life Insurance	China	Financials	500,000
12	Deutsche Post	Germany	Postal	499,018
13	Agricultural Bank of China	China	Financials	477,526
14	Jardine Matheson	China	Financials	469,000
15	Gazprom	Russia	Oil & gas	466,100
16	**China Mobile Communications**	**China**	**Technology**	**462,046**
17	Accenture	US	Professional services	459,000
18	Kroger	US	Food	453,000
19	Industrial & Commercial Bank of China	China	Financials	449,296
20	Aviation Industry Corp. of China	China	Aerospace	446,613

Note: Data as of fiscal year 2018. Technology companies shown in bold.

Source: Author, adapted from Statista, "The world's 50 largest companies based on number of employees in 2018."

Figure 7: Countries that have blocked material on the Internet

Armenia	Italy	Saudi Arabia
Azerbaijan	Jordan	Singapore
Bahrain	Kazakhstan	South Korea
Belarus	Kuwait	Sudan
Burma (Myanmar)	Kyrgyzstan	Syria
China	Libya	Tajikistan
Colombia	Mauritania	Thailand
Ethiopia	Moldova	Turkey
Gaza and the West Bank	Morocco	Turkmenistan
Georgia	Oman	United Arab Emirates
India	Pakistan	Uzbekistan
Indonesia	Qatar	Vietnam
Iran	Russia	Yemen

Source: Adapted from OpenNet Initiative, Internet Filtering Data, https://opennet.net/research/data.

Figure 8: Selected fines against digital MNCs

March 2004 – European Commission fined Microsoft €497 million, for withholding information as to Windows interoperability and for including Media Player in Windows.

February 2008 – European Commission fined Microsoft €899 million for charging unreasonable royalty rates for information pertaining to Windows interoperability.

May 2009 – European Commission fined Intel €1.06 billion for pricing CPUs to discourage PC manufacturers and retailers from using and selling competing chips.

August 2012 – FTC fined Google $22.5 million for circumventing Apple privacy protections in order to collect more information about users.

March 2013 – European Commission fined Microsoft €561 million for malfunctions in the screen that let users choose a preferred web browser.

June 2017 – European Commission fined Google €2.4 billion, for favoring Google Shopping in Google's search results.

July 2018 – European Commission fined Google €4.3 billion, for blocking competing mobile operating systems, including requiring mobile device manufacturers to install certain Google apps if they wanted other Google services, banning manufacturers from selling devices based on modified versions of open-source Android software, and giving financial incentives for exclusivity.

March 2019 – European Commission fined Google €1.49 billion for requiring exclusivity from certain online publishers that showed Google ads.

July 2019 – FTC fined Facebook $5 billion for failing to protect users' data from third parties, serving ads using phone numbers which users had provided only for security, and falsely telling users that its face recognition software was turned off by default.

Note: Each item describes the violation as alleged by the corresponding enforcement agency. The companies disputed the allegations.

Note: This figure lists only a fraction of enforcement actions. The listed digital MNCs, and others, also faced numerous enforcement actions in a variety of countries on multiple other subjects.

Source: Author