

**HOW
BIG-TECH
BARONS
SMASH
INNOVATION—
*AND HOW TO
STRIKE BACK***

**ARIEL EZRACHI AND
MAURICE E. STUCKE**



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An Imprint of HarperCollinsPublishers

HOW BIG-TECH BARONS SMASH INNOVATION—AND HOW TO STRIKE BACK.
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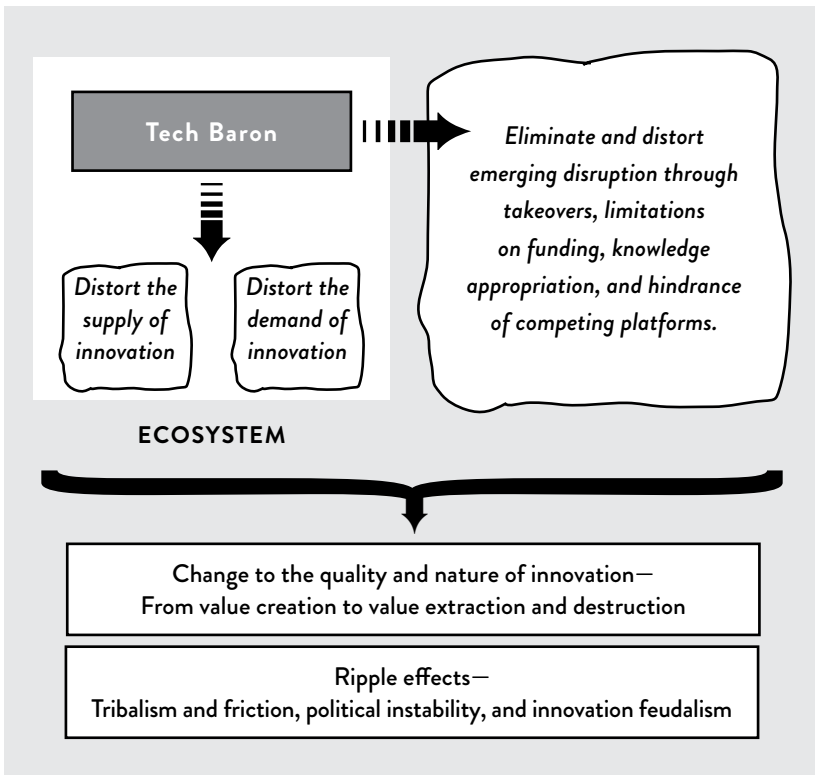
FIRST EDITION

Library of Congress Cataloging-in-Publication Data has been applied for.

ISBN 978-0-06-303088-6

22 23 24 25 26 LSC 10 9 8 7 6 5 4 3 2 1

Introduction



CHAPTER 1

The Rise of the Big-Tech Barons

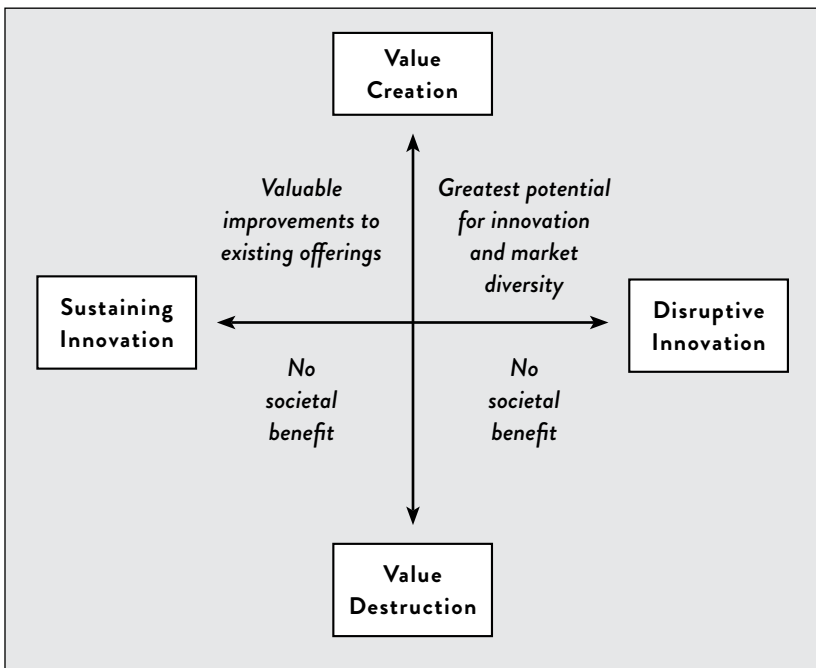
Tech Barons' Investment in Innovation

	FACEBOOK		GOOGLE		APPLE		MICROSOFT		OVERALL TOTAL
	R&D Expenses (in millions)	Percentage of Revenues	R&D Expenses (in millions)	Percentage of Revenues	R&D Expenses (in millions)	Percentage of Revenues	R&D Expenses (in millions)	Percentage of Revenues	
2010	\$144	7%	\$3,762	12.8%	\$1,782	3%	\$8,700	14%	\$14,388
2011	\$388	10%	\$5,162	13.6%	\$2,429	2%	\$9,000	13%	\$16,979
2012	\$1,399	27%	\$6,793	13.5%	\$3,381	2%	\$9,800	13%	\$21,373
2013	\$1,415	18%	\$7,137	12.9%	\$4,475	3%	\$10,400	13%	\$23,427
2014	\$2,666	21%	\$9,832	14.9%	\$6,041	3%	\$11,400	13%	\$29,939
2015	\$4,816	27%	\$12,282	16.3%	\$8,067	3%	\$12,000	13%	\$37,165
2016	\$5,919	21%	\$13,948	15.5%	\$10,045	5%	\$12,000	14%	\$41,912
2017	\$7,754	19%	\$16,625	15%	\$11,581	5%	\$13,037	13%	\$48,997
2018	\$10,273	18%	\$21,419	15.7%	\$14,236	5%	\$14,726	13%	\$60,654
2019	\$13,600	19%	\$26,081	16.1%	\$16,217	6%	\$16,876	13%	\$72,774
2020	\$18,447	21%	\$27,573	15.1%	\$18,752	7%	\$19,269	13%	\$84,041
Total	\$66,821		\$150,614		\$97,006		\$137,208		\$451,649

Source: Form 10-Ks for Google, Apple, Microsoft, and Facebook

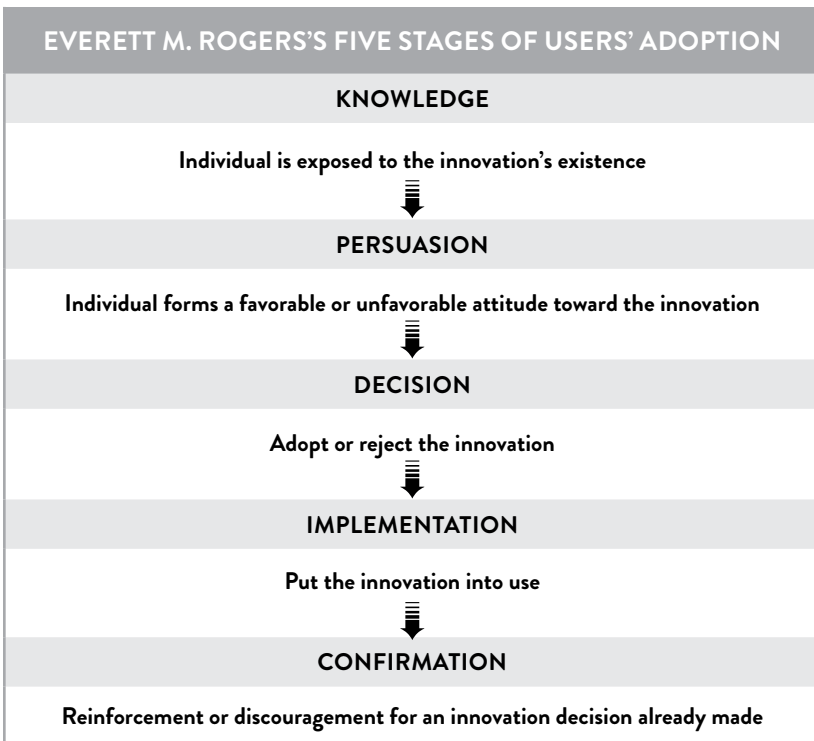
The Tech Pirates

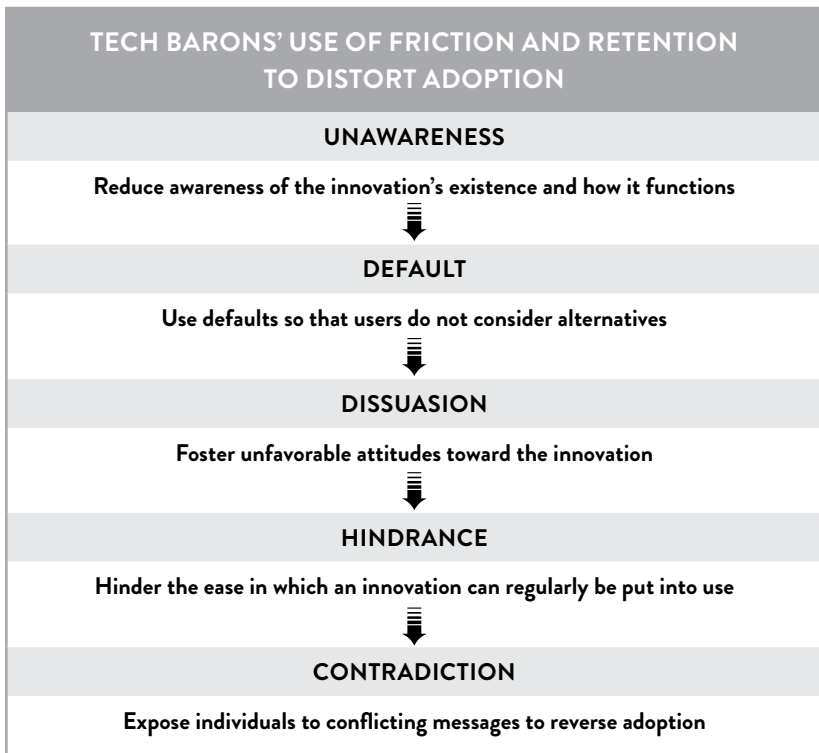
The Value of the Innovation



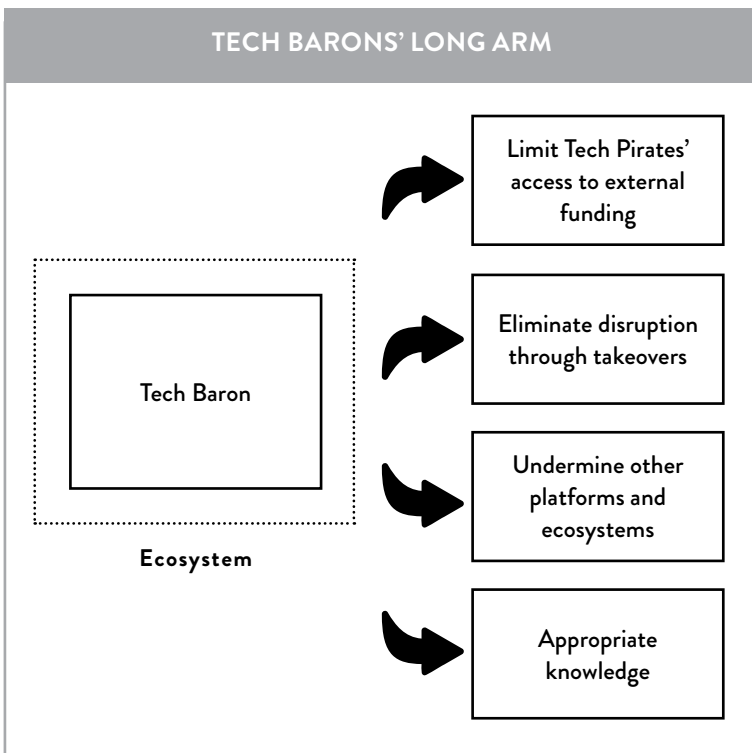
Distorting the Demand for Innovation

The Demand for Innovation

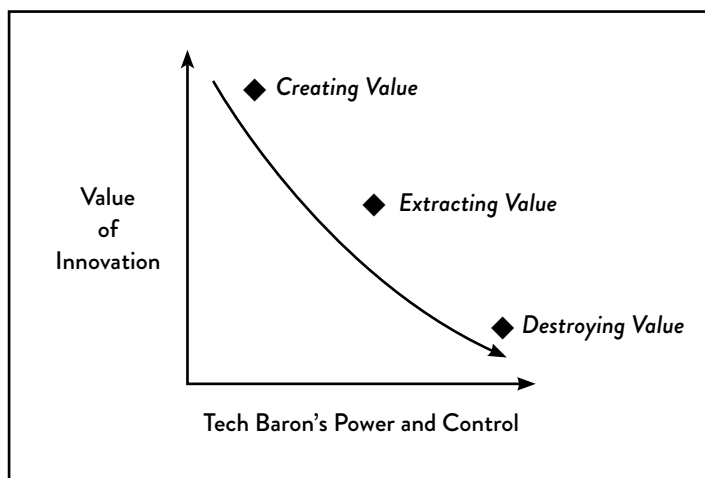




Distortions beyond the Tech Barons' Ecosystems



Toxic Innovation Galore

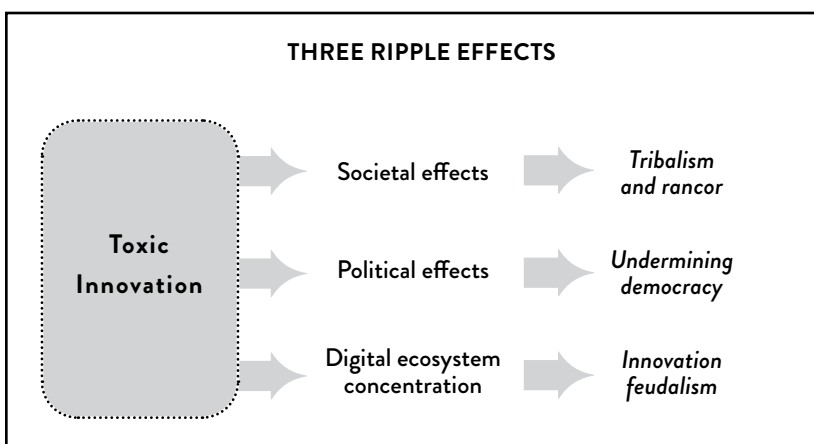


From Value Creation to Extraction

FACEBOOK'S AVERAGE REVENUE PER USER AS OF FOURTH QUARTER 2020, BY REGION (IN U.S. DOLLARS)				
	U.S. and Canada	Europe	Asia Pacific	Rest of world
Q4 '11	\$3.20	\$1.60	\$0.56	\$0.41
Q4 '12	\$4.08	\$1.71	\$0.69	\$0.56
Q4 '13	\$6.03	\$2.61	\$0.95	\$0.84
Q4 '14	\$9.00	\$3.45	\$1.27	\$0.94
Q4 '15	\$13.70	\$4.56	\$1.60	\$1.10
Q4 '16	\$19.81	\$5.98	\$2.07	\$1.41
Q4 '17	\$26.76	\$8.86	\$2.54	\$1.86
Q4 '18	\$34.86	\$10.98	\$2.96	\$2.11
Q4 '19	\$41.41	\$13.21	\$3.57	\$2.48
Q1 '20	\$34.18	\$10.64	\$3.06	\$1.99
Q2 '20	\$36.49	\$11.03	\$2.99	\$1.78
Q3 '20	\$39.63	\$12.41	\$3.67	\$2.22
Q4 '20	\$53.56	\$16.87	\$4.05	\$2.77

Source: Facebook⁹

Ripple Effects



Tribalism and Rancor



**Are you concerned that
someone you know is
becoming an extremist?**

We care about preventing extremism on Facebook. Others in your situation have received confidential support.



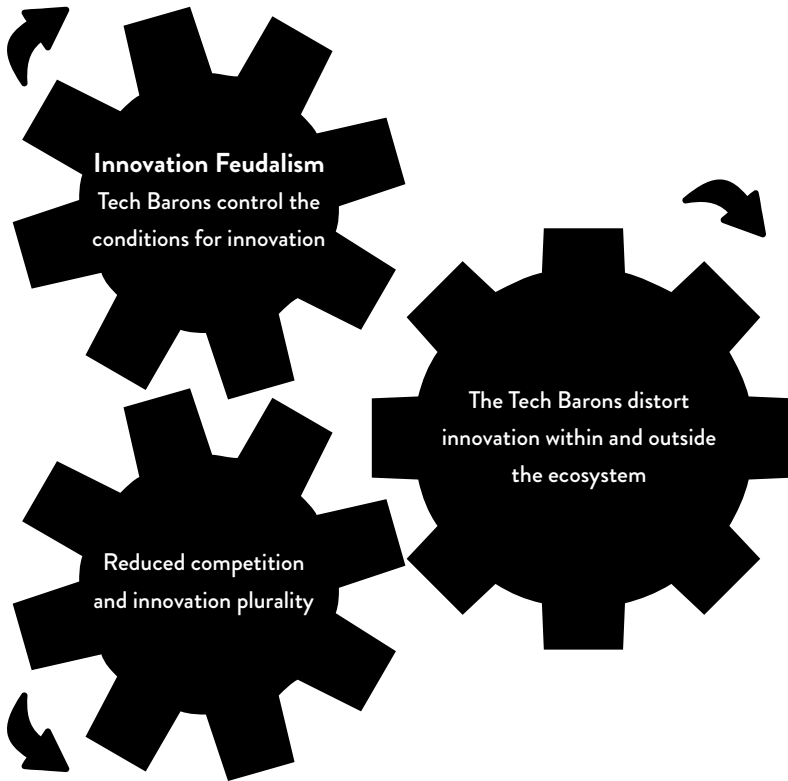
How you can help

Hear stories and get advice from people who escaped violent extremist groups.

Get Support

Close

Innovation Feudalism



Current Antitrust Enforcement

The Resulting Void



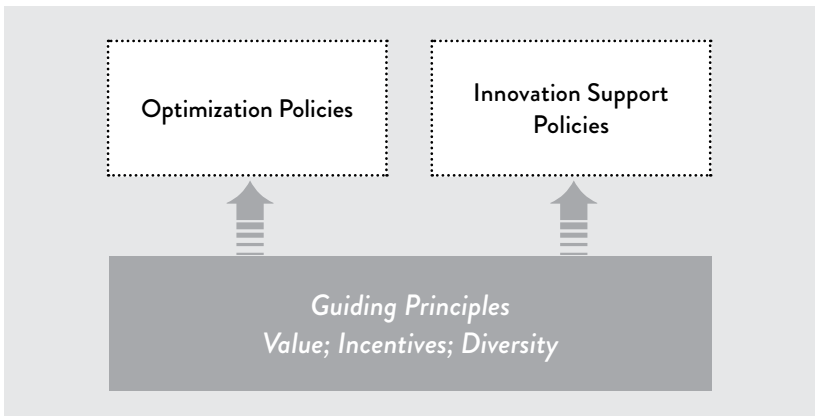
Past Restraints
Impact on Prices
and Output



How the Value Chain
Affects Incentives
and Innovation Paths

The Way Forward

The Policy Switchboard



Notes

Introduction

1. Marco Iansiti and Karim R. Lakhani, *Competing in the Age of AI* (Boston, MA: Harvard Business Review Press, 2020).
2. Erik Brynjolfsson and Andrew McAfee, “The Business of Artificial Intelligence,” in Thomas Davenport et al., *Artificial Intelligence: The Insights You Need from Harvard Business Review* (Boston, MA: Harvard Business Review Press, 2019).
3. Timothy B. Lee, “Tesla Is Now Worth More Than Ford and GM—Combined,” *Ars Technica* (January 13, 2020), <https://arstechnica.com/cars/2020/01/teslas-stock-just-blew-past-500-for-a-new-record/>.

Chapter 1: The Rise of the Big-Tech Barons

1. Alphabet Inc. (GOOG) Q2 2019 Results—Earnings Call Transcript (July 25, 2019), <https://seekingalpha.com/article/4277828-alphabet-inc-goog-q2-2019-results-earnings-call-transcript>.
2. Tomás Dias Sant’Ana et al., “The Structure of an Innovation Ecosystem: Foundations for Future Research,” 58(12) *Management Decision* (2020): 2725–42, <https://doi.org/10.1108/md-03-2019-0383> (noting how “the importance of building an ecosystem has gained prominence in both the strategy and practice of organizations”).
3. Edward Curry, “The Big Data Value Chain: Definitions, Concepts, and Theoretical Approaches,” in José Maria Cavanillas, Edward Curry, and Wolfgang Wahlster, *New Horizons for a Data-Driven Economy: A Roadmap for Usage and Exploitation of Big Data in Europe* (Cham: Springer, 2016): 33 (noting definitions and how within a healthy business ecosystem companies can work together in a complex business web where they can easily exchange and share vital resources).

4. Michael G. Jacobides, Carmelo Cennamo, and Annabelle Gawer, “Distinguishing between Platforms and Ecosystems: Complementarities, Value Creation and Coordination Mechanisms,” Working Paper (2020), https://8dc2143b-87ef-4888-82ec-3db9521c8f92.filesusr.com/ugd/0b15b1_7e0678d2815541bb920c77ec41e4d305.pdf; James F. Moore, “Predators and Prey: A New Ecology of Competition,” *Harvard Business Review* (May–June 1993), <https://hbr.org/1993/05/predators-and-prey-a-new-ecology-of-competition>; Michael A. Cusumano, Annabelle Gawer, and David B. Yoffie, *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power* (New York: Harper Business, 2019).
5. *Epic Games v. Apple*, 4:20-cv-05640-YGR, slip op. at 58 (N.D. Cal. September 10, 2021).
6. The key themes below are discussed in greater detail in Ariel Ezrachi and Maurice E. Stucke, *Virtual Competition: The Promise and Perils of the Algorithm-Driven Economy* (Cambridge, MA: Harvard University Press, 2019); Ariel Ezrachi and Maurice E. Stucke, “Digitalisation and Its Impact on Innovation,” Report Prepared for the European Commission DG Research & Innovation (2018).
7. OECD, “Data-Driven Innovation for Growth and Well-Being: Interim Synthesis Report” (2014): 29, <http://www.oecd.org/sti/inno/data-driven-innovation-interim-synthesis.pdf>. Also see: Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston, MA: Harvard Business School Press, 2005).
8. “Five Tech Giants Just Keep Growing,” *Wall Street Journal* (May 1, 2021), <https://www.wsj.com/articles/five-tech-giants-just-keep-growing-11619841644>.
9. Kashmir Hill, “I Tried to Live without the Tech Giants. It Was Impossible,” *New York Times* (July 31, 2020), <https://www.nytimes.com/2020/07/31/technology/blocking-the-tech-giants.html>.
10. Karen Weise and Michael Corkery, “People Now Spend More at Amazon Than at Walmart,” *New York Times* (August 17, 2021), <https://www.nytimes.com/2021/08/17/technology/amazon-walmart.html>.
11. *Riley v. California*, 573 U.S. 373, 395, 134 S. Ct. 2473, 2490, 189 L. Ed. 2d 430 (2014) (citing Harris Interactive, 2013 Mobile Consumer Habits Study [June 2013]). It is “no exaggeration to say that many of the more than 90% of American adults who own a cell phone keep on their person a digital record of nearly every aspect of their lives—from the mundane to the intimate.”
12. Samantha Subin, “Facebook’s Outage Has People Rethinking How They Make Money Online,” CNBC (October 9, 2021).
13. See, e.g., United States Congress, House of Representatives Report “Investigation of Competition in Digital Markets—Majority Staff Report and Recommendations” (2020): 175 (hereafter “House Report”) (noting that Google’s profit margins were “greater than 20% for nine out of the last 10 years [2011–2020], close to three times larger than the average for a U.S. firm”).
14. Australian Competition & Consumer Commission (ACCC), “Digital Platforms Inquiry—Final Report” (2019): 7 (based on the share price for Alphabet and Facebook on June 20, 2019).

15. Joseph A. Schumpeter, *Capitalism Socialism and Democracy* (New York: Harper & Brothers, 1942).
16. *United States v. Microsoft*, 253 F.3d 34, 49–50 (D.C. Cir. 2001).
17. *Ibid.*
18. *Ibid.* (quoting Howard A. Shelanski and J. Gregory Sidak, “Antitrust Divestiture in Network Industries,” 68(1) *University of Chicago Law Review* (2001): 1, 11–12).
19. Testimony of Mark Zuckerberg, Facebook, Inc., before the United States House of Representatives, Committee on the Judiciary Subcommittee on Antitrust, Commercial, and Administrative Law (July 29, 2020), <https://docs.house.gov/meetings/JU/JU05/20200729/110883/HHRG-116-JU05-Wstate-ZuckerbergM-20200729.pdf>.
20. Statement by Jeffrey P. Bezos, Founder and Chief Executive Officer, Amazon, before the U.S. House of Representatives, Committee on the Judiciary, Subcommittee on Antitrust, Commercial, and Administrative Law (July 29, 2020), <https://docs.house.gov/meetings/JU/JU05/20200729/110883/HHRG-116-JU05-Wstate-BezosJ-20200729.pdf>.
21. Also note writing by John Kenneth Galbraith, *American Capitalism: The Concept of Countervailing Power* (Boston: Houghton Mifflin Company, 1952).
22. C. Scott Hemphill, “Disruptive Incumbents: Platform Competition in an Age of Machine Learning,” 119(7) *Columbia Law Review* (2019): 1973, 1990 (noting how “Schumpeter and others have argued that monopoly is also a potent platform for further innovation”). Joseph A. Schumpeter in *Capitalism, Socialism, and Democracy* argued that innovators require the means to “safeguard” investment through “insuring or hedging” (88), and that monopoly is valuable as protection “against temporary disorganization of the market.” This point is echoed in Peter Thiel with Blake Masters, *Zero to One: Notes on Startups, or How to Build the Future* (London: Virgin Books, 2015): 33 (“The promise of years or even decades of monopoly profits provides a powerful incentive to innovate.”). The U.S. Supreme Court, for example, surmised that monopoly prices “is an important element of the free-market system. The opportunity to charge monopoly prices—at least for a short period—is what attracts ‘business acumen’ in the first place; it induces risk taking that produces innovation and economic growth.” *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 407, 124 S. Ct. 872, 879, 157 L. Ed. 2d 823 (2004).
23. Kenneth J. Arrow, “Economic Welfare and the Allocation of Resources for Invention,” in Richard R. Nelson, *The Rate and Direction of Inventive Activity: Economic and Social Factors* (Princeton, NJ: Princeton University Press, 1982).
24. Statement of Tim Cook, Apple, Inc., before the U.S. House of Representatives, Committee on the Judiciary, Subcommittee on Antitrust, Commercial, and Administrative Law, 3 (July 29, 2020), <https://docs.house.gov/meetings/JU/JU05/20200729/110883/HHRG-116-JU05-Wstate-CookT-20200729.pdf>.
25. Testimony of Mark Zuckerberg.
26. *Ibid.*
27. *Ibid.*

28. Written Testimony of Sundar Pichai, Chief Executive Officer, Alphabet Inc., before the United States House of Representatives, Committee on the Judiciary Subcommittee on Antitrust, Commercial, and Administrative Law (July 29, 2020): 3, <https://docs.house.gov/meetings/JU/JU05/20200729/110883/HHRG-116-JU05-Wstate-PichaiS-20200729.pdf>.
29. “The Global Innovation 1000 Study—Investigating Trends at the World’s 1000 Largest Corporate R&D Spenders,” <https://www.strategyand.pwc.com/gx/en/insights/innovation1000.html>.
30. “List of Countries by GDP,” Statistics Times, <https://statisticstimes.com/economy/countries-by-gdp.php>.
31. Andrew Sather, “R&D Spending as a Percentage of Revenue by Industry,” March 8, 2021, <https://einvestingforbeginners.com/rd-spending-as-a-percentage-of-revenue-by-industry/>.
32. Testimony of Mark Zuckerberg.
33. Ibid.
34. Written Testimony of Sundar Pichai.
35. Ibid.
36. Statement of Tim Cook.
37. “Amazon 2020 Annual Report,” https://s2.q4cdn.com/299287126/files/doc_financials/2021/ar/Amazon-2020-Annual-Report.pdf.
38. Larry Downes and Paul Nunes, *Big Bang Disruption: Business Survival in the Age of Constant Innovation* (London: Portfolio Penguin, 2015).
39. Michael G. Jacobides, “Designing Digital Ecosystems,” in Michael G. Jacobides, Arun Sundararajan, and Marshall Van Alstyne, *Platforms and Ecosystems: Enabling the Digital Economy* (World Economic Forum, Briefing Paper, 2019): 13–18, https://www3.weforum.org/docs/WEF_Digital_Platforms_and_Ecosystems_2019.pdf.
40. “Coral reef,” Wikipedia, accessed July 14, 2021, https://en.wikipedia.org/wiki/Coral_reef#cite.
41. Testimony of Mark Zuckerberg.
42. Statement of Nate Sutton, Associate General Counsel, Competition, Amazon.com, Inc., before the United States House of Representatives Committee on the Judiciary Subcommittee on Antitrust, Commercial and Administrative Law (July 16, 2019), <https://docs.house.gov/meetings/JU/JU05/20190716/109793/HHRG-116-JU05-Wstate-SuttonN-20190716.pdf>.
43. Written Testimony of Sundar Pichai.
44. Ibid.
45. Written Testimony of Adam Cohen, Director, Economic Policy, Google LLC, before the United States House of Representatives Committee on the Judiciary Subcommittee on Antitrust, Commercial and Administrative Law, “Online Platforms and Market Power, Part 2: Innovation and Entrepreneurship” (July 16, 2019), <https://docs.house.gov/meetings/JU/JU05/20190716/109793/HHRG-116-JU05-Wstate-CohenA-20190716.pdf>.

46. "Microsoft Annual Report 2020," <https://www.microsoft.com/investor/reports/ar20/index.html>.
47. Ibid.

Chapter 2: The Tech Pirates

1. Sarah Todd, "The Steve Jobs Speech That Made Silicon Valley Obsessed with Pirates," *Quartz* (October 22, 2019), <https://qz.com/1719898/steve-jobs-speech-that-made-silicon-valley-obsessed-with-pirates/>.
2. Andy Hertzfeld, "Pirate Flag" (August 1983), https://www.folklore.org/StoryView.py?story=Pirate_Flag.txt.
3. For a personal account of the entrepreneur spirit, see: Jim McKelvey, *The Innovation Stack* (New York: Portfolio/Penguin, 2020).
4. Video: "The Real Story behind Apple's Famous '1984' Super Bowl Ad," Bloomberg (December 3, 2014), <https://www.youtube.com/watch?v=PsjMmAqmbIQ>.
5. Steven Si and Hui Chen, "A Literature Review of Disruptive Innovation: What It Is, How It Works and Where It Goes," 56(4) *Journal of Engineering and Technology Management* (2020).
6. Clayton M. Christensen, *The Innovator's Dilemma—When New Technologies Cause Great Firms to Fail* (Boston, MA: Harvard Business Review Press, 2016). Also see: Rajesh K. Chandy and Gerard J. Tellis, "The Incumbent's Curse? Incumbency, Size, and Radical Product Innovation," 64(3) *Journal of Marketing* (2000); Birgitta Sandberg and Leena Aarikka-Stenroos, "What Makes It So Difficult? A Systematic Review on Barriers to Radical Innovation," 43(8) *Industrial Marketing Management* (2014): 1293–1305.
7. Clayton M. Christensen, *The Innovator's Dilemma*, xviii (noting that all sustaining technologies "improve the performance of established products, along the dimensions of performance that mainstream customers in major markets have historically valued").
8. Ibid., 14.
9. Ibid., xviii.
10. Ibid., xx.
11. Christian Hopp et al., "Disruptive Innovation: Conceptual Foundations, Empirical Evidence, and Research Opportunities in the Digital Age," 35(3) *Journal of Product Innovation Management* (2018): 446–57 (surveying literature); Carlos Tadao Kawamoto and Renata Giovinazzo Spers, "A Systematic Review of the Debate and the Researchers of Disruptive Innovation," 14(1) *Journal of Technology Management and Innovation* (April 2019): 73–82; Jill Lepore, "The Disruption Machine: What the Gospel of Innovation Gets Wrong," *New Yorker* (June 16, 2014), <https://www.newyorker.com/magazine/2014/06/23/the-disruption-machine>.
12. Carlos Tadao Kawamoto and Renata Giovinazzo Spers, "A Systematic Review" (noting that for Christensen disruptive innovations "either create new markets, bring new attractiveness to nonconsumers, or offer more convenience, at lower prices, to lower-income consumers in an existing market" and that these innovations for nonconsumers

- bring new consumers to the market, previously untapped due to lack of ability to consume or enjoy the good [or service] or insufficient resources); Jonathan C. Ho, “Disruptive Innovation from the Perspective of Innovation Diffusion Theory,” *Technology Analysis & Strategic Management* (2021), DOI: 10.1080/09537325.2021.1901873.
13. “A Third Way to Innovation—Questions for David Robertson, Interview by Karen Christensen,” Rotman Management (Winter 2018), <https://www.rotman.utoronto.ca/Connect/Rotman-MAG/IdeaExchange/Page1/Winter2018-David-Robertson> (discussing a Third Way of innovation where (1) a set of complementary innovations around a core product make the product more appealing or valuable; (2) the complementary innovations operate together and with the key product as a system to carry out a single strategy or purpose—what Robertson calls the promise to the user; and (4) the complementary innovations—even those delivered by outside partners—are closely and centrally managed by the owner of the key product); Steven Si and Hui Chen, “A Literature Review,” 101568 (synthesizing the literature in describing disruptive innovation as: an innovation process in which technologies, products, or services are initially inferior than those provided by incumbents in the attributes that mainstream consumers value, but these technologies, products, or services can attract and satisfy the consumers in low-end or new markets with advantages in performance attributes [such as being cheap, simple, or convenient] that these consumers value but which at the same time are neglected by mainstream markets. Over time, through incremental improvement of technology or process, a disruptive innovation gradually satisfies the needs of mainstream consumers, so as to attain certain market share from or even replace incumbents in mainstream markets); Clifford Maxwell and Scott Duke Kominers, “What Makes an Online Marketplace Disruptive?,” *Harvard Business Review* (May 24, 2021) (noting how disruptive innovations bring nonproducers and nonconsumers together—disruptive marketplaces make good on famed Silicon Valley investor Bill Gurley’s observation that internet marketplaces “literally create ‘money out of nowhere’” because “in connecting economic traders that would otherwise not be connected, they unlock economic wealth that otherwise would not exist”); more generally, see Joshua Gans, *The Disruption Dilemma* (Cambridge, MA: MIT Press, 2016) (who explores demand and supply side disruption and notes that disruption occurs when “successful firms fail because they continue to make the choices that drove their success”). Neele Petzold, Lina Landinez, and Thomas Baake, “Disruptive Innovation from a Process View: A Systematic Literature Review,” 28(2) *Creativity and Innovation Management* (2019): 157–74.
 14. For the different taxonomies of innovation, see Claudia S. L. Dias and João J. Ferreira, “What We (Do Not) Know about Research in the Strategic Management of Technological Innovation?,” 21(3) *Innovation: Organization & Management* (2019): 398–420, DOI: 10.1080/14479338.2019.1569464; Delio Ignacio Castaneda and Sergio Cuelar, “Knowledge Sharing and Innovation: A Systematic Review,” 27(3) *Knowledge & Process Management* (2020): 159–73, <https://onlinelibrary.wiley.com/doi/epdf/10.1002/kpm.1637>; Adrian Kovacs et al., “Radical, Disruptive, Discontinuous and

- Breakthrough Innovation: More of the Same?,” *Academy of Management Annual Meeting Proceedings* (2019): 14866, DOI: 10.5465/AMBPP.2019.272; Steven Si and Hui Chen, “A Literature Review,” 101568.
15. Steven Si and Hui Chen, “A Literature Review,” 101568 (noting that “disruptive innovation usually adopts a completely different business model that must not only be sustainable from an economic perspective, but also be consistent with existing market realities, customer expectations, and competitive pressures” and how this “requires a new approach to convert value into profits, especially in terms of revenue and pricing structure”).
 16. Our definition, in focusing on the value chain of an ecosystem or a dominant firm, differs from Michael Porter’s definition of value chain analysis and its purpose. See: Michael Porter, “The Value Chain and Competitive Advantage,” in David Barnes, *Understanding Business: Processes* (London: Routledge in association with the Open University, 2001): 50. Porter uses the concept to disaggregate the firm “into strategically relevant activities in order to understand the behavior of costs and the existing and potential sources of differentiation.” For the application of value chain to big data ecosystems, see: Edward Curry, “The Big Data Value Chain: Definitions, Concepts, and Theoretical,” 29, 30–33 (defining the Big Data Value Chains as the information flow within a big data system as a series of steps needed to generate value and useful insights from data, which includes data acquisition, data analysis, data curation, data storage, and data usage).
 17. See, e.g., *Epic Games v. Apple*, slip op. at 32 (noting that in Apple’s fiscal year 2019, 83 percent of apps with at least one download on its App Store were free to consumers).
 18. *Ibid.*, 43. As the court found, over 80 percent of all Apple consumer accounts generated virtually no revenue, as 80 percent of all apps on the App Store were free. Slip op. at 1. On a revenue basis, gaming apps accounted for approximately 70 percent of all Apple’s App Store revenues. This 70 percent of revenue was generated by less than 10 percent of all App Store consumers. These gaming-app consumers were primarily making in-app purchases, which was the focus of Epic Games’ antitrust claims.
 19. *Ibid.*, 28 (noting how the “creation, constant update, and modernization of the SDKs and APIs was not insignificant. To protect its system, Apple built tools, kits, and interfaces that would allow other developers to build native apps. Epic Games did not introduce any evidence to rebut Apple’s claim that in those initial years, the engineering work was novel, sophisticated, time-consuming and expensive. These tools simplified and accelerated the development process of native apps.”). On the other hand, the evidence in that trial “established that a significant portion of the App Store revenue is built upon long-term relationships between developers and consumers independent of Apple.” For example, during a 2019–2020 presentation, Apple recognized that “in any given month, 41% of [Apple’s] monthly billings are generated from apps that were downloaded more than 180 days prior,” as contrasted to 31 percent for apps downloaded between 30 and 180 days prior and to 28 percent for apps downloaded less than 30 days prior. As Apple conceded at trial, “This engagement is almost completely

driven by [App Store] developers, and the App Store does not participate in a meaningful way.” Ibid.

20. Over half of Apple’s App Store billings (53.7 percent) came from less than .5 percent of all Apple accounts in the third quarter of 2017. *Epic Games v. Apple*, slip op. at 43.
21. Google and Apple, with some minor exceptions, collect a 30 percent commission on every purchase made through their app stores, whether an initial download or an in-app purchase.
22. Ibid.
23. Kristina Rakic, “Breakthrough and Disruptive Innovation: A Theoretical Reflection,” 15(4) *Journal of Technology Management & Innovation* (2020); Adrian Kovacs et al., “Radical, Disruptive, Discontinuous and Breakthrough Innovation”; Birgitta Sandberg and Leena Aarikka-Stenroos, “What Makes It So Difficult?,” 1293–1305; Joseph Bower and Clayton Christensen, “Disruptive Technologies: Catching the Wave,” *Harvard Business Review* (January–February 1995): 43–53, <https://hbr.org/1995/01/disruptive-technologies-catching-the-wave>.
24. Anuraag Singh, Giorgio Triulzi, and Christopher L. Magee, “Technological Improvement Rate Predictions for All Technologies: Use of Patent Data and an Extended Domain Description,” 50(9) *Research Policy* (2021), <https://doi.org/10.1016/j.respol.2021.104294>; Alison Gopnik, “Innovation Relies on Imitation: A New Study of Computer Coders Shows That the Best Problem-Solvers Learn from the Efforts of Their Peers,” *Wall Street Journal* (October 1, 2020), <https://www.wsj.com/articles/innovation-relies-on-imitation-11601571842> (discussing study involving coding contestants, where the researchers found that pragmatists who flexibly switched back and forth between copying and substantially altering and improving the code were by far the most likely to receive higher scores than the “copiers” who consistently imitated the successful solutions, making only the smallest changes, and the “mavericks” who “didn’t copy the entries that were already out there but tried something new, more like the stereotypical lone genius”).
25. Steven Johnson, *Where Good Ideas Come From: The Natural History of Innovation* (London: Penguin, 2010).
26. Anuraag Singh, Giorgio Triulzi, and Christopher L. Magee, “Technological Improvement Rate Predictions for All Technologies” (finding that while different technologies all improve exponentially, they do so at different rates); Clayton M. Christensen, *The Innovator’s Dilemma*, 113, 166–68.
27. Jim McKelvey, “Good Entrepreneurs Don’t Set Out to Disrupt,” *Harvard Business Review* (2020).
28. Clayton M. Christensen, *The Innovator’s Dilemma*, 178–79, 182 (discussing the need for agnostic marketing where no one knows whether, how, or in what quantities a disruptive product can or will be used before they experience using it).
29. Steven Johnson, *Where Good Ideas Come From*, 52.
30. For a review of various internal and external barriers, see: Helen T. Wagner et al., “Path Dependent Constraints on Innovation Programmes in Production and Op-

- erations Management,” 49(11) *International Journal of Production Research* (2011): 3069–85; Pablo D’Estea et al., “What Hampers Innovation? Revealed Barriers versus Deterring Barriers,” 41(2) *Research Policy* (2012): 482–88; John Baldwin and Zhengxi Lin, “Impediments to Advanced Technology Adoption for Canadian Manufacturers,” 31(1) *Research Policy* (2002): 1–18; Werner Hölzl and Jürgen Janger, “Innovation Barriers across Firms and Countries,” WIFO Working Papers, No. 426, Austrian Institute of Economic Research (WIFO), Vienna, 2012, https://www.econstor.eu/bitstream/10419/128992/1/wp_426.pdf; Birgitta Sandberg and Leena Aarikka-Stenroos, “What Makes It So Difficult?”
31. Geoffrey A. Moore, *Escape Velocity: Free Your Company’s Future from the Pull of the Past* (New York: HarperCollins, 2011): 31.
 32. See generally: W. Chan Kim and Renée Mauborgne, *Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant* (Boston, MA: Harvard Business Review Press, 2015).
 33. Geoffrey A. Moore, *Escape Velocity*, 85.
 34. Ufuk Akcigit and William R. Kerr, “Growth through Heterogeneous Innovations,” NBER Working Paper 16443, 126(4) *Journal of Political Economy* (August 2018), <http://www.nber.org/papers/w16443>; Birgitta Sandberg and Leena Aarikka-Stenroos, “What Makes It So Difficult?”; Arthur Fishman, Hadas Don-Yehiya, and Amnon Schreiber, “Too Big to Succeed or Too Big to Fail?,” 51 *Small Business Economics* (2018): 811–22, <https://doi.org/10.1007/s11187-017-9968-1> (citing literature that larger incumbent firms tend to pursue relatively more incremental and relatively more process innovation than smaller firms, which tend to pursue more radical innovation).
 35. *Epic Games v. Apple*, slip op. at 102.
 36. X, accessed January 4, 2022, <https://x.company>.
 37. Steven Johnson, *Where Good Ideas Come From*, 46 (discussing neural networks).
 38. For illustration, see for example: Hakan Ener et al., “‘Digital Colonization’ of Highly Regulated Industries: An Analysis of Big Tech Platforms’ Entry into Healthcare and Education,” *California Management Review* (2021).
 39. Delio Ignacio Castaneda and Sergio Cuellar, “Knowledge Sharing and Innovation: A Systematic Review” 27(3) *Knowledge & Process Management* (2020) 159–173, <https://onlinelibrary.wiley.com/doi/epdf/10.1002/kpm.1637>.
 40. See the OECD definition in the Oslo Manual: “An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations,” OECD/Eurostat. *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*, 3rd Edition (Paris: OECD Publishing, 2005): 46, para 146, <http://dx.doi.org/10.1787/9789264013100-en>; also see: Fred Gault, *Defining and Measuring Innovation in All Sectors of the Economy: Policy Relevance*, OECD Blue Sky Forum III, Ghent, Belgium, September 19–21, 2016; Fred Gault, “Defining and Measuring Innovation in All Sectors of the Economy,” 47(3) *Research Policy* (2018): 617–22.

41. The positive definition of innovation suggests that any negative change should not be seen as innovation but as an external negative change. We find this normative assumption to create a false expectation that any investment in research and development would increase welfare. As we illustrate later, this is not necessarily the case. Note in this respect the OECD comment that accepts alternative change—*new or improved*—to substantiate innovation. “The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the firm.” Oslo Manual, at para 148.
42. On the possible adverse effects of competition, see our work on competition overdose: Maurice E. Stucke and Ariel Ezrachi, *Competition Overdose: How Free Market Mythology Transformed Us from Citizen Kings to Market Servants* (New York: Harper Business, 2020).
43. Christian Nielsen and Henrik Dane-Nielsen, “Value Creation in Business Models Is Based on Intellectual Capital—and Only Intellectual Capital!,” 7(2) *Journal of Business Models* (2019): 64–81.
44. “Value,” *Merriam-Webster*, accessed January 4, 2022, <https://www.merriam-webster.com/dictionary/value>.
45. In this respect we narrow the definitions of Mariana Mazzucato, who defined value creation as the ways in which different types of resources are established to produce new goods and services, and value extraction as activities focused on moving around resources to gain disproportionately from the ensuring trade. Mariana Mazzucato, *The Value of Everything: Making and Taking in the Global Economy* (New York: Public Affairs, 2020): 6.
46. OECD, “Measuring Well-being and Progress: Well-being Research,” accessed January 4, 2022, <https://www.oecd.org/statistics/measuring-well-being-and-progress.htm>.
47. James F. Moore, “Predators and Prey: A New Ecology of Competition,” 71(3) *Harvard Business Review* (1993): 75–86; Annabelle Gawer and Michael A. Cusumano, “Industry Platforms and Ecosystem Innovation,” 31(3) *Journal of Product Innovation Management* (2014): 417–33; Carmelo Cennamo, Annabelle Gawer, and Michael G. Jacobides, “Towards a Theory of Ecosystems,” 39(8) *Strategic Management Journal* (2018): 2255–76.
48. Airbnb, Inc. Form 10-K for the fiscal year ended December 31, 2020, 4, <https://d18rn0p25nwr6d.cloudfront.net/CIK-0001559720/84dcc076-235d-4520-805c-0e64b6fe8c40.pdf>.
49. Nitin Nohria and Hemant Taneja, “A New Model to Spark Innovation Inside Big Companies,” *Harvard Business Review* (May 12, 2021) (noting that “an internal start-up that reaches \$100 million in annual revenue [a remarkable feat for a start-up that can earn it a stratospheric valuation] will have delivered just one percent in incremental growth for a \$10 billion company”).
50. W. Chan Kim and Renée Mauborgne, *Blue Ocean Strategy*.
51. Aashish Pahwa, “The History of WhatsApp,” Feedough (September 8, 2021), <https://www.feedough.com/history-of-whatsapp/>.

52. FTC Complaint. *FTC v. Facebook, Inc.*, No. 1:20-cv-03590 (D.D.C. December 9, 2020), para. 17.
53. *Ibid.*, para. 18.
54. FTC Substitute Amended Complaint. *FTC v. Facebook, Inc.*, No. 1:20-cv-03590 (D.D.C. September 8, 2021) para. 108.
55. *Ibid.*, para. 110.
56. *Ibid.*, para. 111.
57. *Ibid.*, para. 113.
58. *Ibid.*, para. 122.
59. *Ibid.*, para. 126.

Chapter 3: Disrupting Disruptive Innovation

1. Christian Hopp et al., “Disruptive Innovation,” 446–57.
2. Maurice E. Stucke and Allen P. Grunes, *Big Data and Competition Policy* (Oxford: Oxford University Press, 2016): 285–87.
3. Deepa Seetharaman and Betsy Morris, “Facebook’s Onavo Gives Social-Media Firm Inside Peek at Rivals’ Users,” *Wall Street Journal* (August 13, 2017), <https://www.wsj.com/articles/facebooks-onavo-gives-social-media-firm-inside-peek-at-rivals-users-1502622003>.
4. Multi-State Complaint, *State of New York et al v. Facebook Inc.*, No. 1:20-cv-03589 (D.D.C. December 9, 2020) para. 147; Eve Smith, “The Techlash against Amazon, Facebook and Google—and What They Can Do,” *Economist* (January 20, 2018), <https://www.economist.com/news/briefing/21735026-which-antitrust-remedies-welcome-which-fight-techlash-against-amazon-facebook-and> (noting how this nowcasting radar “helped [Facebook] spot several potential threats, including Instagram, a photo app, which it bought in 2012; WhatsApp, a messaging service, for which it paid a stunning \$22bn in 2014; and tbh, a social-polling app, which it acquired last year [2017]. When Snapchat rebuffed it in 2013, it responded by cloning the app’s most successful features.”).
5. The European Commission raised concerns as to the legality of it using non-public independent seller data to benefit its own online retail business: https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2077. In the US, the Congressional Anti-trust Subcommittee noted, similarly, how Amazon would use its nowcasting radar to “(1) copy the product to create a competing private-label product; or (2) identify and source the product directly from the manufacturer to free ride off the seller’s efforts, and then cut that seller out of the equation,” House Report, 275 (internal footnotes omitted). Amazon claims that “it has no incentive to abuse sellers’ trust because third-party sales make up nearly 60% of its sales and Amazon’s first-party sales are relatively small,” House Report, 275. But as Congress learned, “Amazon admitted that by percentage of sales—a more telling measure—Amazon’s first-party sales are significant and growing in a number of categories.” Congress in 2020 estimated that Amazon may, in fact, “overtake its third-party sellers in several categories as its first-party business continues to grow,” House Report, 276.

6. House Report, 275 (internal footnotes omitted).
7. “How to Submit Your App to the App Store and Get It Approved,” *FarShore* (March 9, 2017), <https://www.farshore.com/blog/submit-app-to-app-store-get-approved/>.
8. Kif Leswing, “Apple Says It Rejected Almost 1 Million New Apps in 2020 and Explains Common Reasons Why,” CNBC (May 11, 2021), <https://www.msn.com/en-us/news/technology/apple-says-it-rejected-almost-1-million-new-apps-in-2020-and-explains-common-reasons-why/ar-BB1gCnpx>.
9. *Ibid.*
10. “Number of iPhone Users in the United States from 2012 to 2022,” Statista (March 1, 2021), <https://www.statista.com/statistics/232790/forecast-of-apple-users-in-the-us/>.
11. *Epic Games v. Apple*, No. 4:20-CV-05640-YGR, 2020 WL 5993222, *17 (N.D. Cal. Oct. 9, 2020).
12. “Android—Statistics & Facts,” Statista, accessed January 4, 2022, <https://www.statista.com/topics/876/android/>.
13. Disconnect, Inc. Complaint of Disconnect, Inc., Regarding Google’s Infringement of Article 102 TFEU through Bundling into the Android Platform and the Related Exclusion of Competing Privacy and Security Technology, Case COMP/40099 June 2015), para. 18.
14. *Ibid.*, para. 38.
15. Julie Bort, “Why Google Banned a Privacy Tool Called ‘Disconnect Mobile’ from the Android App Store,” *Business Insider* (August 28, 2014).
16. *Ibid.*
17. Reed Albergotti, Alistair Barr, and Elizabeth Dwoskin, “Why Some Privacy Apps Get Blocked from the Android Play Store,” *Wall Street Journal* (August 28, 2014).
18. *Ibid.*
19. *Ibid.*
20. Michael Muchmore, “Google Chrome’s Sham ‘Do Not Track’ Feature,” *PC Magazine* (May 16, 2014), <https://in.pcmag.com/browsers/58948/google-chromes-sham-do-not-track-feature>.
21. House Report, 385.
22. Multi-State Complaint, *Utah et al. v. Google LLC*, para. 116.
23. *Ibid.*
24. *Ibid.*, para. 125.
25. Bruce Sterling, “Dead Media Beat: Mapquest,” *Wired* (October 9, 2019), <https://www.wired.com/beyond-the-beyond/2019/10/dead-media-beat-mapquest/>.
26. Facebook 2020 10-K, 17.
27. “What Does Facebook Platform Mean?,” Techopedia, accessed January 4, 2022, <https://www.techopedia.com/definition/27916/facebook-platform>.
28. House Report, 166.
29. House Report, 166–67.
30. House Report, 167.
31. *Ibid.*

32. House Report, 169.
33. House Report, 143.
34. “Number of Monthly Active Facebook Users Worldwide as of 2nd Quarter 2012,” Statista (November 1, 2021), <https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/>.
35. Olivia Solon, “As Tech Companies Get Richer, Is It ‘Game Over’ for Startups?,” *Guardian* (October 20, 2017), <https://www.theguardian.com/technology/2017/oct/20/tech-startups-facebook-amazon-google-apple>; Betsy Morris and Deepa Seetharaman, “The New Copycats: How Facebook Squashes Competition from Startups,” *Wall Street Journal* (August 9, 2017), <https://www.wsj.com/articles/the-new-copycats-how-facebook-squashes-competition-from-startups-1502293444>.
36. Jason Del Rey, “Amazon Invested Millions in the Startup Nucleus—Then Cloned Its Product for the New Echo—Another Cautionary Tale for Would-be Amazon Partners,” *Vox* (May 10, 2017), <https://www.vox.com/2017/5/10/15602814/amazon-invested-startup-nucleus-cloned-alexa-echo-show-voice-control-touchscreen-video>.
37. Ibid.
38. Olivia Solon, “As Tech Companies Get Richer.”
39. Dana Mattioli and Cara Lombardo, “Amazon Met with Startups about Investing, Then Launched Competing Products—Some Companies Regret Sharing Information with Tech Giant and Its Alexa Fund,” *Wall Street Journal* (July 23, 2020), <https://www.wsj.com/articles/amazon-tech-startup-echo-bezos-alexa-investment-fund-11595520249>.
40. Ibid.
41. Ibid.
42. “iPhone (1st Generation)—Full Phone Information,” Igotoffer Apple, accessed January 4, 2022, <https://igotoffer.com/apple/iphone-1st-generation>.
43. Shanhong Liu, “Global Market Share Held by Operating Systems for Desktop PCs, from January 2013 to June 2021,” Statista (September 10, 2021), <https://www.statista.com/statistics/218089/global-market-share-of-windows-7/>.
44. S. O’Dea, “Mobile Operating Systems’ Market Share Worldwide from January 2012 to June 2021,” Statista (June 29, 2021), <https://www.statista.com/statistics/272698/global-market-share-held-by-mobile-operating-systems-since-2009/>.
45. Karolina Safarzyńska and Jeroen C. J. M. van den Bergh, “Evolutionary Models in Economics: A Survey of Methods and Building Blocks,” 20(3) *Journal of Evolutionary Economics* (2010): 329–73, DOI: 10.1007/s00191-009-0153-9.

Chapter 4: Distorting the Demand for Innovation

1. Peter Berthold et al., “Rapid Microevolution of Migratory Behaviour in a Wild Bird Species,” 360 *Nature* (1992): 668–70, <https://www.nature.com/articles/360668a0>; Darren E. Irwin, “Speciation: New Migratory Direction Provides Route toward Divergence,” 19(24) *Current Biology* (2009): R1111–13, <https://www.sciencedirect.com/science/article/pii/S0960982209019848>; Sue Anne Zollinger, “Blackcaps Change Their Migration Patterns . . . But Why?,” Indiana Public Radio (September 23, 2009),

<https://indianapublicmedia.org/amomentofscience/blackcaps-change-migration-patternsbut.php>.

2. Everett M. Rogers, *Diffusion of Innovations* (New York: Free Press, 2003). Classical theory on diffusion of innovation holds that “the very early adopter group consists of novelty seekers who are innovative and have financial resources to take risks on new ideas.” Jonathan C. Ho, “Disruptive Innovation from the Perspective of Innovation Diffusion Theory,” *Technology Analysis & Strategic Management* (March 17, 2021), DOI: 10.1080/09537325.2021.1901873. For our purposes, the Tech Barons’ use of friction and retention can distort adoption by both high-end and low-end disruption.
3. Geoffrey A. Moore, *Escape Velocity*, 49.
4. “Discover What Google Assistant Is,” accessed January 4, 2022, <https://assistant.google.com>.
5. Case AT.39740, *Google Search (Shopping)* European Commission (June 27, 2017). Upheld by the European General Court in Case T-612/17 *Google and Alphabet v. Commission (Google Shopping)* (November 10, 2021). In January 2022, Google appealed the judgment of the General Court. Case C-48/22P *Google and Alphabet v Commission* (Google Shopping). Appeal pending.
6. Press Release (EU Commission): “Antitrust: Commission Fines Google €2.42 Billion for Abusing Dominance as Search Engine by Giving Illegal Advantage to Own Comparison Shopping Service” (June 27, 2017), https://ec.europa.eu/commission/presscorner/detail/en/IP_17_1784.
7. Case AT.39740, *Google Search (Shopping)*, para 460.
8. *Ibid.*, para 345.
9. *Ibid.*, para 596. Other platforms are concerned about similar behavior happening to them. For example, a significant amount of traffic is directed to Expedia’s travel websites through participation in pay-per-click and display advertising campaigns on search engines. Expedia warns its investors of the risk that the leading search engines “offering comprehensive travel planning, shopping or booking capabilities, or increasingly refer those leads directly to suppliers or other favored partners.” This could increase the cost of traffic directed to Expedia’s websites and harm its business. “Expedia 2017 Annual Report,” 10, <https://annualreport.stocklight.com/NASDAQ/EXPE/17588959.pdf>.
10. Case AT.39740 *Google Search (Shopping)*, para 595.
11. *Ibid.*, para 656.
12. Multi-State Complaint, *Utah et al. v. Google LLC*, No. 3:21-cv-05227 (N.D. Cal. July 7, 2021), para. 108.
13. House Report, 382–83.
14. Johan Moreno, “Google Estimated to Be Paying \$15 Billion to Remain Default Search Engine on Safari,” *Forbes* (August 27, 2021), <https://www.forbes.com/sites/johanmoreno/2021/08/27/google-estimated-to-be-paying-15-billion-to-remain-default-search-engine-on-safari/>; Chance Miller, “Analysts: Google to Pay Apple \$15 Billion to Remain Default Safari Search Engine in 2021” (August 25, 2021),

<https://9to5mac.com/2021/08/25/analysts-google-to-pay-apple-15-billion-to-remain-default-safari-search-engine-in-2021/>.

15. StatCounter, “Search Engine Market Share Worldwide, Jan. 2009–Aug 2021,” <https://gs.statcounter.com/search-engine-market-share#monthly-200901-202108>.
16. Multi-State Complaint, *Utah et al. v. Google LLC*, paras. 121 and 124 (alleging that Google’s MADAs require OEMs to (1) preinstall and place the Google Play Store icon on the home screen of Android devices, and that no competing app store be any more prominent and (2) preinstall a suite of Google proprietary apps, to make it impossible to delete or remove many of these Google apps, and to provide all of them preferential placement on device home screens or the very next screen).
17. House Report, 215.
18. Ibid.
19. Multi-State Complaint, *Utah et al. v. Google LLC*, para. 124.
20. Case AT.40099, *Google Android*.
21. Everett Rogers, 177.
22. Ibid., 203.
23. Multi-State Complaint, *Utah et al. v. Google LLC*, para. 19.
24. Ibid., para. 77.
25. State AG Android Complaint para 89 (alleging that “[h]aving recognized that sideloading constitutes a competitive risk to its business, Google has been waging <redacted> by degrading the consumer experience. To do this, Google embeds its generally misleading warnings and hurdles to sideloading into the Google-certified Android OS”). As the states allege in their complaint, Google’s representations “would lead users to believe Google when it displays warnings that the apps or app stores they are attempting to sideload are ‘unknown,’ harmful, and could damage their devices. Despite its claims of Android’s superior security, Google purposefully deceives users by presenting warnings that falsely describe highly popular apps from well-known developers as an ‘unknown app,’ which gives the user the false or misleading impression that apps and app stores downloaded from any source other than the Play Store are PHAs or that they are otherwise harmful”; Ibid., para. 230.
26. Jamie Luguri and Lior Jacob Strahilevitz, “Shining a Light on Dark Patterns,” 13(1) *Journal of Legal Analysis* (March 23, 2021): 43; Nir Eyal with Ryan Hoover, *Hooked: How to Build Habit-Forming Products* (New York: Penguin, 2019); Karen Yeung, “‘Hypernudge’: Big Data as a Mode of Regulation by Design,” 20(1), *Information, Communication & Society* (2017): 118, 121; Daniel Susser, Beate Roessler, and Helen Nissenbaum, “Technology, Autonomy and Manipulation,” 8(2) *Internet Policy Review* (June 30, 2019): 1, 3; Byung-Kwan Lee and Wei-Na Lee, “The Effect of Information Overload on Consumer Choice Quality in an On-Line Environment,” 21(3) *Psychology and Marketing* (February 12, 2004): 159; “Dark Patterns,” accessed January 4, 2022, <https://www.darkpatterns.org/types-of-dark-pattern>.
27. Natasha Lomas, “Aptoide, a Play Store Rival, Cries Antitrust Foul over Google

- Hiding Its App,” Tech Crunch (June 4, 2019), <https://techcrunch.com/2019/06/04/aptoide-a-play-store-rival-cries-antitrust-foul-over-google-hiding-its-app/>.
28. Ibid.
 29. Ibid.
 30. Multi-State Complaint, *Utah et al. v. Google LLC*, para. 92.
 31. Facebook, “What Is the Face Recognition Setting on Facebook and How Does It Work?,” accessed January 4, 2022, https://www.facebook.com/help/122175507864081?ref=learn_more.
 32. April Glaser, “Facebook’s Face-ID Database Could Be the Biggest in the World. Yes, It Should Worry Us,” *Slate* (July 9, 2019), <https://slate.com/technology/2019/07/facebook-facial-recognition-ice-bad.html>.
 33. “Amazon’s Friction-Killing Tactics to Make Products More Seamless,” *First Round Review*, <https://review.firstround.com/amazons-friction-killing-tactics-to-make-products-more-seamless>.
 34. House Report, 104.
 35. House Report, 53.
 36. L. Ceci, “Leading Google Apps in the Google Play Store in June 2021, by Downloads (in Millions),” Statista (December 7, 2021), <https://www.statista.com/statistics/248959/top-global-google-app-downloads-google-play/>.
 37. Venkatesh Abhay, “Google Is Trying to Dissuade Edge Users from Using Chrome Extensions,” Neowin (February 21, 2020), <https://www.neowin.net/news/google-is-trying-to-persuade-edge-users-from-using-chrome-extensions/> (discussing the clash between Microsoft and Google over Microsoft’s Edge browser).
 38. GlobalWebIndex Report, “The State of Mobile Ad-Blocking in 2017” (Q2 2017), <http://insight.globalwebindex.net/hubfs/The-State-of-Mobile-Ad-blocking-in-2017.pdf>.
 39. Ibid.
 40. Ibid. Of US respondents who have not blocked ads on a mobile, more than six in ten said that they did not know that it was possible to block ads via their smartphone.
 41. Wladimir Palant, “Adblock Plus for Android Removed from Google Play Store,” *Ad-block Plus* (March 14, 2013), <https://adblockplus.org/blog/adblock-plus-for-android-removed-from-google-play-store>.
 42. Lara O’Reilly, “Ad Blocker Usage Is Up 30%—and a Popular Method Publishers Use to Thwart It Isn’t Working,” *Business Insider* (January 31, 2017), <http://www.businessinsider.com/pagefair-2017-ad-blocking-report-2017-1>.
 43. Kif Leswing, “Battle of the Ad Blockers: iOS vs. Android,” *Fortune* (September 22, 2015), <http://fortune.com/2015/09/22/ad-block-ios-android/>.
 44. GlobalWebIndex Report, 131.
 45. Ibid.
 46. Tom Warren, “Google’s Chrome Ad Blocking Arrives Today and This Is How It Works,” *Verge* (February 14, 2018), <https://www.theverge.com/2018/2/14/17011266/google-chrome-ad-blocker-features>. Samsung in 2016 introduced ad-blocking technology

for its version of the Android phone. Sarah Perez, “Following Apple’s Move, Samsung Rolls Out Ad Blocking to Android Devices,” *Tech Crunch* (February 1, 2016), <https://techcrunch.com/2016/02/01/following-apples-move-samsung-rolls-out-ad-blocking-to-android-devices/>.

47. Dieter Bohn, “Google Delays Blocking Third-party Cookies in Chrome until 2023,” *Verge* (June 24, 2021), <https://www.theverge.com/2021/6/24/22547339/google-chrome-cookiepocalypse-delayed-2023>.
48. See, e.g., AGCOM, “Average Monthly Time Spent Per User on Leading Online Platforms in Italy in March 2021 (in Minutes),” Statista (July 12, 2021), <https://www-statista-com.utk.idm.oclc.org/statistics/1068649/italy-monthly-time-spent-on-leading-websites/>; Ofcom, “Leading Internet Properties Ranked by Time Spent in the United Kingdom (UK) as of September 2019 (in Minutes),” Statista (June 24, 2020), <https://www-statista-com.utk.idm.oclc.org/statistics/272879/leading-internet-properties-in-the-uk-by-time-spent/>; Verto Analytics, “Most Popular Digital Brands in the United States from May to July 2017, Ranked by Monthly User Engagement (in Hours.Minutes),” Statista (August 18, 2017).
49. “Largest Companies by Market Cap,” accessed January 4, 2022, <https://companies.marketcap.com>.
50. WordStream, “A Google Projects Resting Ground: The Google Graveyard,” accessed January 4, 2022, <https://www.wordstream.com/articles/retired-google-projects>.
51. Shoshana Zuboff, *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power* (London: Profile Books, 2019): 139.
52. Steve Jobs quote, <https://www.inc.com/jason-aten/this-was-steve-jobs-most-controversial-legacy-it-was-also-his-most-brilliant.html>.
53. Press Release (EU Commission): “Antitrust: Commission Sends Statement of Objections to Google on Android Operating System and Applications” (April 20, 2016), http://europa.eu/rapid/press-release_IP-16-1492_en.htm.

Chapter 5: Distortions beyond the Tech Barons’ Ecosystems

1. Biz Carson, “DOJ Lawyers Ask Startup Investors about Big Tech’s ‘Kill Zones’—As the DOJ Worries That Big Tech Is Squashing Smaller Startups, the Feds Ask VCs for Their Thoughts,” *Protocol* (February 12, 2020), <https://www.protocol.com/doj-antitrust-venture-capital-workshop>.
2. An OECD Report on “Start-ups, Killer Acquisitions and Merger Control” cites economic research that considers the effects of acquisitions on VC investments. “For example, Zingales et al. (2019) model investment incentives and show that nascent acquisitions lead to reduced incentives to invest in start-ups. This effect occurs because the prospect of acquisition discourages early adoption of nascent products, and hence makes entry difficult, thereby making them less attractive investments. The authors follow this by identifying a decline in venture capital funding for start-ups in the ‘same space’ as the companies acquired by Google and Facebook. Similarly, Singer (2019) cites analysis showing that VC funding for start-ups in the same category as Google

- (internet software), Facebook (social platform software) and Amazon (internet retail) have each declined dramatically in recent years.” OECD, “Start-ups, Killer Acquisitions and Merger Control—Background Note” (June 10, 2020): 32, [https://one.oecd.org/document/DAF/COMP\(2020\)5/en/pdf](https://one.oecd.org/document/DAF/COMP(2020)5/en/pdf) (citing Sai Krishna Kamepalli, Raghuram G. Rajan, and Luigi Zingales, “Kill Zone,” Stigler Center, New Working Paper Series No. 39, November 2019) (no citation was given for the Singer paper).
3. Bureau of Labor Statistics, “Survival Rate of Businesses Established in 1994 and 2000 in the United States,” Statista (July 10, 2012).
 4. Clayton M. Christensen, *The Innovator’s Dilemma*, 179; Mariana Mazzucato, *The Value of Everything*, 193.
 5. See, e.g., NVCA, “Value of Venture Capital Investment Deals in the United States 2020, by Stage (in Billion U.S. Dollars),” Statista (March 30, 2021) (noting that in 2020, US companies in their later stage acquired the largest value of venture capital investment deals: companies during their late stage acquired VC investments worth \$110.3 billion; companies in their early stage acquired VC investments worth \$43.6 billion, and those in their angel and seed stage acquired investments worth \$10.4 billion); KPMG, “Median Deal Size of Venture Capital-Backed Companies in the United States from 2010 to 2020, by Stage (in Million U.S. Dollars),” Statista (January 20, 2021) (showing that the median deal size for companies in their angel/seed stage grew from \$.5 million in 2010 to \$1.3 billion in 2020, whereas it grew from \$6 billion to \$10 billion for later stage companies over that period).
 6. Antitrust Division of the United States Department of Justice, Public Workshop on Venture Capital and Antitrust (February 12, 2020): 30, <https://www.justice.gov/atr/page/file/1255851/download>.
 7. Sai Krishna Kamepalli, Raghuram Rajan, and Luigi Zingales, “Kill Zone,” Becker Friedman Inst. Working Paper No. 2020–19 (March 17, 2020), <https://ssrn.com/abstract=3555915>.
 8. Asher Schechter, “Google and Facebook’s ‘Kill Zone’: ‘We’ve Taken the Focus Off of Rewarding Genius and Innovation to Rewarding Capital and Scale,’” Pro Market (May 25, 2018), <https://promarket.org/2018/05/25/google-facebooks-kill-zone-weve-taken-focus-off-rewarding-genius-innovation-rewarding-capital-scale/>.
 9. Submission by Paul Arnold to the United States House of Representatives, Committee on the Judiciary Subcommittee on Antitrust, Commercial, and Administrative Law (September 3, 2020): 48.
 10. Olivia Solon, “As Tech Companies Get Richer.”
 11. “Stigler Committee on Digital Platforms, Final Report,” Subcommittee on Market Structure and Antitrust, 77 (incorporating comments by Ian Hathaway who critiques a report commissioned by Facebook to explore the impact on investment). See: <http://www.ianhathaway.org/blog/2018/10/12/platform-giants-and-venture-backed-startups>.
 12. Ibid.

13. Congressional Research Service, “Mergers and Acquisitions in Digital Markets” (March 30, 2021): 1 (noting how Facebook acquired at least 63 companies, Alphabet at least 260, Amazon at least 100, Apple at least 120, and Microsoft at least 167); House Report, 392.
14. Jason Furman et al., “Independent Report of the UK Digital Competition Expert Panel ‘Unlocking Digital Competition’” (March 13, 2019): para 3.44.
15. “Non-HSR Reported Acquisitions by Select Technology Platforms, 2010–2019: An FTC Study” (September 15, 2021), <https://www.ftc.gov/reports/non-hsr-reported-acquisitions-select-technology-platforms-2010-2019-ftc-study>.
16. Press Release (US FTC): “FTC Staff Presents Report on Nearly a Decade of Unreported Acquisitions by the Biggest Technology Companies” (September 15, 2021), <https://www.ftc.gov/news-events/press-releases/2021/09/ftc-report-on-unreported-acquisitions-by-biggest-tech-companies>.
17. Axel Gautier and Joe Lamesch, “Mergers in the Digital Economy,” CESifo Working Paper Series 8056 (2020), https://ideas.repec.org/p/ces/ceswps/_8056.html.
18. See, for example, presentation by Uber to the UK Expert Panel, para 3.40.
19. Oliver Latham, Isabel Tecu, and Nitika Bagaria, “Beyond Killer Acquisitions: Are There More Common Potential Competition Issues in Tech Deals and How Can These Be Assessed?,” *Competition Policy International—Antitrust Chronicle* (May 2020), https://www.competitionpolicyinternational.com/beyond-killer-acquisitions-are-there-more-common-potential-competition-issues-in-tech-deals-and-how-can-these-be-assessed/#_edn1.
20. One can draw a distinction between the theories of harm applicable to “killer acquisitions” and “acquisitions of nascent competitors.” See: OECD, *Start-ups, Killer Acquisitions and Merger Control*; Colleen Cunningham, Florian Ederer, and Song Ma, “Killer Acquisitions,” 129(3) *Journal of Political Economy* (2021): 649.
21. FTC Amended Complaint, *FTC v. Facebook, Inc.*, No.1:20-cv-03590-JEB (D.D.C. August 19, 2021), para. 1.
22. *Ibid.*, para. 58.
23. Brian Fung, “Congress Grilled the CEOs of Amazon, Apple, Facebook and Google. Here Are the Big Takeaways,” CNN Business (July 30, 2020), <https://edition.cnn.com/2020/07/29/tech/tech-antitrust-hearing-ceos/index.html>; Casey Newton and Nilay Patel, “‘Instagram Can Hurt Us’: Mark Zuckerberg Emails Outline Plan to Neutralize Competitors,” *Verge* (July 29, 2020), <https://www.theverge.com/2020/7/29/21345723/facebook-instagram-documents-emails-mark-zuckerberg-kevin-systrom-hearing>.
24. FTC Amended Complaint, *FTC v. Facebook, Inc.*, para. 81.
25. *Ibid.*, para. 95.
26. *Ibid.*, para. 7.
27. *Ibid.*, para. 91.
28. “Instagram Founder Feared Zuckerberg Would Go into ‘Destroy Mode’ over Facebook

- Sale, Says U.S. Rep. Jayapal,” CNBC (July 29, 2020), <https://www.cnn.com/video/2020/07/29/instagram-founder-feared-zuckerberg-would-go-into-a-destruction-mode-if-he-didnt-sell-to-facebook-says-u-s-rep-jayapal.html>.
29. FTC Amended Complaint, *FTC v. Facebook, Inc.*
 30. *Ibid.*, para. 102.
 31. *Ibid.*
 32. House Report, 394.
 33. Dara Kerr, “Google Reveals It Spent \$966 Million in Waze Acquisition,” CNET (July 25, 2013), <https://www.cnet.com/news/google-reveals-it-spent-966-million-in-waze-acquisition/>.
 34. Noam Bardin, “Why Did I Leave Google or, Why Did I Stay So Long?,” PayGo (February 17, 2021), <https://paygo.media/p/25171>.
 35. Suzanne Rowan Kelleher, “Did Google Just Deliver a Death Blow to Waze?,” *Forbes* (October 21, 2019), <https://www.forbes.com/sites/suzannerowankelleher/2019/10/21/did-google-just-deliver-a-death-blow-to-waze/?sh=72ca5a8718c4>.
 36. Noam Bardin, “Why Did I Leave.”
 37. Ufuk Akcigit et al., “Rising Corporate Market Power: Emerging Policy Issues,” International Monetary Fund (March 15, 2021), <https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2021/03/10/Rising-Corporate-Market-Power-Emerging-Policy-Issues-48619>. See also: Ioannis Kokkoris and Tommaso Valletti, “Innovation Considerations in Horizontal Merger Control,” 16(2) *Journal of Competition Law & Economics* (2020): 220, <https://academic.oup.com/jcle/article-abstract/16/2/220/5820042>.
 38. Sai Krishna Kamepalli, Raghuram Rajan, and Luigi Zingales, 5. See also Cristina Caffarra, Gregory Crawford, and Tommaso Valletti, “‘How Tech Rolls’: Potential Competition and ‘Reverse’ Killer Acquisitions,” VOXEU (May 11, 2020), <https://voxeu.org/content/how-tech-rolls-potential-competition-and-reverse-killer-acquisitions>. For an opposite argument, see: Simon Bishop and Stephen Lewis, “How Merger Control Rolls: A Response to Caffarra, Crawford and Valletti” (December 2020), <https://www.rbbecon.com/how-merger-control-rolls-a-response-to-caffarra-crawford-and-valletti/>.
 39. James F. Moore, “Predators and Prey: A New Ecology of Competition,” 71(3) *Harvard Business Review* (1993): 75, <https://hbr.org/1993/05/predators-and-prey-a-new-ecology-of-competition>.
 40. Mariana Mazzucato, *The Value of Everything*, 194.
 41. Press Release (EU Commission): “Antitrust: Commission Sends Statement of Objections to Apple on App Store Rules for Music Streaming Providers” (April 30, 2021), https://ec.europa.eu/commission/presscorner/detail/en/ip_21_2061.
 42. Android Open Source Project, “Android Unites the World! Use the Open Source Android Operating System to Power Your Device,” accessed January 4, 2022, <https://source.android.com>.
 43. Multi-State Complaint, *Utah et al. v. Google LLC*, No. 3:21-cv-05227 (N.D. Cal.

July 7, 2021), para. 103 (alleging that Google forces app developers, as a condition of appearing in the Google Play Store, to sign a non-negotiable Developer Distribution Agreement, which prohibits developers from using “Google Play to distribute or make available any Product that has a purpose that facilitates the distribution of software applications and games for use on Android devices outside of Google Play”). As the states further alleged in their complaint, “This requirement unreasonably raises the cost of customer acquisition for the competing app distribution channels, as they cannot reach consumers through widely used forms of advertising that are uniquely effective in reaching users who are immediately prepared to acquire an app but instead must find alternative means of advertising to reach users.”

44. Multi-State Complaint, *Utah et al. v. Google LLC*, para. 107.
45. Complaint filed in *United States v. Google*, No. 1:20-cv-03010 (D.D.C. October 20, 2020).
46. FTC Opposition to Motion to Dismiss, 5, in *FTC v. Facebook*, No.1:20-cv-03590-JEB (D.D.C. July 4, 2021).
47. *Ibid.*
48. *Ibid.*
49. Delio Ignacio Castaneda and Sergio Cuellar, “Knowledge Sharing and Innovation: A Systematic Review,” 159–73.
50. Anuraag Singh, Giorgio Triulzi, and Christopher L. Magee, “Technological Improvement Rate Predictions for All Technologies: Use of Patent Data and an Extended Domain Description,” 50(9) *Research Policy* (2021): 104294, ISSN 0048-7333, <https://doi.org/10.1016/j.respol.2021.104294> (citing some of the literature of how technologies have extensive interaction with one another [spillover] in that technological ideas can be used for various purposes and that prior technological and scientific ideas are at the root of even the most novel technologies).
51. Matthew C. Le Merle and Alison Davis, *Corporate Innovation in the Fifth Era: Lessons from Alphabet/Google, Amazon, Apple, Facebook* (Corte Madera, CA: Cartwright Publishing, 2017): 171.
52. *Ibid.*, 182.
53. On absorption capacity, see: Wesley M. Cohen and Daniel A. Levinthal, “Absorptive Capacity: A New Perspective on Learning and Innovation,” 35(1) *Administrative Science Quarterly* (1990): 128–52; Tengjian Zou, Gokhan Ertug, and Gerard George, “The Capacity to Innovate: A Meta-Analysis of Absorptive Capacity,” 20(2) *Innovation: Organization & Management* (2018): 87, 121. On innovation clusters, see: Xavier Ferras-Hernandez and Petra A. Nylund, “Clusters as Innovation Engines: The Accelerating Strengths of Proximity,” 16(1) *European Management Review* (2019): 37.
54. Cecilia Rikap and Bengt-Åke Lundvall, “Big Tech, Knowledge Predation and the Implications for Development,” *Innovation and Development* (2020) DOI: 10.1080/2157930X.2020.1855825.
55. *Ibid.*, 2, 6.
56. Michele Boldrin and David K. Levine, “2003 Lawrence R. Klein Lecture—The Case

- against Intellectual Monopoly,” 45(2) *International Economic Review* (2004): 327–50; Ugo Pagano, “The Crisis of Intellectual Monopoly Capitalism,” 38(6) *Cambridge Journal of Economics* (2014): 1409–129; Cédric Durand and William Milberg, “Intellectual Monopoly in Global Value Chains,” 27(2) *Review of International Political Economy* (2020): 404–29.
57. Terrence J. Sejnowski, *The Deep Learning Revolution* (Cambridge, MA: MIT Press, 2018): 193.
 58. Joseph A. Schumpeter, *Capitalism, Socialism and Democracy*. For criticism, note, for example: Michele Boldrin and David K. Levine, “2003 Lawrence R. Klein Lecture.”
 59. On the value of open innovation, see: Henry Chesbrough, *Open Innovation Results: Going Beyond the Hype and Getting Down to Business* (Oxford, UK: Oxford University Press, 2019).
 60. Wesley M. Cohen and Daniel A. Levinthal, “Absorptive Capacity.”
 61. *United States v. Google*.
 62. “Sonos Unveils Next Generation Beam with Support for Dolby Atmos and New Audio Formats,” Yahoo! Finance (September 14, 2021), <https://finance.yahoo.com/news/sonos-unveils-next-generation-beam-130000678.html>.
 63. House Report, 50 (statement of Patrick Spence, CEO, Sonos, Inc.).

Chapter 6: Toxic Innovation Galore

1. When discussing technology based on patent applications, it should be noted that not all patents have been transformed into products and services. Some of the technologies may have been developed, but not necessarily implemented. Still, they offer a valuable indication as to the assets a company is trying to secure and the direction in which its technology is heading. See comments by Jason M. Schultz, a law professor at New York University, cited in: Sahil Chinoy, “What 7 Creepy Patents Reveal about Facebook,” *New York Times* (June 21, 2018), <https://www.nytimes.com/interactive/2018/06/21/opinion/sunday/facebook-patents-privacy.html>.
2. Even when healthy, this competition can occur: (1) on various dimensions (such as price, quality, service, variety, innovation); (2) operating at different levels of efficiency; (3) with different levels of product differentiation, entry barriers, and transparency; (4) at different stages of the product life cycle; and (5) with different demands for technological innovation.
3. Joseph E. Stiglitz, *Freefall: America, Free Markets, and the Sinking of the World Economy* (New York: W.W. Norton, 2010): 5, 80.
4. Gillian Tett, *Fool’s Gold: How the Bold Dream of a Small Tribe at J.P. Morgan Was Corrupted by Wall Street Greed and Unleashed a Catastrophe* (London: Abacus, 2009).
5. Sergey Brin and Lawrence Page, “The Anatomy of a Large-Scale Hypertextual Web Search Engine,” 30(1-7) *Computer Networks and ISDN Systems* (1998): 107–17, <https://snap.stanford.edu/class/cs224w-readings/Brin98Anatomy.pdf>.
6. Tracy Samantha Schmidt, “Inside the Backlash Against Facebook,” *Time* (September 6, 2006), <http://content.time.com/time/nation/article/0,8599,1532225,00.html>.

7. Antone Gonsalves, “Facebook Founder Apologizes in Privacy Flap; Users Given More Control—Founder Mark Zuckerberg Says the Social Networking Site ‘Really Messed This One Up,’” *InformationWeek* (September 8, 2006), https://www.informationweek.com/facebook-founder-apologizes-in-privacy-flap-users-given-more-control/d/d-id/1046840?pidll_msgorder=asc.
8. Jennifer Shore and Jill Steinman, “Did You Really Agree to That? The Evolution of Facebook’s Privacy Policy,” *Technology Science* (August 10, 2015), <https://techscience.org/a/2015081102/>.
9. “Facebook’s Average Revenue per User as of 4th Quarter 2020, by Region (in U.S. Dollars),” Statista (January 28, 2021), accessed May 5, 2021, <https://www.statista.com/statistics/251328/facebooks-average-revenue-per-user-by-region/>.
10. In a 2018 survey, for example, nearly 42 percent said they would be willing to spend only between \$1 and \$5 per month for an ad-free Facebook, about 25 percent said they’d pay between \$6 and \$10, 22 percent were willing to pay between \$11 and \$15, and only about 12 percent were willing to pay more than \$15 per month. See: Rani Molla, “How Much Would You Pay for Facebook Without Ads?,” *Vox Recode* (April 11, 2018), <https://www.vox.com/2018/4/11/17225328/facebook-ads-free-paid-service-mark-zuckerberg>.
11. Douglas MacMillan, “Tech’s ‘Dirty Secret’: The App Developers Sifting Through Your Gmail—Software Developers Scan Hundreds of Millions of Emails of Users Who Sign Up for Email-Based Services,” *Wall Street Journal* (July 2, 2018), <https://www.wsj.com/articles/techs-dirty-secret-the-app-developers-sifting-through-your-gmail-1530544442>; Laura Tucker, “Fears Confirmed: Third-Party App Developers Can Access Your Gmail,” *MakeTechEasier* (July 3, 2018), <https://www.maketecheasier.com/third-party-app-developers-access-gmail-emails/>; Andrew Braun, “Which Email Providers Are Scanning Your Emails?,” *MakeTechEasier* (September 24, 2018), <https://www.maketecheasier.com/which-email-providers-scanning-emails/>.
12. *Ibid.*
13. For example, one patent (“Correlating media consumption data with user profiles”) explores such use to identify which television shows you may watch. See: Sahil Chinoy, “What 7 Creepy Patents Reveal about Facebook.” Also note: Press Release (US FTC): “FTC Issues Warning Letters to App Developers Using ‘Silverpush’ Code: Letters Warn Companies of Privacy Risks in Audio Monitoring Technology” (March 17, 2016), <https://www.ftc.gov/system/files/attachments/press-releases/ftc-issues-warning-letters-app-developers-using-silverpush-code/160317samplesilverpushltr.pdf>.
14. For example: U.S. patent 10192546, “Pre-wakeword speech processing” (Amazon Technologies, Inc.); U.S. patent 10714081, “Dynamic voice assistant interaction” (Amazon Technologies, Inc.); U.S. patent 10692506, “Keyword determinations from conversational data” (Amazon Technologies, Inc.); “Truth, Trust and the Future of Commerce,” *Sparks & Honey Report* (June 2018).
15. Sam Biddle, “Facebook Uses Artificial Intelligence to Predict Your Future Actions for

- Advertisers, Says Confidential Document,” *The Intercept* (April 13, 2018), <https://theintercept.com/2018/04/13/facebook-advertising-data-artificial-intelligence-ai/>.
16. Oleksii M. Skriabin et al., “Neurotechnologies in the Advertising Industry: Legal and Ethical Aspects,” 17(2) *Innovative Marketing* (2021): 189–201, <https://www.businessperspectives.org/index.php/journals/innovative-marketing/issue-382/neurotechnologies-in-the-advertising-industry-legal-and-ethical-aspects>.
 17. Sophie Kleber, “Three Ways AI Is Getting More Emotional,” in Thomas Davenport et al., *Artificial Intelligence: The Insights You Need from Harvard Business Review* (Boston, MA: Harvard Business Review Press, 2019), 137.
 18. Ibid.
 19. Erik Brynjolfsson and Andrew McAfee, “The Business of Artificial Intelligence,” 10, 23 (noting how the software companies like Affectiva are using AI-based vision systems to recognize emotions such as joy, surprise, and anger in focus groups).
 20. Oleksii Skriabin et al., “Neurotechnologies in the Advertising Industry.”
 21. This was the “first experimental evidence for massive-scale emotional contagion via social networks.” Adam D. I. Kramer, Jamie E. Guillory, and Jeffrey T. Hancock, “Experimental Evidence of Massive-Scale Emotional Contagion through Social Networks,” 24 *PNAS* (2014): 111, <https://www.pnas.org/content/111/24/8788>.
 22. Ibid. (“a larger percentage of words in the users’ status updates were negative and a smaller percentage were positive”).
 23. Daniel Ringbeck, Dominic Seeberger, and Arnd Huchzermeier, “Toward Personalized Online Shopping: Predicting Personality Traits Based on Online Shopping Behavior,” SSRN (June 24, 2019), <http://dx.doi.org/10.2139/ssrn.3406297>. The study first gathered the self-reported personality traits of participants in the experiment via an online survey and in the following track their browsing behavior when shopping within a realistic online shop for books, which was set up for this study. That online shop contains about 120 books from four different categories: fiction, nonfiction, romance, and textbooks. The study then employed Google Analytics trackers to record every browsing action taken by consumers in the shop at the most granular level. We find that consumers’ browsing behavior data is sufficient for us to predict their personality traits with the aid of a machine learning classification algorithm.
 24. Ibid. Consumers with high NFA “buy products to explore them”; “buy more impulsively and value products for the feelings they produce”; “take more risks, switch brands more often, enjoy exploring new products, and seek more information before purchasing”; and react more favorably to violent, sexual, and fear-provoking content.
 25. Ibid., 19 (“Openness [O] and Extraversion [E] stand out as individual personality traits that can be predicted with high accuracy based on a short observation time: after only 10 seconds, the algorithm’s predictive accuracy regarding O and E is 0.70 and 0.72 respectively.”)
 26. As the study’s authors noted, “additional product views would result in even more revealing data on customer behavior and hence should further improve predictive performance.”

27. U.S. patent application 20210035298, "Utilization of luminance changes to determine user characteristics" (Apple); "Apple Glass Will Analyze Users' Eyes to Track User Attention," Beebom (February 7, 2021), <https://beebom.com/apple-glass-will-analyze-users-eyes-and-adjust-the-display/>.
28. U.S. patent application 20200358627, "Meeting insight computing system" (Microsoft).
29. U.S. patent application 20150356180, "Inferring relationship statuses of users of a social networking system" (Facebook); U.S. patent application 20150039524, "Detecting and responding to sentiment-based communications about a business on a social networking system" (Facebook).
30. U.S. patent application 9740752B2, "Determining user personality characteristics from social networking system communications and characteristics" (Facebook).
31. Ibid.
32. "Patently Creepy: Facebook's Plan to 'Read Emotions' through Your Smartphone," RT (June 8, 2017), <https://www.rt.com/viral/391420-facebook-patent-emotions-camera/>.
33. U.S. patent application 20120143693, "Targeting advertisements based on emotion" (Microsoft).
34. U.S. patent 10762429, "Emotional/cognitive state presentation" (Microsoft).
35. Ibid.
36. U.S. patent application 20170140049, "Web search based on browsing history and emotional state" (IBM); Sidney Fussell, "Alexa Wants to Know How You're Feeling Today," *Atlantic* (October 12, 2018), <https://www.theatlantic.com/technology/archive/2018/10/alexa-emotion-detection-ai-surveillance/572884/>.
37. Sidney Fussell, "Alexa Wants to Know."
38. Didem Kaya Bayram and Furkan Akyurek, "How Our Voices Could Turn into a Weapon of Mass, Hyper-Targeted Advertising," TRT World (July 12, 2018), <https://www.trtworld.com/life/how-our-voices-could-turn-into-a-weapon-of-mass-hyper-targeted-advertising-18681>.
39. U.S. patent application 20150242679A1, "Techniques for emotion detection and content delivery" (Facebook).
40. Didem Kaya Bayram and Furkan Akyurek, "How Our Voices Could Turn."
41. "AI Can Predict Whether Your Relationship Will Last Based on How You Speak to Your Partner," The Conversation (September 29, 2017), <https://theconversation.com/ai-can-predict-whether-your-relationship-will-last-based-on-how-you-speak-to-your-partner-81420>.
42. Terrence J. Sejnowski, *The Deep Learning Revolution*, 181.
43. Ibid.
44. Sophie Kleber, "Three Ways," 138.
45. Terrence J. Sejnowski, *The Deep Learning Revolution*, 182.
46. See for example range of related patents: U.S. patent application 9235849B2, "Generating user information for use in targeted advertising" (Google); U.S. patent application 20110010239, "Model-based advertisement optimization" (Yahoo); U.S. patent application 9672525B2, "Identifying related information given content and/or presenting

related information in association with content-related advertisements” (Google); U.S. patent application 20050021397, “Content-targeted advertising using collected user behavior data” (Google).

47. Sophie Kleber, “Three Ways,” 142.
48. Oleksii Skriabin et al., “Neurotechnologies in the Advertising Industry.”
49. Robin Marks, “‘Neuroprosthesis’ Restores Words to Man with Paralysis—Technology Could Lead to More Natural Communication for People Who Have Suffered Speech Loss,” University of California San Francisco, <https://www.ucsf.edu/news/2021/07/420946/neuroprosthesis-restores-words-man-paralysis>.
50. Ibid.
51. “Imagining a New Interface: Hands-free Communication without Saying a Word,” Tech@Facebook, <https://tech.fb.com/imagining-a-new-interface-hands-free-communication-without-saying-a-word/>.
52. “Virtual Reality,” Facebook Engineering, <https://engineering.fb.com/category/virtual-reality/>.
53. “Facebook, Inc. (FB), Second Quarter 2021 Results Conference Call” (July 28, 2021), https://s21.q4cdn.com/399680738/files/doc_financials/2021/q2/FB-Q2-2021-Earnings-Call-Transcript.pdf.
54. Ibid.
55. *Epic Games v. Apple*, slip. op., 20.
56. Ibid., 20, n. 132.
57. Justin Scheck, Newley Purnell, and Jeff Horwitz, “Facebook Employees Flag Drug Cartels and Human Traffickers. The Company’s Response Is Weak, Documents Show,” *Wall Street Journal* (September 16, 2021), https://www.wsj.com/articles/facebook-drug-cartels-human-traffickers-response-is-weak-documents-11631812953?mod=article_inline.
58. Ibid.
59. Ibid.
60. Ibid.
61. Ibid.
62. Ibid.
63. Video: “Big Data, Big Questions: Implications for Competition and Consumers” Subcommittee on Competition Policy, Antitrust, and Consumer Rights Hearing (September 21, 2021), Sen. Lee at 1:38, <https://www.judiciary.senate.gov/meetings/big-data-big-questions-implications-for-competition-and-consumers>.
64. Georgia Wells, Jeff Horwitz, and Deepa Seetharaman, “Facebook Knows Instagram Is Toxic for Teen Girls, Company Documents Show,” *Wall Street Journal* (September 14, 2021), https://www.wsj.com/articles/facebook-knows-instagram-is-toxic-for-teen-girls-company-documents-show-11631620739?mod=article_inline.
65. Ibid.
66. Ibid.
67. Ibid.

68. Royal Society for Public Health (RSPH), “Instagram Ranked Worst for Young People’s Mental Health” (May 19, 2017), <https://www.rsph.org.uk/about-us/news/instagram-ranked-worst-for-young-people-s-mental-health.html> (finding young people themselves say four of the five most used social media platforms actually make their feelings of anxiety worse, noting the “growing evidence linking social media use and depression in young people, with studies showing that increased use is associated with significantly increased odds of depression”).
69. Georgia Wells, Jeff Horwitz, and Deepa Seetharaman, “Facebook Knows Instagram Is Toxic.”
70. Ibid.
71. Ibid. (noting how Facebook, among other things, used focus groups, online surveys, and diary studies in 2019 and 2020, and large-scale surveys of tens of thousands of people in 2021 that paired user responses with Facebook’s own data about how much time users spent on Instagram and what they saw there).
72. Ibid.
73. Ibid.
74. Ibid., showing image of Teen Mental Health Deep Dive, Instagram slide presentation, *Wall Street Journal*, 2019.
75. Ibid.
76. Georgia Wells and Jeff Horwitz, “Facebook’s Effort to Attract Preteens Goes Beyond Instagram Kids, Documents Show,” *Wall Street Journal* (September 28, 2021), <https://www.wsj.com/articles/facebook-instagram-kids-tweens-attract-11632849667>.
77. Ibid.
78. Ibid.
79. Video: “Big Data,” Sen. Lee at 1:37.
80. Ibid. at 2:03–2:04.
81. Ibid. at 2:03.
82. For the impact of smartphones on children, see: Jean M. Twenge, *iGen: Why Today’s Super-Connected Kids Are Growing Up Less Rebellious, More Tolerant, Less Happy—and Completely Unprepared for Adulthood—and What That Means for the Rest of Us* (New York: Atria Books, 2017).
83. Damjan Jugovic Spajic, “How Much Time Does the Average Person Spend on Their Phone?,” KomandoTech (February 11, 2020), <https://kommandotech.com/statistics/how-much-time-does-the-average-person-spend-on-their-phone/>.
84. The *Diagnostic and Statistical Manual of Mental Disorders (DSM–5)* defines and classifies mental disorders in order to improve diagnoses, treatment, and research: <https://www.psychiatry.org/psychiatrists/practice/dsm>.
85. Daria J. Kuss and Mark D. Griffiths, “Social Networking Sites and Addiction: Ten Lessons Learned,” 14(3) *International Journal of Environmental Research and Public Health* (2017): 311, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5369147/>.
86. Gustavo Ferreira Veiga et al., “Emerging Adults and Facebook Use: The Validation of the Bergen Facebook Addiction Scale (BFAS),” 17 *International Journal of Mental*

- Health and Addiction* (2018): 279; Julia Brailovskaia and Jürgen Margraf, “Facebook Addiction Disorder (FAD) among German Students—A Longitudinal Approach,” *PLoS One* (December 14, 2017), <https://doi.org/10.1371/journal.pone.0189719> (noting how Facebook use is very attractive for narcissists, and could make them especially vulnerable to Facebook addiction disorder).
87. Cecilie Schou Andreassen and Ståle Pallesen, “Social Network Site Addiction—an Overview,” 20(25) *Current Pharmaceutical Design* (2014): 4053, <https://pubmed.ncbi.nlm.nih.gov/24001298/>; Julia Brailovskaia and Jürgen Margraf, “Facebook Addiction Disorder (FAD)” (defining Facebook addiction disorder through six typical characteristics of addiction disorders: “salience [e.g., permanent thinking of Facebook use], tolerance [e.g., requiring increasing time on Facebook to achieve previous positive using effect], mood modification [e.g., mood improvement by Facebook use], relapse [reverting to earlier use pattern after ineffective attempts to reduce Facebook use], withdrawal symptoms [e.g., becoming nervous without possibility to use Facebook], and conflict (e.g., interpersonal problems caused by intensive Facebook use]”).
 88. Haley Sweetland Edwards, “The Masters of Mind Control,” 191(15) *Time International* (April 2018), 30.
 89. Anna Lembke, “Digital Addictions Are Drowning Us in Dopamine,” *Wall Street Journal* (August 13, 2021), <https://www.wsj.com/articles/digital-addictions-are-drowning-us-in-dopamine-11628861572>.
 90. “Tristan Harris,” accessed January 4, 2022, <https://www.tristanharris.com>; Haley Sweetland Edwards, “The Masters of Mind Control.”
 91. Roger McNamee, “I Mentored Mark Zuckerberg. I Loved Facebook. But I Can’t Stay Silent about What’s Happening,” *Time* (January 17, 2019), <http://time.com/5505441/mark-zuckerberg-mentor-facebook-downfall/>.
 92. Ibid.
 93. Ibid. (“Every action a user took gave Facebook a better understanding of that user—and of that user’s friends—enabling the company to make tiny ‘improvements’ in the user experience every day, which is to say it got better at manipulating the attention of users.”); Roger McNamee, *Zucked: Waking Up to the Facebook Catastrophe* (New York: Penguin Press, 2019): 9, 62–63, 98–101.
 94. Roger McNamee, *Zucked*, 103.
 95. Comments made by Sandy Parakilas in an interview to BBC panorama. For the article and video: Hilary Andersson, “Social Media Apps Are ‘Deliberately’ Addictive to Users,” BBC Panorama (July 4, 2018), <https://www.bbc.co.uk/news/technology-44640959>.
 96. Evan Osnos, “Can Mark Zuckerberg Fix Facebook Before It Breaks Democracy?,” *New Yorker* (September 10, 2018), <https://www.newyorker.com/magazine/2018/09/17/can-mark-zuckerberg-fix-facebook-before-it-breaks-democracy>.
 97. Video: “Facebook Admits They Intentionally Made Us Addicted,” *Viral Nation*, <https://www.viralnation.com/blog/facebook-execs-admit-to-intentionally-making-us-addicted/>.

98. Thuy Ong, "Sean Parker on Facebook: 'God Only Knows What It's Doing to Our Children's Brains,'" *Verge* (November 9, 2017), <https://www.theverge.com/2017/11/9/16627724/sean-parker-facebook-childrens-brains-feedback-loop>.
99. "Smartphones—The Dark Side," BBC Panorama, available online: <https://www.bbc.co.uk/programmes/b0b9dzb6>.
100. Hilary Andersson, "Social Media Apps."
101. "Facebook, Inc. (FB), Second Quarter 2021 Results Conference Call."
102. *Ibid.*

Chapter 7: Ripple Effects

1. Video: Interview with Chamath Palihapitiya, founder and CEO Social Capital, "Money as an Instrument of Change," <https://www.youtube.com/watch?v=PMotykw0SIk&t=1281s>, at minute 21.
2. Jeff Horwitz and Deepa Seetharaman, "Facebook Executives Shut Down Efforts to Make the Site Less Divisive," *Wall Street Journal* (May 26, 2020), <https://www.wsj.com/articles/facebook-knows-it-encourages-division-top-executives-nixed-solutions-11590507499>; Keach Hagey and Jeff Horwitz, "Facebook Tried to Make Its Platform a Healthier Place. It Got Angrier Instead," *Wall Street Journal* (September 15, 2021), https://www.wsj.com/articles/facebook-algorithm-change-zuckerberg-11631654215?mod=article_inline.
3. *Ibid.*
4. Luke Darby, "Facebook Knows It's Engineered to 'Exploit the Human Brain's Attraction to Divisiveness,'" *GQ* (May 27, 2020), <https://www.gq.com/story/facebook-spare-the-share>.
5. Andre Ye, "The Algorithm Worth Billions: How YouTube's Addictive Video Recommender Works," *FAUN* (May 11, 2020), <https://faun.pub/the-algorithm-worth-billions-how-youtubes-addictive-video-recommender-works-d75646dac6a3>.
6. *Ibid.*
7. Karen Hao, "YouTube Is Experimenting with Ways to Make Its Algorithm Even More Addictive," *MIT Technology Review* (September 27, 2019), <https://www.technologyreview.com/2019/09/27/132829/youtube-algorithm-gets-more-addictive/>; Jonas Kaiser and Adrian Rauchfleisch, "Unite the Right? How YouTube's Recommendation Algorithm Connects the U.S. Far-Right," *Medium* (April 11, 2018), <https://medium.com/@MediaManipulation/unite-the-right-how-youtubes-recommendation-algorithm-connects-the-u-s-far-right-9f1387ccfabd>.
8. Rana Foroohar, *Don't Be Evil: The Case against Big Tech* (London: Penguin, 2019), 53.
9. Keach Hagey and Jeff Horwitz, "Facebook Tried."
10. Karen Hao, "The Facebook Whistleblower Says Its Algorithms Are Dangerous. Here's Why," *MIT Technology Review* (October 5, 2021), <https://www.technologyreview.com/2021/10/05/1036519/facebook-whistleblower-frances-haugen-algorithms/>.
11. Brian Dean, "How Many People Use YouTube in 2021?," Backlink, accessed January 4, 2022, <https://backlinko.com/youtube-users#daily-active-users>; "Number of Daily

- Active Facebook Users Worldwide as of 3rd Quarter 2021 (in Millions),” Statista (January 28, 2022), <https://www.statista.com/statistics/346167/facebook-global-dau/>.
12. Newley Purnell and Jeff Horwitz, “Facebook Services Are Used to Spread Religious Hatred in India, Internal Documents Show,” *Wall Street Journal* (October 23, 2021), <https://www.wsj.com/articles/facebook-services-are-used-to-spread-religious-hatred-in-india-internal-documents-show-11635016354>.
 13. Evan Osnos, “Can Mark Zuckerberg Fix Facebook before It Breaks Democracy?”
 14. Dissenting Statement of Commissioner Rohit Chopra, *In re Facebook, Inc.*, Commission File No. 1823109 (July 24, 2019).
 15. Nathan Grayson, “As Streamers Spread Dangerous Conspiracy Theories, Twitch Does Little to Stop Them,” *Kotaku* (May 29, 2020), <https://kotaku.com/as-streamers-spread-dangerous-conspiracy-theories-twit-1843684035>; Patricia Hernandez, “Twitch Removes PogChamp Emote after Star Encourages ‘Further Violence’ at Capitol Hill,” *Polygon* (January 6, 2021), <https://www.polygon.com/2021/1/6/22218059/pogchamp-twitch-removed-emote-ryan-gootecks-gutierrez-trump-capitol-hill>; Daniel Avelar, “WhatsApp Fake News during Brazil Election ‘Favoured Bolsonaro,’” *Guardian* (October 30, 2019), <https://www.theguardian.com/world/2019/oct/30/whatsapp-fake-news-brazil-election-favoured-jair-bolsonaro-analysis-suggests>.
 16. Institute of Strategic Dialogue, “Recommended Reading: Amazon’s Algorithms, Conspiracy Theories and Extremist Literature” (April 2021): 8, <https://www.isdglobal.org/wp-content/uploads/2021/04/Amazon-1.pdf>.
 17. Yaël Eisenstat, “How to Hold Social Media Accountable for Undermining Democracy,” *Harvard Business Review* (January 11, 2021), <https://hbr.org/2021/01/how-to-hold-social-media-accountable-for-undermining-democracy>.
 18. Keach Hagey and Jeff Horwitz, “Facebook Tried.”
 19. Peter Dizikes, “Study: On Twitter, False News Travels Faster Than True Stories,” MIT News Office (March 8, 2018), <https://news.mit.edu/2018/study-twitter-false-news-travels-faster-true-stories-0308>.
 20. Keach Hagey and Jeff Horwitz, “Facebook Tried.” (One proposed change was to take away the boost the algorithm gave to content most likely to be reshared by long chains of users. “Mark doesn’t think we could go broad” with the change, wrote the Facebook team leader to colleagues after the meeting. Mr. Zuckerberg said he was open to testing the approach, she said, but “We wouldn’t launch if there was a material tradeoff with MSI [meaningful social interactions] impact.”)
 21. Republican Staff Report, “Reining in Big Tech’s Censorship of Conservatives” (October 6, 2020), <https://republicans-judiciary.house.gov/wp-content/uploads/2020/10/2020-10-06-Reining-in-Big-Techs-Censorship-of-Conservatives.pdf>.
 22. Keach Hagey and Jeff Horwitz, “Facebook’s Internal Chat Boards Show Politics Often at Center of Decision Making,” *Wall Street Journal* (October 24, 2021), <https://www.wsj.com/articles/facebook-politics-decision-making-documents-11635100195>.
 23. FTC Complaint, *In the Matter of Aleksandr Kogan* (Chief Executive Officer of Cam-

- bridge Analytica*), para. 8, https://www.ftc.gov/system/files/documents/cases/182_3106_and_182_3107_complaint.pdf.
24. Fed. Trade Comm'n, Press Release: "FTC Sues Cambridge Analytica, Settles with Former CEO and App Developer" (July 24, 2019), <https://www.ftc.gov/news-events/press-releases/2019/07/ftc-sues-cambridge-analytica-settles-former-ceo-app-developer>.
 25. Video: Chanel 4 News, "Cambridge Analytica Uncovered: Secret Filming Reveals Election Tricks," <https://www.youtube.com/watch?v=mpbeOCKZFfQ>.
 26. *Ibid.*
 27. Dan Patterson, "Cambridge Analytica: 'We Know What You Want before You Want It,'" *TechRepublic* (August 10, 2016), <https://www.techrepublic.com/article/we-know-what-you-want-before-you-want-it/>.
 28. See, for example: Josh Dawsey, "Russian-Funded Facebook Ads Backed Stein, Sanders and Trump," *Politico* (September 26, 2017), <https://www.politico.com/story/2017/09/26/facebook-russia-trump-sanders-stein-243172>; "How the Facebook Ads That Targeted Voters Centered on Black American Culture: Voter Suppression Was the End Game," *Stop Online Violence Against Women*, <https://stoponlinevaw.com/wp-content/uploads/2018/10/Black-ID-Target-by-Russia-Report-SOVAW.pdf>.
 29. Evan Osnos, "Can Mark Zuckerberg Fix Facebook before It Breaks Democracy?"
 30. "Why We're Concerned about Profiling and Micro-Targeting in Elections," *Privacy International* (April 30, 2020), <https://privacyinternational.org/news-analysis/3735/why-were-concerned-about-profiling-and-micro-targeting-elections>.
 31. Jamie Bartlett, *The People vs. Tech: How the Internet Is Killing Democracy (and How We Save It)* (London: Ebury Press, 2018): 81.
 32. *Ibid.*, 89.
 33. Rana Foroohar, *Don't Be Evil*.
 34. Jessica Dawson, "Microtargeting as Information Warfare," 6(1) *Cyber Defense Review* (2021): 63.
 35. Keach Hagey and Jeff Horwitz, "Facebook Tried to Make Its Platform a Healthier Place."
 36. *Ibid.*
 37. *Ibid.*
 38. Facebook for Business, "About Ads about Social Issues, Elections or Politics," accessed January 4, 2022, <https://www.facebook.com/business/help/167836590566506?id=288762101909005>.
 39. The OECD, for example, noted that small and medium-sized enterprises (SMEs) that are regarded as key engine for innovation account on average "for over 90% of the innovative firms" and "incur between 20% and 60% of business expenditures on product or process innovation." "OECD SME and Entrepreneurship Outlook 2019," https://www.oecd-ilibrary.org/sites/34907e9c-en/1/2/2/6/index.html?itemId=/content/publication/34907e9c-en&_csp_=97b1ca7ff34abaf04c3b6ec7089258c9&itemIGO=oeed&itemContentType=book.

40. Economic Innovation Group, “Dynamism in Retreat,” <https://eig.org/dynamism>.
41. “In 1982, young firms [those five years old or younger] accounted for about half of all firms, and one-fifth of total employment,” observed Jason Furman, chairman, Council of Economic Advisers. But by 2013, these figures fell “to about one-third of firms and one-tenth of total employment.” Speech: Jason Furman, chairman, Council of Economic Advisers, “Beyond Antitrust: The Role of Competition Policy in Promoting Inclusive Growth,” Searle Center Conference on Antitrust Economics and Competition Policy, Chicago, IL (September 16, 2016). Also note: Jonathan B. Baker, “Market Power in the U.S. Economy Today,” Washington Center for Equitable Growth (March 2017), <http://equitablegrowth.org/research-analysis/market-power-in-the-u-s-economy-today/>.
42. Leigh Buchanan, “American Entrepreneurship Is Actually Vanishing. Here’s Why,” Inc., <https://www.inc.com/magazine/201505/leigh-buchanan/the-vanishing-startups-in-decline.html>.
43. House Report, 47 (citing John Haltiwanger et al., “Declining Business Dynamism in the U.S. High-Technology Sector”).
44. IMF Staff Discussion Note, “Rising Corporate Market Power: Emerging Policy Issues” (March 2021), https://www.vbb.com/media/Insights_Articles/SDNEA202101.pdf.
45. Insights based on: Ufuk Akcigit and Sina T. Ates, “Ten Facts on Declining Business Dynamism and Lessons from Endogenous Growth Theory,” NBER Working Paper 25755 (April 2019); Ufuk Akcigit and Sina T. Ates, “What Happened to U.S. Business Dynamism?,” NBER Working Paper 25756 (May 2019).
46. *Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 407 (2004).
47. House Report, 47.
48. Commission Staff Working Document, “Impact Assessment Report—Accompanying the Document Proposal for a Regulation of the European Parliament and of the Council on Contestable and Fair Markets in the Digital Sector (Digital Markets Act),” COM (2020): 842 final, at point 92.
49. Federico J. Díez, Daniel Leigh, and Suchanan Tambunlertchai, “Global Market Power and Its Macroeconomic Implications,” IMF Working Paper WP/18/137 (June 2018), <https://www.imf.org/en/Publications/WP/Issues/2018/06/15/Global-Market-Power-and-its-Macroeconomic-Implications-45975>; Gustavo Grullon, Yelena Larkin, and Roni Michaely, “Are US Industries Becoming More Concentrated?,” 23(4) *Review of Finance* (2019): 697, <https://academic.oup.com/rof/article/23/4/697/5477414?login=true>; Germán Gutiérrez and Thomas Philippon, “Declining Competition and Investment in the U.S.,” NBER Working Paper No. 23583 (July 2017), <https://www.nber.org/papers/w23583>. The paper used a mixture of firm- and industry-level data to test the implications of higher US and foreign competition on both leader and industry investment. To test the idea that firms that do not face the threat of entry have less incentive to invest and innovate, the study used Chinese import exposure. Industries “most affected by Chinese competition saw a decline in the number of domestic firms,

but at the same time, leaders in these industries increased investment the most.” Firms “in industries with higher excess entry in the 1990’s invested more in the 2000’s, after controlling for firm fundamentals.”

50. Philippe Aghion et al., “Competition and Innovation: An Inverted-U Relationship,” 120 *Quarterly Journal of Economics* (2005): 720, 701–28, https://www.ucl.ac.uk/~uctp39a/ABBGH_QJE_2005.pdf; Philippe Aghion, Ufuk Akcigit, and Peter Howitt, “The Schumpeterian Growth Paradigm,” 7 *Annual Review of Economics* (2015): 557–75, <https://www.annualreviews.org/doi/abs/10.1146/annurev-economics-080614-115412>; Kenneth. J. Arrow, “Economic Welfare and the Allocation of Resources for Invention,” in Richard Nelson, *The Rate and Direction of Inventive Activity: Economic and Social Factors Princeton* (Princeton, NJ: Princeton University Press, 1982); Morton I. Kamien and Nancy L. Schwartz, “On the Degree of Rivalry for Maximum Innovative Activity,” 90 *Quarterly Journal of Economics* (1976): 245–60.
51. Keach Hagey and Tripp Mickle, “Google Charges Over Twice Its Rivals in Ad Fees, Suit Shows,” *Wall Street Journal* (October 22, 2021), <https://www.wsj.com/articles/google-charges-more-than-twice-its-rivals-in-ad-deals-wins-80-of-its-own-auctions-court-documents-say-11634912297>.
52. Stacy Mitchell and Olivia LaVecchia, “Amazon’s Stranglehold,” Institute for Local Self-Reliance (November 2016), https://ilsr.org/wp-content/uploads/2020/04/ILSR_AmazonReport_final.pdf.
53. Alphabet 2020, 10-K, 17.
54. Dan Milmo, “Facebook Whistleblower Accuses Firm of Serially Misleading over Safety,” *Guardian* (October 5, 2021), <https://www.theguardian.com/technology/2021/oct/05/facebook-whistleblower-accuses-firm-of-serially-misleading-over-safety>; Dan Milmo, “Five Questions in Westminster for Facebook Whistleblower Frances Haugen,” *Guardian* (October 25, 2021), <https://www.theguardian.com/technology/2021/oct/25/five-questions-in-westminster-for-facebook-whistleblower-frances-haugen>.
55. Video: “Tristan Harris—Facebook’s Danger to Society” (October 6, 2021), <https://www.youtube.com/watch?v=qMcyuiMEEXs>.
56. Craig Timberg, “New Whistleblower Claims Facebook Allowed Hate, Illegal Activity to Go Unchecked,” *Washington Post* (October 22, 2021), <https://www.washingtonpost.com/technology/2021/10/22/facebook-new-whistleblower-complaint/>.

Chapter 8: The Innovation Narrative

1. “Why Americans Don’t Fully Trust Many Who Hold Positions of Power and Responsibility,” Pew Research Center (September 19, 2019), <https://www.people-press.org/2019/09/19/why-americans-dont-fully-trust-many-who-hold-positions-of-power-and-responsibility/>.
2. Alice Dechêne, Christoph Stahl, and Jochim Hansen, “The Truth about the Truth: A Meta-Analytic Review of the Truth Effect,” 14(2) *Personality and Social Psychology Review* (December 18, 2009): 238, <https://journals.sagepub.com/doi>

- /abs/10.1177/1088868309352251; *Walker, Jr. v. Gill*, No. 2162016CV00316, 2018 WL 3326517, at *8 (N.H. Super. April 12, 2018) (providing the historical context of the phrase “If you repeat a lie often enough, people will believe it, and you will even come to believe it yourself” to the Publications Relating to Various Aspects of Communism [1946]; United States Congress, House Committee on Un-American Activities, Issues 1–15, 19).
3. Tom Stafford, “How Liars Create the ‘Illusion of Truth,’” *BBC—Future* (October 26, 2016), <https://www.bbc.com/future/article/20161026-how-liars-create-the-illusion-of-truth>.
 4. *Williamson v. United States*, 512 U.S. 594, 599–600, 114 S. Ct. 2431, 2435, 129 L. Ed. 2d 476 (1994) (observing “One of the most effective ways to lie is to mix falsehood with truth, especially truth that seems particularly persuasive because of its self-inculpatory nature”).
 5. *Epic Games v. Apple*, 2020 WL 7012286 (N.D. Cal.).
 6. For some of these other app stores, see: “Ultimate Mobile App Stores List (2021),” BuildFire, <https://buildfire.com/mobile-app-stores-list/>.
 7. Hila Lifshitz-Assaf and Frank Nagle, “The Digital Economy Runs on Open Source. Here’s How to Protect It,” *Harvard Business Review* (September 2, 2021), <https://hbr.org/2021/09/the-digital-economy-runs-on-open-source-heres-how-to-protect-it>.
 8. *Ibid.* (Noting how Amazon took a version of Elasticsearch that Elastic had made open source, repackaged it, and sold it to their customers under nearly the same name. Elastic argued that essentially Amazon took free code that created value for the whole community and walled it off so that they were the only ones who could capture value from it.)
 9. Tim Wu, “Bell Labs and Centralized Innovation,” 54(5) *Communications of the ACM* (May 2011): 31–33.
 10. *Ibid.*
 11. Press Release (European Commission): “Antitrust: Commission Sends Statement of Objections to Apple on App Store Rules for Music Streaming Providers.”
 12. Dan Gallagher, “Apple Has Two Trillion Reasons to Fight for the App Store,” *Wall Street Journal* (May 3, 2021), <https://www.wsj.com/articles/apple-has-two-trillion-reasons-to-fight-for-the-app-store-11620039781>.
 13. *Epic Games v. Apple*, slip op. at 41.
 14. Press Release (European Commission): “Antitrust: Commission Sends Statement of Objections.”
 15. John Stuart Mill, *On Liberty* (New York: Sterling Publishing, 2004): 121.
 16. John Van Reenen, “Can Innovation Policy Restore Inclusive Prosperity in America?,” Aspen Economic Strategy Group (November 21, 2019): 121, <https://www.economicstrategygroup.org/publication/can-innovation-policy-restore-inclusive-prosperity-in-america/>.
 17. *Ibid.*
 18. *Ibid.*, 119.

19. See, e.g., Ekaterina Turkina, Boris Oreshkin, and Raja Kali, “Regional Innovation Clusters and Firm Innovation Performance: An Interactionist Approach,” 53(8) *Regional Studies* (March 2019): 1193, <https://www.tandfonline.com/doi/abs/10.1080/00343404.2019.1566697>.
20. Abby Monteil, “50 Inventions You Might Not Know Were Funded by the US Government,” *Stacker* (December 9, 2020), <https://stacker.com/stories/5483/50-inventions-you-might-not-know-were-funded-us-government>.
21. Mariana Mazzucato, *The Value of Everything*, 196.
22. *Ibid.*, 191.
23. *Ibid.*
24. John Stuart Mill, *On Liberty*, 123.
25. *Ibid.*
26. Thomas Philippon, *The Great Reversal—How America Gave Up on Free Markets* (Cambridge, MA: Harvard University Press, 2019): 256.
27. Alphabet 2020 10-K, 39; Microsoft 2021 10-K, 42.
28. Facebook 2020 10-K, 64 (“Research and development expenses consist primarily of salaries and benefits, share-based compensation, and facilities-related costs for employees on our engineering and technical teams who are responsible for building new products as well as improving existing products.”) and 65 (of the \$18.447 billion in R&D expenses for 2020, \$4.918 billion was for share-based compensation expenses).
29. Apple 2018 10-K, 38 (\$2.668 billion of \$14.236 billion in R&D expenses).
30. Annex A, available online: <https://www.mauricestucke.com/chart>.
31. Anuraag Singh, Giorgio Triulzi, and Christopher L. Magee, “Technological Improvement Rate Predictions for All Technologies: Use of Patent Data and an Extended Domain Description,” 50(9) *Research Policy* (2021): 104294 (finding from its dataset contains all patents issued by USPTO from 1976 to 2015 for which valid U.S. Patent Classification system and International Patent Classification).
32. Jonathan B. Baker, *The Antitrust Paradigm: Restoring a Competitive Economy* (Cambridge, MA: Harvard University Press, 2019): 167 (noting that “when the dominant firm views R&D rivalry as a strategic complement it will have a postmerger incentive to channel the acquired firm’s R&D capabilities into developing complementary products for those of the dominant firm rather than substitute products. As a result, buyers will have fewer substitutes to choose from, and the merged firm’s products will face less competition.”).
33. Speech: Margrethe Vestager at OECD’s conference on competition and the digital economy (June 3, 2019), https://ec.europa.eu/commission/commissioners/2014-2019/vestager/announcements/competition-and-digital-economy_en.
34. *Ibid.*
35. *Epic Games v. Apple*, No. 4:20-cv-05640-YGR, Slip op., 1 (N.D. Cal September 10, 2021).
36. Alphabet 2020 10-K, 7.
37. Facebook 2020 10-K, 7.

38. David S. Evans, “Why the Dynamics of Competition for Online Platforms Leads to Sleepless Nights but Not Sleepy Monopolies,” SSRN (July 25, 2017), <http://dx.doi.org/10.2139/ssrn.3009438>.
39. Holman W. Jenkins, “Google and the Search for the Future—The Web Icon’s CEO on the Mobile Computing Revolution, the Future of Newspapers, and Privacy in the Digital Age,” *Wall Street Journal* (August 14, 2010), <https://www.wsj.com/articles/SB10001424052748704901104575423294099527212>.
40. Apple 2020 10-K, 7.
41. *United States v. E. I. du Pont de Nemours & Co.*, 351 U.S. 377, 420, 76 S. Ct. 994, 1020, 100 L. Ed. 1264 (1956) (Warren, C.J., dissenting).
42. Geoffrey West, *Scale: The Universal Laws of Growth, Innovation, Sustainability, and the Pace of Life in Organisms, Cities, Economies, and Companies* (London: Penguin Press, 2018): 402.
43. Michael A. Cusumano, Annabelle Gawer, and David B. Yoffie, *The Business of Platforms: Strategy in the Age of Digital Competition, Innovation, and Power* (New York: HarperCollins, 2019), 108.
44. “Desktop Operating System Market Share Worldwide, 2009–2021,” Statcounter—Global Stats, accessed January 4, 2022, <https://gs.statcounter.com/os-market-share/desktop/worldwide/#yearly-2009-2021>.
45. “Largest Companies by Market Cap,” accessed January 4, 2022, <https://companiesmarketcap.com>.
46. *Verizon Commc’ns Inc. v. Law Offices of Curtis V. Trinko, LLP*, 540 U.S. 398, 407, 124 S. Ct. 872, 879, 157 L. Ed. 2d 823 (2004); Giulio Federico, “Horizontal Mergers, Innovation and the Competitive Process,” 8(10) *Journal of European Competition Law & Practice* (2017), 668.
47. *Verizon v. Trinko*.
48. Facebook, Inc.’s Motion to Dismiss FTC’s Complaint, filed in *FTC v. Facebook Inc.*, No. 1:20-cv-03590-JEB (D.D.C. October 3, 2021), 23 (quoting dicta to successfully dismiss the FTC’s monopolization complaint).
49. Computer & Communications Industry Association (CCIA) White Paper, “National Security Issues Posed by House Antitrust Bills” (2021), <https://www.ccia.net.org/wp-content/uploads/2021/09/CCIA-KS-NatSec-White-Paper.pdf>.
50. Jonathan B. Baker, *The Antitrust Paradigm*, 172 (noting the economic argument for patents is “the ability of patent holders to exclude others allows them to earn a greater profit by appropriating a larger share of social gains from their innovations, a prospect that provides would-be innovators with incentives for R&D investment”).
51. Kenneth. J. Arrow, “Economic Welfare and the Allocation of Resources for Invention,” in Richard R. Nelson, *The Rate and Direction of Inventive Activity: Economic and Social Factors* (Princeton, NJ: Princeton University Press, 1982): 609–26.
52. Consider discussion in chapters 1 and 2, and note: Frank Crowley and Declan Jordan, “Does More Competition Increase Business-Level Innovation? Evidence from Domestically Focused Firms in Emerging Economies,” 26(5) *Economics of Innovation and*

- New Technology* (2017): 38–49, <https://www.tandfonline.com/doi/abs/10.1080/10438599.2016.1233627>; Richard Blundell, Rachel Griffith, and John van Reenen, “Market Share, Market Value and Innovation in a Panel of British Manufacturing Firms,” 66(3) *Review of Economic Studies* (1999): 529–54, <https://academic.oup.com/restud/article-abstract/66/3/529/1575508>.
53. Jonathan B. Baker, *The Antitrust Paradigm*, 27–28.
 54. High levels of competition can decrease the rate of innovation (the bottom of the inverted U), a decrease in competition (from an initial high position) increases the rate of creation, but then innovation declines as competition lessens to the point of monopoly; Philippe Aghion, et al., “Competition and Innovation: An Inverted-U Relationship,” 120(2) *Quarterly Journal of Economics* (2005): 720, 701–28, https://www.ucl.ac.uk/~uctp39a/ABBGH_QJE_2005.pdf (suggesting that competition may increase the incremental profit from innovating [the “escape-competition effect”] but may also reduce innovation incentives for laggards [the “Schumpeterian effect”]). See also: Philippe Aghion, Ufuk Akcigit, and Peter Howitt, “The Schumpeterian Growth Paradigm,” 7 *Annual Review of Economics* (2015): 557–75; and more generally, Morton I. Kamien and Nancy L. Schwartz, “On the Degree of Rivalry for Maximum Innovative Activity,” 90 *Quarterly Journal of Economics* (1976): 245.
 55. See, e.g., Jonathan B. Baker, *The Antitrust Paradigm*, 28 (noting that the earlier inverted U studies “were not reliable because they did not successfully control for differences in technological opportunity across industries”).
 56. Mitsuru Igami and Kosuke Uetake, “Mergers, Innovation, and Entry-Exit Dynamics: Consolidation of the Hard Disk Drive Industry, 1996–2016,” 87(6) *Review of Economic Studies* (2020): 2672–702, <https://academic.oup.com/restud/article-abstract/87/6/2672/5568308>.
 57. Jonathan B. Baker, *The Antitrust Paradigm*, 28.
 58. Arora Ashish et al., “The Changing Structure of American Innovation: Some Cautionary Remarks for Economic Growth,” NBER Working Paper 25893 (May 2019).
 59. Video: “Declining Competition: A Transatlantic Challenge,” <https://vimeo.com/523765033#t=21m23s>.
 60. The reality is that for Tencent, the world’s largest video game company by revenue, minors account for a small percentage of its revenues. Most revenues come from adults.
 61. On the competition between Tech Barons, across industries, see: Nicolas Petit, “Technology Giants, the Moligopoly Hypothesis and Holistic Competition: A Primer,” SSRN (2016), <http://dx.doi.org/10.2139/ssrn.2856502>; Nicolas Petit, *Big Tech and the Digital Economy: The Moligopoly Scenario* (Oxford: Oxford University Press, 2020).
 62. Facebook, Inc. (FB), “First Quarter 2021 Results Conference Call” (April 28, 2021).
 63. Allison Prang, “Mark Zuckerberg’s Net Worth Drops by \$31 Billion. He’s Now the 10th Richest Person in the World,” *Wall Street Journal* (Feb. 4, 2022).
 64. Likewise, Google announced allowing its leading browser Chrome to remove support for third-party cookies. David Temkin, “Google Charts a Course towards a More

Privacy-First Web,” blog.google (March 3, 2021), <https://blog.google/products/ads-commerce/a-more-privacy-first-web/>; Chetna Bindra, “Building a Privacy-First Future for Web Advertising,” blog.google (January 25, 2021), <https://blog.google/products/ads-commerce/2021-01-privacy-sandbox/>.

65. “Tech Competition: The Rules of the Tech Game Are Changing,” *Economist* (February 27, 2021).
66. Note the OECD event on “Competition Economics of Digital Ecosystems,” with contributions from Professors Amelia Fletcher, Marc Bourreau, Daniel A. Crane, Georgios Petropoulos, Nicolas Petit, and David J. Teece. Available online: <https://www.oecd.org/daf/competition/competition-economics-of-digital-ecosystems.htm>.
67. Lance Whitney, “Apple, Google, Others Settle Antipoaching Lawsuit for \$415 Million,” CNET (September 3, 2015), <https://www.cnet.com/news/apple-google-others-settle-anti-poaching-lawsuit-for-415-million/>.
68. Daisuke Wakabayashi and Jack Nicas, “Apple, Google and a Deal That Controls the Internet,” *New York Times* (October 25, 2020), <https://www.nytimes.com/2020/10/25/technology/apple-google-search-antitrust.html>.
69. Australian Competition and Consumer Commission (ACCC) “Digital Platforms Inquiry—Final Report” (July 26, 2019): 10, 30 (recommending changes to search engine and internet browser defaults so that Google provides Australian users of Android devices with the same options being rolled out to existing Android users in Europe: the ability to choose their default search engine and default internet browser from a number of options); UK Competition and Markets Authority (CMA) “Online Platforms and Digital Advertising Market Study—Final Report” (July 1, 2020), para. 89 and para. 3,106 (finding that in 2019, Google paid Apple £1.2 billion for default positions in the UK alone, which represented over 17 percent of Google’s total annual search revenues in the UK).
70. Apple 2019 Form 10-K.
71. Bennett Cyphers, “Google’s FloC Is a Terrible Idea,” Electronic Frontier Foundation (March 3, 2021), <https://www.eff.org/deeplinks/2021/03/googles-floc-terrible-idea>; Eerke Boitn, “Google’s Scrapping Third-Party Cookies—but Invasive Targeted Advertising Will Live On,” *The Conversation* (March 8, 2021), <https://theconversation.com/googles-scrapping-third-party-cookies-but-invasive-targeted-advertising-will-live-on-156530>.
72. Laurie Clarke, Oscar Williams, and Katharine Swindells, “How Google Quietly Funds Europe’s Leading Tech Policy Institutes,” *New Statesman* (July 30, 2021), <https://www.newstatesman.com/science-tech/big-tech/2021/07/how-google-quietly-funds-europe-s-leading-tech-policy-institutes>; Brody Mullins and Jack Nicas, “Paying Professors: Inside Google’s Academic Influence Campaign,” *Wall Street Journal* (July 14, 2017), <https://www.wsj.com/articles/paying-professors-inside-googles-academic-influence-campaign-1499785286>.
73. “Big Tech’s Backdoor to the FTC,” Tech Transparency Project (March 2021): 8, https://www.techtransparencyproject.org/sites/default/files/Big-Techs-Backdoor-to-the-FTC_031221.pdf.

74. Ibid.
75. Ibid.
76. David McLaughlin, “One Tech-Funded University Helped Shape FTC’s Hands-off Approach,” *Bloomberg Businessweek* (March 12, 2021), <https://www.bloomberg.com/news/articles/2021-03-12/how-george-mason-university-shaped-ftc-s-hands-off-approach-to-tech>.
77. Daisuke Wakabayashi, “Big Tech Funds a Think Tank Pushing for Fewer Rules. For Big Tech,” *New York Times* (July 24, 2020), <https://www.nytimes.com/2020/07/24/technology/global-antitrust-institute-google-amazon-qualcomm.html>.
78. “Proposals to Address Gatekeeper Power and Lower Barriers to Entry Online,” Subcommittee on Antitrust, Commercial, and Administrative Law Hearing (February 25, 2021), <https://judiciary.house.gov/calendar/eventsingle.aspx?EventID=4382>.
79. Ibid.
80. “Report: Google Academics Inc.,” Tech Transparency Project (July 11, 2017), <https://www.techtransparencyproject.org/articles/google-academics-inc>.
81. Daisuke Wakabayashi, “Big Tech Funds a Think Tank.”

Chapter 9: Current Antitrust Enforcement

1. Statement by Jeffrey P. Bezos, founder and chief executive officer, Amazon before the U.S. House of Representatives, Committee on the Judiciary, Subcommittee on Antitrust, Commercial, and Administrative Law (July 29, 2020), <https://docs.house.gov/meetings/JU/JU05/20200729/110883/HHRG-116-JU05-Wstate-BezozJ-20200729.pdf>.
2. Testimony of Mark Zuckerberg, Facebook, Inc., before the United States House of Representatives, Committee on the Judiciary, Subcommittee on Antitrust, Commercial, and Administrative Law (July 29, 2020), <https://docs.house.gov/meetings/JU/JU05/20200729/110883/HHRG-116-JU05-Wstate-ZuckerbergM-20200729.pdf>.
3. OECD Policy Roundtable, “Competition, Patents and Innovation 2006,” <https://www.oecd.org/daf/competition/39888509.pdf>.
4. U.S. Department of Justice and the Federal Trade Commission, “Horizontal Merger Guidelines” (August 19, 2010) § 6.4; see also: EU Guidelines on the assessment of horizontal mergers OJ (2004) C 31/5, 8. (“Effective competition brings benefits to consumers, such as low prices, high quality products, a wide selection of goods and services, and innovation.”)
5. “Start-ups, Killer Acquisitions and Merger Control—Note by the United States,” OECD DAF/COMP/WD(2020)23 (June 11, 2020), <https://www.justice.gov/atr/page/file/1316551/download>.
6. U.S. Department of Justice and the Federal Trade Commission, “Horizontal Merger Guidelines” (August 19, 2010): 2 (“enhanced market power can also be manifested in non-price terms and conditions that adversely affect customers, including reduced product quality, reduced product variety, reduced service, or diminished innovation. Such non-price effects may coexist with price effects, or can arise in their absence.

When the Agencies investigate whether a merger may lead to a substantial lessening of non-price competition, they employ an approach analogous to that used to evaluate price competition.”); EC Guidelines on the Assessment of Horizontal Mergers under the Council Regulation on the control of concentrations between undertakings, 2004/C 31/03, para 8 (likewise noting that “effective competition brings benefits to consumers, such as low prices, high quality products, a wide selection of goods and services, and innovation”).

7. US Horizontal Merger Guidelines, § 6.4.
8. FTC Complaint, *FTC v. Facebook, Inc.*, No. 1:20-cv-03590 (D.D.C. December 9, 2020), para. 72.
9. “Start-ups, Killer Acquisitions and Merger Control—Note by the United States,” para. 43.
10. “Unlocking Digital Competition: Report of the UK Digital Competition Expert Panel” (March 2019), para. 3.43 (noting that “there have been no false positives in mergers involving the major digital platforms, for the simple reason that all of them have been permitted”).
11. “Start-ups, Killer Acquisitions and Merger Control—Note by the United States,” OECD DAF/COMP/WD(2020)23, para 14 (June 11, 2020), <https://www.justice.gov/atr/page/file/1316551/download>.
12. See, e.g., *Google/ITA. Google/Fitbit. Microsoft/LinkedIn*.
13. Jonathan B. Baker, *The Antitrust Paradigm*, 151 (noting how enforcement agencies identify innovation issues in one-third of their merger challenges, almost always along with other concerns not involving innovation, and that mergers taking place in R&D-intensive industries are almost always flagged for innovation concerns, but that these statistics overstate the extent of enforcement attention. Half the time innovation comes up, the agencies simply mention innovation without elaboration. And while the agencies have lately shown interest in innovation issues, the courts have not yet grappled with the mechanisms by which mergers can harm innovation.).
14. OECD Background Note: “Start-ups, Killer Acquisitions and Merger Control” (2020): 16, www.oecd.org/daf/competition/start-ups-killer-acquisitions-and-merger-control-2020.pdf, citing Axel Gautier and Joe Lamesch, “Mergers in the Digital Economy,” CESifo Working Paper No. 8056 (2020), <https://ssrn.com/abstract=3529012>.
15. Section 7 of the Clayton Act prohibits an acquisition “where in any line of commerce or in any activity affecting commerce in any section of the country, the effect of such acquisition may be substantially to lessen competition,” 15 U.S.C. § 18. The term “may be” in the statute requires only “an appreciable danger” of harm to competition, *United States v. H&R Block, Inc.*, 833 F. Supp. 2d 36, 49 (D.D.C. 2011) (quotation omitted).
16. *United States v. Energy Solutions*, 265 F. Supp. 3d 415, 436 (D. Del. 2017).
17. David I. Gelfand, “Preserving Competition the Only Solution, Evolve,” Speech, Loyola 2015 Antitrust Colloquium (April 24, 2015), <https://www.justice.gov/atr/file/518896/download>; Video: “Declining Competition: A Transatlantic Challenge” (March 15, 2021), [https://vimeo.com/523765033#t=21m23s%20\(ar%201:34\)](https://vimeo.com/523765033#t=21m23s%20(ar%201:34)).

18. *U.S. v. Kimberly-Clark Corp. and Scott Paper*, Civil No.: 3:95 CV 3055-P (December 12, 1995), <https://www.justice.gov/atr/case-document/complaint-141>.
19. Speech: Charles E. Biggio, “Merger Enforcement at the Antitrust Division,” Before the Antitrust Law Committee, Chicago Bar Association (May 15, 1996), <https://www.justice.gov/atr/speech/merger-enforcement-antitrust-division>.
20. Speech: Constance K. Robinson, “Quantifying Unilateral Effects in Investigations and Cases,” Before the George Mason Law Review Symposium, Antitrust in the Information Revolution: New Economic Approaches for Analyzing Antitrust Issues (October 11, 1996), <https://www.justice.gov/atr/speech/quantifying-unilateral-effects-investigations-and-cases>.
21. Speech: Charles A. James, “Rediscovering Coordinated Effects,” American Bar Association Annual Meeting, Section of Antitrust Law (August 13, 2002): 7–8, <http://www.justice.gov/atr/public/speeches/200124.pdf> (noting “one interesting side-effect of the 1992 Guidelines has been the emergence of unilateral effects as the predominant theory of economic harm pursued in government merger investigations and challenges.”); Malcolm B. Coate, “The Merger Review Process at the Federal Trade Commission from 1989 to 2016,” SSRN (February 28, 2018), <https://ssrn.com/abstract=2955987> (identifying for FTC mergers a trend toward unilateral effects analysis).
22. Malcolm B. Coate, “The Merger Review Process,” 6.
23. *Ibid.*, 18.
24. Richard R. Nelson and Sidney G. Winter, *An Evolutionary Theory of Economic Change* (Cambridge, MA: Harvard University Press, 1985): 370.
25. Bart Verspagen, “The Use of Modelling Tools for Policy in Evolutionary Environments,” in Albert Faber et al., *Environmental Policy and Modelling in Evolutionary Economics* (2006): 6.
26. *Epic Games v. Apple*, No. 4:20-cv-05640-YGR, Slip op., 1 (N.D. Cal September 10, 2021).
27. Instead the agencies must use other non-price factors, which the European Commission and Bundeskartellamt have done in their cases against the Tech Barons. Likewise the district court agreed with the FTC that it “must plead specific facts regarding the price or non-price terms under which [personal social network]—service users would switch (if ever) to alternatives. Instead, *at this stage* the FTC may permissibly plead that certain ‘factors’ of both the service at issue and its potential substitutes—e.g., their ‘price, use[,] and qualities’—render them not ‘reasonably interchangeable’ in the eyes of users.” *FTC v. Facebook*, Case No. 1:20-cv-03590-JEB, slip op. at 24 (D.D.C. June 28, 2021) (emphasis added). It remains to be seen whether the district court will require proof of cross-elasticity of demand at the summary judgment or trial stage.
28. *Epic Games v. Apple*, 56–57.
29. OECD Background Note: “Start-ups, Killer Acquisitions and Merger Control,” 10.
30. Jacques Crémer, Yves-Alexandre de Montjoye, and Heike Schweitzer, “Competition Policy for the digital Era—Final Report,” European Commission (2019): 116–17 (suggesting that “there exists a gap in currently accepted theories of harm,” the result

of which is that such transactions may go unchallenged despite early elimination of potential competitive threats).

31. *Epic Games v. Apple*, 35.
32. *Ibid.*, 141.
33. *Ibid.*, 41, 93.
34. *Ibid.*, 100–4, 118.
35. *Ibid.*, 139.
36. *FTC v. Facebook, Inc.*, No. 1:20-cv-03590 (D.D.C. June 28, 2021), *12.
37. *FTC v. Facebook, Inc.*, No. CV 20-3590 (JEB), 2022 WL 103308, at *1 (D.D.C. Jan. 11, 2022).
38. *United States v. Grinnell Corp.*, 384 U.S. 563, 571, 86 S. Ct. 1698, 1704, 16 L. Ed. 2d 778 (1966).
39. *Epic Games v. Apple*, 137 (noting that “Epic Games failed to produce evidence that this rate [of 30% which the court agreed was supra-competitive] has had any impact on the output of mobile gaming transactions.”)
40. “Unfortunately, what is needed is a comparison of output in a ‘but-for’ world without the challenged restrictions. Such comparison is not in the record,” *Epic Games v. Apple*, 99.
41. Lance Whitney, “Apple, Google, Others Settle Antipoaching Lawsuit for \$415 Million,” CNET (September 3, 2015), <https://www.cnet.com/news/apple-google-others-settle-anti-poaching-lawsuit-for-415-million/>.
42. Sarah E. Needleman and Tim Higgins, “Apple Denies Request by Epic to Bring ‘Fortnite’ Developer Account Back,” *Wall Street Journal* (September 22, 2021), <https://www.wsj.com/articles/epic-games-says-apple-won-t-reinstate-developer-account-11632331517>.
43. Case AT.39740, *Google Search (Shopping)*.
44. Case AT.40099 *Google Android* (Commission received the first complaint on March 2013, opened a formal investigation on April 2015 and reached its decision in July 2018.); Case AT.40411, *Google Search (AdSense)* (Commission formal investigation was initiated in 2016 and resulted in a decision in 2019).
45. See: “Predictions for 2031 | Future Timeline,” Quantumrun <https://www.quantumrun.com/future-timeline/2031>.
46. *In re Facebook, Inc.* (FTC File No. 1823109), Dissenting Statement of Commissioner Rebecca Kelly Slaughter (July 24, 2019) (she could not “view the [FTC] order as adequately deterrent without both meaningful limitations on how Facebook collects, uses, and shares data and public transparency regarding Facebook’s data use and order compliance”), https://www.ftc.gov/system/files/documents/public_statements/1536918/182_3109_slaughter_statement_on_facebook_7-24-19.pdf.
47. *In re Facebook, Inc.* (FTC File No. 1823109), Dissenting Statement of Commissioner Rohit Chopra (July 24, 2019), https://www.ftc.gov/system/files/documents/public_statements/1536911/chopra_dissenting_statement_on_facebook_7-24-19.pdf [<https://perma.cc/5U9N-SJN7>].
48. OECD Background Note: “Start-ups, Killer Acquisitions and Merger Control.”

49. *Ibid.*, 3.
50. Malcolm B. Coate, “The Merger Review Process.”
51. *Northern Pacific R. Co. v. United States*, 356 U.S. 1 (1958).
52. A Senate report stated that “the purpose of the proposed bill . . . is to limit future increases in the level of economic concentration resulting from corporate mergers and acquisitions.” S. Rep. No. 1775, 81st Cong., 2d Sess. 3 (1950). A House report announced a similar purpose: “The bill is intended to permit intervention in such a cumulative process [of acquisitions] when the effect of an acquisition may be a significant reduction in the vigor of competition, even though this effect may not be so far-reaching as to amount to a combination in restraint of trade, create a monopoly or constitute an attempt to monopolize,” H.R. Rep. No. 1191, 81st Cong., 1st Sess. 8 (1949).
53. Robert H. Lande, “Wealth Transfers as the Original and Primary Concern of Antitrust: The Efficiency Interpretation Challenged,” 34 *Hastings Law Journal* (1982): 65, 135–36, https://repository.uchastings.edu/hastings_law_journal/vol50/iss4/11/; Wesley A. Cann, “Section 7 of the Clayton Act and the Pursuit of Economic ‘Objectivity’: Is There Any Role for Social and Political Values in Merger Policy?,” 60 *Notre Dame Law Review* (1985): 273, 278.
54. *United States v. Anthem, Inc.*, 236 F. Supp. 3d 171, 231 (D.D.C. 2017) (finding that the merger is likely to slow innovation in the market), affirmed, *United States v. Anthem, Inc.*, 855 F.3d 345 (D.C. Cir. 2017).
55. See for example concerns over horizontal overlaps between close innovators in Case M.7932 *Dow/DuPont*, European Commission, [2017] OJ C353/9.
56. Video: “Declining Competition: A Transatlantic Challenge,” 1:47.
57. *United States v. Sabre Corp.*, 452 F. Supp. 3d 97, 148 (D. Del. 2020), vacated, No. 20-1767, 2020 WL 4915824 (3d Cir. July 20, 2020) (emphasis added). The parties abandoned the merger after the US appealed to the Third Circuit, which ultimately vacated the court’s decision.
58. *Ibid.*
59. Video: “Declining Competition: A Transatlantic Challenge,” 1:34.
60. OECD online event: “Competition Economics of Digital Ecosystems” (December 3, 2020, and February 24, 2021).
61. Press Release (US House of Representatives): “Nadler & Cicilline Statement on Federal Court’s Dismissal of FTC Antitrust Suits Against Facebook,” House Judiciary Committee (June 28, 2021), <https://judiciary.house.gov/news/documentsingle.aspx?DocumentID=4626>.
62. Leah Nylen, “Apple Wins Round One. Round Two Will Come from Washington,” *Politico* (September 10, 2021), <https://www.msn.com/en-us/news/technology/apple-wins-round-one-round-two-will-come-from-washington/ar-AAOjISd>.
63. Anna Edgerton, “Apple Ruling Shows Need for App Store Law, Lawmakers Say,” *Bloomberg* (September 11, 2021), <https://www.bloomberqint.com/politics/apple-ruling-underscores-need-for-app-store-bill-lawmakers-say>.

Chapter 10: Pyrrhus, Ducks, and Proposed Reforms

1. “Antitrust Division (ATR)—2021 Budget Request,” <https://www.justice.gov/doj/page/file/1246781/download>.
2. “America’s 350 Largest Law Firms,” Public Legal, <https://www.ilrg.com/nlj250?page=3>.
3. “Federal Trade Commission Congressional Budget Justification—Fiscal Year 2022,” 4, <https://www.ftc.gov/system/files/documents/reports/fy-2022-congressional-budget-justification/fy22cbj.pdf>.
4. Video: Subcommittee on Competition Policy, Antitrust, and Consumer Rights, “Big Data, Big Questions: Implications for Competition and Consumers” (September 21, 2021): 2:05, <https://www.judiciary.senate.gov/meetings/big-data-big-questions-implications-for-competition-and-consumers>.
5. House Report, 7; see also *ibid.*, 387. (“It is unclear whether the antitrust agencies are presently equipped to block anticompetitive mergers in digital markets. The record of the Federal Trade Commission and the Justice Department in this area shows significant missteps and repeat enforcement failures.”)
6. Press Release (US FTC): “Nadler & Cicilline Statement on Federal Court’s Dismissal of FTC Antitrust Suits Against Facebook.”
7. Press Release (U.S. House of Representatives): “Chairman Nadler Applauds Committee Passage of Bipartisan Tech Antitrust Legislation” (June 24, 2021), <https://judiciary.house.gov/news/documentsingle.aspx?DocumentID=4622>.
8. *Ibid.*
9. *Ibid.*
10. *Ibid.*
11. *Ibid.*
12. Once an online platform is designated as a covered platform under the Act, it cannot own or control in a line of business other than the covered platform that (1) utilizes the covered platform for the sale or provision of products or services; (2) offers a product or service that the covered platform requires a business user to purchase or utilize as a condition for access to the covered platform, or as a condition for preferred status or placement of a business user’s products or services on the covered platform; or (3) gives rise to a conflict of interest. A conflict of interest under the Act would include the conflict of interest that arises when (1) a covered platform operator owns or controls a line of business, other than the covered platform; and (2) the covered platform operator’s ownership or control of that line of business creates the incentive and ability for the covered platform operator to (a) advantage the covered platform operator’s own products, services, or lines of business on the covered platform over those of a competing business or a business that constitutes nascent or potential competition to the covered platform operator; or (b) exclude from, or disadvantage, the products, services, or lines of business on the covered platform of a competing business or a business that constitutes nascent or potential competition to the covered platform operator.
13. European Commission, “Proposal for a Regulation of the European Parliament and of

- the Council on Contestable and Fair Markets in the Digital Sector (Digital Markets Act),” SEC(2020) 437 final (December 15, 2020), 2 (hereinafter Digital Markets Act).
14. Digital Markets Act, 33.
 15. Press Release (Apple): “Japan Fair Trade Commission Closes App Store Investigation” (September 1, 2021), <https://www.apple.com/newsroom/2021/09/japan-fair-trade-commission-closes-app-store-investigation/>.
 16. *Ibid.*, 1.
 17. *Ibid.*, 10.
 18. *Ibid.*, 10.
 19. *Ibid.*, 5 (the Digital Markets Act would prohibit the gatekeepers “from using, in competition with business users, any data not publicly available, which is generated through activities by those business users, including by the end users of these business users, of its core platform services or provided by those business users of its core platform services or by the end users of these business users”).
 20. House Report, 392.
 21. House Report, 399 (noting also that generally “false positives” are not more costly than “false negatives” for antitrust enforcement). See also: Jacques Crémer, Yves-Alexandre de Montjoye, and Heike Schweitzer, “Competition Policy for the Digital Era,” 4, <https://www.bibsonomy.org/bibtex/2f87b8251c8f49b69fd7bddedec8a7a49/meneteqel>: “The specific characteristics of many digital markets have arguably changed the balance of error cost and implementation costs, such that some modifications of the established tests, including allocation of the burden of proof and definition of the standard of proof, may be called for. In particular, in the context of highly concentrated markets characterized by strong network effects and high barriers to entry (i.e., not easily corrected by markets themselves), one may want to err on the side of disallowing potentially anti-competitive conducts, and impose on the incumbent the burden of proof for showing the pro-competitiveness of its conduct.”
 22. Jason Furman et al., “Unlocking Digital Competition—Independent Report of the UK Digital Competition Expert Panel” (March 13, 2019), <https://www.gov.uk/government/publications/unlocking-digital-competition-report-of-the-digital-competition-expert-panel>; ACCC “Digital Platforms Inquiry—Final Report,” 30, 105 (recommending amending merger law to incorporate in the agency’s assessment “(i) the likelihood that the acquisition would result in the removal from the market of a potential competitor; and (ii) the nature and significance of assets, including data and technology, being acquired directly or through the body corporate”); “Competition and Antitrust Law Enforcement Reform Act of 2021,” 117th Congress, https://www.klobuchar.senate.gov/public/_cache/files/e/1/e171ac94-edaf-42bc-95ba-85c985a89200/375AF2AEA4F2AF97FB96DBC6A2A839F9.sil21191.pdf; Jacques Crémer, Yves-Alexandre de Montjoye, and Heike Schweitzer, “Competition Policy for the Digital Era.”
 23. “Competition and Antitrust Law Enforcement Reform Act of 2021,” 117th Congress,

- S. 225; House Report, 387–88, 394–95 (recommending clarifying that the agency would not have to prove that the nascent competitor would have been a successful entrant, but for the transaction; proposing “a presumption against acquisitions of startups by dominant firms, particularly those that serve as direct competitors, as well as those operating in adjacent or related markets” and shifting the burden to the dominant platform for other acquisitions, so that “any acquisition by a dominant platform would be presumed anticompetitive unless the merging parties could show that the transaction was necessary for serving the public interest and that similar benefits could not be achieved through internal growth and expansion”); Video: “Declining Competition: A Transatlantic Challenge,” 1:40–1:45, (former top economist of the European Commission, Professor Tommaso Valletti, opining that as markets have become concentrated, there is an argument in favor of changing the benchmark and possibly introducing a structural presumption that is rebuttable).
24. House Report, 395–96 (recommending that “Congress explore presumptions involving vertical mergers, such as a presumption that vertical mergers are anticompetitive when either of the merging parties is a dominant firm operating in a concentrated market, or presumptions relating to input foreclosure and customer foreclosure”).
 25. Digital Markets Act, Article 12; ACCC “Digital Platforms Inquiry—Final Report,” 10 (recommending that “the large digital platforms should each agree to a protocol to notify the ACCC of proposed acquisitions that may impact competition in Australia”) and 109; House Report, 388 (recommending that the dominant platforms “be required to report all transactions and no HSR deadlines would be triggered”).
 26. Press Release (German Bundeskartellamt): “Amendment of the German Act against Restraints of Competition” (January 19, 2021), https://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2021/19_01_2021_GWB%20Novelle.html.
 27. Ibid.
 28. Digital Markets Act, Article 22 (proposing that the Commission in case of urgency due to the risk of serious and irreparable damage for business users or end users of gatekeepers, to order interim measures against a gatekeeper on the basis of a prima facie finding of an infringement of the DMA); for an example under current EU competition law, see Press Release: EU Commission “Antitrust: Commission Imposes Interim Measures on Broadcom in TV and Modem Chipset Markets” (October 16, 2019), and Bundeskartellamt.
 29. When it has reasonable grounds for believing that competition is not working effectively in a market, the UK competition authority can use powers under its antitrust laws to obtain information and conduct research for “a wide consideration of issues affecting the market,” including a range of outcomes, such as imposing orders to remedy anticompetitive effects, and issuing “recommendations to government, enforcement action and referral for market investigation.” Press Release: UK Competition and Markets Authority, “CMA Launches Immediate Review of Audit Sector” (October 9, 2018).
 30. “EU Proposal for New Competition Tool” (June 2, 2020), <https://ec.europa.eu>

/info/law/better-regulation/have-your-say/initiatives/12416-Single-Market-new-complementary-tool-to-strengthen-competition-enforcement_en. Also note the Digital Markets Act, Articles 15–17.

31. Digital Markets Act, 40; American Choice and Innovation Online Act, H.R. 3816 (subject to certain affirmative defenses, the Act prohibits the covered platforms from using non-public data to offer, or support the offering of, the covered platform operator's own products, services, or lines of business that are obtained from or generated on the covered platform (a) by the activities of a business user; or (b) through an interaction of a covered platform user with the products or services of a business user).
32. Digital Markets Act, Article 6(b) (allowing end users to uninstall any preinstalled software applications on its core platform service without prejudice to the possibility for a gatekeeper to restrict such uninstallation in relation to software applications that are essential for the functioning of the operating system or of the device and which cannot technically be offered on a standalone basis by third-parties); American Choice and Innovation Online Act, H.R. 3816 (subject to certain affirmative defenses, the Act prohibits the covered platforms from restricting or impeding their users from uninstalling software applications that have been preinstalled on the covered platform or changing default settings that direct or steer covered platform users to products or services offered by the covered platform operator; Digital Services Act (proposal, as modified by the European Parliament) (Jan. 20, 2022)
33. American Choice and Innovation Online Act, H.R. 3816 (subject to certain affirmative defenses, the Act prohibits the covered platforms from conditioning access to the covered platform or preferred status or placement on the covered platform on the purchase or use of other products or services offered by the covered platform operator).
34. Digital Markets Act, Article 6(d) (refraining the Tech Barons “from treating more favourably in ranking services and products offered by the gatekeeper itself or by any third party belonging to the same undertaking compared to similar services or products of third party and apply fair and non-discriminatory conditions to such ranking”); American Choice and Innovation Online Act, H.R. 3816 (subject to certain affirmative defenses, the Act prohibits powerful platforms “to engage in any conduct in connection with the operation of the covered platform that (1) advantages the covered platform operator's own products, services, or lines of business over those of another business user; (2) excludes or disadvantages the products, services, or lines of business of another business user relative to the covered platform operator's own products, services, or lines of business; or (3) discriminates among similarly situated business users” and in connection with any user interface, including search or ranking functionality offered by the covered platform, treat the covered platform operator's own products, services, or lines of business more favorably than those of another business user; and restricting or impeding a business user, or a business user's customers or users, from interoperating or connecting to any product or service).
35. Digital Markets Act, Article 6(c) (allowing the installation and effective use of third party software applications or software application stores using, or interoperating with,

operating systems of that gatekeeper and allow these software applications or software application stores to be accessed by means other than the core platform services of that gatekeeper. The gatekeeper shall not be prevented from taking proportionate measures to ensure that third party software applications or software application stores do not endanger the integrity of the hardware or operating system provided by the gatekeeper), and 6(f) (allowing business users and providers of ancillary services access to and interoperability with the same operating system, hardware or software features that are available or used in the provision by the gatekeeper of any ancillary services); American Choice and Innovation Online Act, H.R. 3816 (preventing covered platforms from restricting or impeding covered platform users from uninstalling software applications that have been preinstalled on the covered platform or changing default settings that direct or steer covered platform users to products or services offered by the covered platform operator).

36. Digital Markets Act, Article 6(e) (refraining the Tech Barons “from technically restricting the ability of end users to switch between and subscribe to different software applications and services to be accessed using the operating system of the gatekeeper, including as regards the choice of Internet access provider for end users”); Augmenting Compatibility and Competition by Enabling Service Switching (ACCESS) Act of 2021, H.R. 3849 (requiring a covered platform to maintain “a set of transparent, third-party-accessible interfaces [including application programming interfaces] to facilitate and maintain interoperability with a business user that complies with the standards issued” by the FTC under section 6(c) of the Act. The FTC must issue standards of interoperability specific to each covered platform that “seek to encourage entry by reducing or eliminating the network effects that limit competition with the covered platform, ensure that business users interconnect with the covered platform on fair and nondiscriminatory terms, and protect data security and privacy.”).
37. Keith Sutton, “Break Bad Shooting Habits, Bag More Ducks,” Ducks Unlimited, <https://www.ducks.org/hunting/shooting-tips/break-bad-shooting-habits-bag-more-ducks>.
38. Michael G. Jacobides, “Designing Digital Ecosystems,” in Michael G. Jacobides, Arun Sundararajan, and Marshall Van Alstyne, “Platforms and Ecosystems: Enabling the Digital Economy,” World Economic Forum, Briefing Paper (2019): 13–18, https://www3.weforum.org/docs/WEF_Digital_Platforms_and_Ecosystems_2019.pdf (noting “Ecosystems can be the tool to dislodge established incumbents and change the very definition of a sector, but they can also offer the means to reorganize, and to protect incumbent firms that find themselves under immense pressure to offer far-reaching solutions that encompass an ever-growing gamut of potential complements. Younger and more established participants alike are keenly aware of the desirability to offer a ‘one-stop shop’ solution to cover all customers’ needs.”).
39. Terrence J. Sejnowski, *The Deep Learning Revolution*, 10.
40. As recalled by Eric Schmidt in an interview in 2011: Lillian Cunningham, “Google’s Eric Schmidt Expounds on His Senate Testimony,” *Washington Post* (October 1, 2011), https://www.washingtonpost.com/national/on-leadership/googles-eric-schmidt-expounds-on-his-senate-testimony/2011/09/30/gIQAPyVgCL_story.html.

41. Building upon Europe's extensive privacy framework, the proposed Digital Markets Act would allow Europeans to opt out of the gatekeepers' combining their personal data across their services and the data collected from third parties and require the powerful platforms to provide the Commission more information on how they are profiling individuals. Digital Markets Act Articles 5(a) (gatekeeper must refrain "from combining personal data sourced from these core platform services with personal data from any other services offered by the gatekeeper or with personal data from third-party services, and from signing in end users to other services of the gatekeeper in order to combine personal data, unless the end user has been presented with the specific choice and provided consent in the sense of Regulation (EU) 2016/679") and 13 (requiring gatekeeper to annually "submit to the Commission an independently audited description of any techniques for profiling of consumers that the gatekeeper applies to or across its core platform services identified pursuant to Article 3").
42. Interview with Cecilia Rikap.
43. Press Release (UK CMA): "UK's New Pro-Competition Regime for Digital Markets" (December 8, 2020), <https://www.gov.uk/government/news/cma-advises-government-on-new-regulatory-regime-for-tech-giants>; "A New Pro-Competition Regime for Digital Markets" (July 20, 2021), <https://www.gov.uk/government/consultations/a-new-pro-competition-regime-for-digital-markets>.
44. Rani Molla, "Poll: Most Americans Want to Break Up Big Tech," *Vox* (January 26, 2021), <https://www.vox.com/2021/1/26/22241053/antitrust-google-facebook-break-up-big-tech-monopoly>.
45. Maurice E. Stucke and Ariel Ezrachi, *Competition Overdose*.
46. Brian Schwartz, "Big Tech Spends Over \$20 Million on Lobbying in First Half of 2020, Including on Coronavirus Legislation," CNBC (July 31, 2020), <https://www.cnbc.com/2020/07/31/big-tech-spends-20-million-on-lobbying-including-on-coronavirus-bills.html>.
47. Anna Edgerton and Bill Allison, "Big Tech Spent Millions on Lobbying amid Antitrust Scrutiny," Bloomberg (July 21, 2021), <https://www.bloomberg.com/news/articles/2021-07-21/big-tech-spent-millions-on-lobbying-amid-antitrust-scrutiny>.
48. UNCTAD, "Digital Economy Report 2019: Value Creation and Capture—Implications for Developing Countries" (2019): 88, https://unctad.org/system/files/official-document/der2019_en.pdf.
49. Ben Brody, "Washington's Tech Issues Provide Lobbyists an Opening," *Protocol* (May 4, 2021), <https://www.protocol.com/policy/washingtons-tech-issues-lobbyists>.
50. "Pyrrhus, The Great King of Epirus," Greece High Definition (December 1, 2020), <https://www.greecehighdefinition.com/blog/pyrrhus-king-of-epirus>.

Chapter 11: The Way Forward

1. For more on recalibrating the privacy, consumer protection, and competition policies, see Maurice E. Stucke, *Breaking Away: How to Regain Control over Our Data, Privacy, and Autonomy* (Oxford: Oxford University Press, 2022).

2. Christian Hopp et al., “Disruptive Innovation,” 446–57 (after surveying the literature on disruptive innovations noting many unanswered questions, including: How can potentially disruptive innovation be spotted? And how early can it be anticipated? Can disruptive innovations be separated from technological advancements that enable disruptive innovations? Will there be one candidate or multiple candidates of innovations than can be potentially disruptive? How can we predict the impact of multiple potentially disruptive innovations relative to each other, and in comparison to the prevailing business model an incumbent employs?).
3. The most creative individuals, according to one study, were those with broad, diverse social networks: those with diverse, horizontal networks were “three times more innovative than uniform, vertical networks.” Steven Johnson, *Where Good Ideas Come From*, 166 (discussing Martin Ruef’s studies).
4. OECD, “Science, Technology and Innovation Outlook 2021” (January 12, 2021), https://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-innovation-outlook-2021_75f79015-en.
5. Speech: Margrethe Vestager, “Technology with Purpose” (March 5, 2020), https://ec.europa.eu/commission/commissioners/2019-2024/vestager/announcements/technology-purpose_en.
6. Mariana Mazzucato, *The Value of Everything*, 206.
7. *Sears, Roebuck & Co. v. Stiffel Co.*, 376 U.S. 225, 84 S.Ct. 784, 11 L.Ed.2d 661 (1964).
8. John Van Reenen, “Can Innovation Policy Restore Inclusive Prosperity in America?”
9. However, note that in themselves tax incentives will often form an insufficient instrument to guide innovation. See: OECD, “Science, Technology and Innovation Outlook 2021.”
10. John Van Reenen, “Can Innovation Policy Restore Inclusive Prosperity in America?”; Delio Ignacio Castaneda and Sergio Cuellar, “Knowledge Sharing and Innovation: A Systematic Review,” 159–73 (noting the research on the role of universities in knowledge transfer for the generation of technological innovation and patent licenses, the importance of knowledge exchange between government and academy, and the relevance of networks in innovation dissemination).
11. Interview with Romain Duval, assistant director at the International Monetary Fund.
12. Geoffrey West, *Scale*, 29.
13. The larger city requires a bit less infrastructure per capita (by about .85), which means when a city doubles in population, it will need only 85 percent more gas stations and is thus a bit more productive (around 15 percent). *Ibid.*, 29, 272 (noting that cities scale sublinearly with size, indicating a systematic economy of scale, but with an exponent of about 0.85 rather than 0.75 for living organisms).
14. “The Hidden Maths of Organisms, Cities, and Companies,” *Economist* (May 13, 2017), <https://www.economist.com/books-and-arts/2017/05/11/the-hidden-maths-of-organisms-cities-and-companies>.
15. Geoffrey West, *Scale*, 322. Another contributing factor might be greater diversity. As a city’s population doubles, it will not necessarily require double the population of

engineers. As their population grows, cities scale *sublinearly* for infrastructure and energy use (mean they require relatively less—about 15 percent—when their population increases), but scale *superlinearly* for socioeconomic activity (so they become more creative, innovate more, and make more by about 15 percent). That potentially means greater diversity in professions and artisans, and greater opportunities for collisions of diverse ideas and fields.

16. Ekaterina Turkina, Boris Oreshkin, and Raja Kali, “Regional Innovation Clusters and Firm Innovation Performance” (citing Rafael Boix and Vittorio Galletto, “Innovation and Industrial Districts: A First Approach to the Measurement and Determinants of the I-District Effect,” 43(9) *Regional Studies* (2009): 1117–33; Steven Johnson, *Where Good Ideas Come From*, 163).
17. Michael B. Sauter, “5 Cities Have Lost Half or More of Their Populations Since 1950,” 24/7 Wall St (June 7, 2019), <https://247wallst.com/special-report/2019/06/07/5-cities-have-lost-half-or-more-of-their-populations-since-1950/2/>.
18. Geoffrey West, *Scale*, 32.
19. Ekaterina Turkina, Boris Oreshkin, and Raja Kali, “Regional Innovation Clusters and Firm Innovation Performance” (citing the business literature of the industry life cycle and a firm’s organization and innovative activity change during the cycle).
20. Arthur Fishman, Hadas Don-Yehiya, and Amnon Schreiber, “Too Big to Succeed or Too Big to Fail?,” 811–22 (noting that “empirically, the consensus is that R&D activity does indeed increase with firm size, but only proportionately (Cohen, 2010). This finding suggests that, contrary to Schumpeter (1942), large size offers no advantage in the conduct of R&D since, holding industry sales constant, the same amount of R&D will be conducted whether an industry is composed of large firms or a greater number of smaller firms.”).
21. Geoffrey West, *Scale*, at 33.
22. Interview with Professor Richard Florida.
23. Sarah Jacobs, “10 American Cities That Have Fallen into Decline,” *Business Insider* (January 14, 2018), <https://www.businessinsider.com/us-census-data-population-decrease-shows-american-cities-in-decline-2018-1#9-scranton-pennsylvanias-population-has-declined-from-its-peak-by-469-2>.
24. Ekaterina Turkina, Boris Oreshkin, and Raja Kali, “Regional Innovation Clusters and Firm Innovation Performance,” 1193–1206 (noting the consensus “that a high degree of similarity among firms located in the region is not a good thing either since it decreases the probability of more radical innovations that strengthen the cluster’s ability to adapt to changing external conditions”).
25. Ekaterina Turkina, Boris Oreshkin, and Raja Kali, “Regional Innovation Clusters and Firm Innovation Performance” (citing studies that “emphasize socially driven mechanisms in clusters such as networking among firms, universities, regional authorities and research institutions that ensure collaboration and enable the sharing of resources and knowledge on specific projects”).
26. Grant Miles, Charles C. Snow, and Mark P. Sharfman, “Industry Variety and Performance,”

- 14(3) *Strategic Management Journal* (1993): 163, 166–72, <https://onlinelibrary.wiley.com/doi/abs/10.1002/smj.4250140302>. The study also found that such variety decreased as the industry matured and declined. Ibid., 172.
27. Ekaterina Turkina, Boris Oreshkin, and Raja Kali, “Regional Innovation Clusters and Firm Innovation Performance.”
 28. Leyland Cecco, “Toronto Swaps Google-Backed, Not-So-Smart City Plans for People-Centred Vision,” *Guardian* (March 12, 2021), <https://www.theguardian.com/world/2021/mar/12/toronto-canada-quayside-urban-centre>.
 29. For example, one VC firm from its 2021 survey of companies in its fund identified this shift. Whereas pre-pandemic, “slightly less than 20 percent of the companies” were decentralized or remote, by early 2021, over 40 percent of founders said that the best place to start a company will be in the cloud. See: Kim-Mai Cutler, “DATA: Post-Pandemic Silicon Valley Isn’t a Place,” *Initialized* (January 21, 2021), <https://blog.initialized.com/2021/01/data-post-pandemic-silicon-valley-isnt-a-place/>.
 30. Before the pandemic, a few cities captured most of the innovation gains. Between 1971 and 2007, ten US cities, according to one study, were home to “70% of the inventors of all U.S. patents for computers, 79% of inventors in semiconductors and 59% of the inventors in biology and chemistry.” See: Jon Hilsenrath, “Winning Streak of Big Cities Fades with 2020 Crises,” *Wall Street Journal* (July 19, 2020), <https://www.wsj.com/articles/american-cities-covid-coronavirus-reopen-lockdown-housing-new-york-boston-los-angeles-11595182903> (discussing work of Enrico Moretti). Another study found that five metropolitan areas—Boston; San Diego; San Francisco; Seattle; and San Jose, California—accounted for 90 percent of all US high-tech job growth between 2005 to 2017, whereas the 377 other metro areas in the US accounted for only 10 percent of the 256,063 jobs created during that period. Jon Hilsenrath, “Five Cities Account for Vast Majority of Growth in Tech Jobs, Study Finds,” *Wall Street Journal* (December 9, 2019), <https://www.wsj.com/articles/five-cities-account-for-vast-majority-of-growth-in-tech-jobs-study-finds-11575867660>.
 31. Note for example the rise of Islamic science in the ninth century in Baghdad and its subsequent fall. For a short review, see: Jim Al-Khalili, “When Baghdad Was Centre of the Scientific World,” *Guardian* (September 26, 2010), <https://www.theguardian.com/books/2010/sep/26/baghdad-centre-of-scientific-world>. For a detailed overview see: Ehsan Masood, *Science and Islam: A History* (London: Icon Books, second edition, 2017).