

DIGITAL FINANCE PLATFORMS: TOWARD A NEW REGULATORY PARADIGM

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ABSTRACT

One of the most consequential yet unexamined developments in finance is the recent evolution of large financial technology platforms. In the first analysis of its kind, we scrutinize the world's \$89 trillion investment and asset management industry to explore the function of these systems, to consider their possible risks, and to develop a taxonomy for their regulation. This analysis is essential because these systems now play a critical role in asset management, rendering nugatory several layers of existing regulation. While the COVID-19 pandemic has caused havoc with economic activity, it has accelerated this process of digitization and concentration of financial control.

The leading example of such a platform is BlackRock's Aladdin, a system used to manage the risks relating to ten percent of the world's investment assets and which institutional investors – as well as the U.S. government – admit they cannot operate without. Even greater concentrations of financial power are possible when Big Technology firms

and finance unite. Ant Group, a spinoff of Alibaba, controls a financial ecosystem for over 1.2 billion clients – twenty-one percent of the world’s adults – covering all financial services, including payments, insurance, asset management, and deposits. Large U.S. financial and tech firms, including Facebook, Apple, and Google, are working hard to emulate Ant’s scale and scope, driving concentration into a small number of dominant digital finance platforms.

Although Financial Technology is typically associated with small innovative firms, we argue that these giant digital finance platforms are already having a far greater impact on society. We identify the economic reasons for the dramatic ascendancy of these financial leviathans and propose a legal framework for mitigating their threats to national security, financial stability, consumer protection, antitrust and cybersecurity.

Aladdin is like oxygen. Without it we wouldn't be able to function.
– Anthony Malloy, CEO of New York Life Investors¹

INTRODUCTION

The raging COVID-19 pandemic has dramatically exposed fragilities in the world’s public health systems. The virus has also, less obviously, sounded warning bells about weaknesses in our global financial system. In February and March 2020, thousands of investment funds managing billions of dollars in retirement assets, and some fifty million American households, withdrew from investment markets.² The result was one of the largest financial market corrections in history.³ But imagine, if you will, if the technology underlying international financial markets had proven as vulnerable as our public health systems. If global financial systems had malfunctioned during that period of acute economic stress – for instance, the failure of a major payment or securities trading system – the consequences for the world’s markets would have been catastrophic.

The myriad potential ways in which such systems can fail is daunting and exposes our total dependence on massive, unseen, and largely

1. Antoine Gara, *BlackRock’s Edge: Why Technology Is Creating the Amazon of Wall Street*, FORBES (Dec. 26, 2017, 6:00 AM), <https://www.forbes.com/sites/antoinegara/2017/12/19/blackrocks-edge-why-technology-is-creating-a-6-trillion-amazon-of-wall-street/#6fbfcdc6561b> [<https://perma.cc/966E-SQ9C>].

2. Matt Phillips Peter Eavis & David Enrich, *Economy Faces ‘Tornado-Like Headwind’ as Financial Markets Spiral*, N.Y. TIMES (Mar. 9, 2020), <https://www.nytimes.com/2020/03/09/business/stock-market-oil-coronavirus.html> [<https://perma.cc/Y3CX-3U9E>].

3. INT’L MONETARY FUND, GLOBAL FINANCIAL STABILITY REPORT: MARKETS IN THE TIME OF COVID-19 1–6 (2020), <https://www.imf.org/en/Publications/GFSR/Issues/2020/04/14/global-financial-stability-report-april-2020> [<https://perma.cc/7VVT-3FGN>].

unregulated financial technology platforms: a failure to deliver securities after payment could destroy a buyer's investment and a failure to honor stop-loss orders in a falling market could impose massive losses on clients, while the failure of a major securities trading or payment system would cause panic and probably widespread financial chaos and collapse. Service interruptions of minutes or even seconds have contributed to severe market reactions in the past.⁴

Once participants lose trust in financial market infrastructure they will naturally seek to preserve value by withdrawing: client demands for payment could turn into bank or money market runs, ruining financially sound institutions; money market funds could “break the buck,” crippling one of the central financial management tools for millions of Americans and disrupting a key financing mechanism of the U.S. economy; and retirement investments through 401(k) accounts could be frozen, casting citizens loose from their financial lifelines. In short, financial intermediation – the process by which the supply of finance meets its demand – could cease, cutting off the flow of money at the most important moment. In healthy times, this chain reaction could prompt a financial and economic crisis as severe as the Great Recession of 2008. In the current pandemic, when economic growth depends on financial intermediation, the desperately needed economic recovery could judder to a halt,⁵ threatening a second Great Depression on the scale of 1929.

Technology's benefits are undisputable: speed, scale and efficiency, to name a few. But as financial technology (“FinTech”) and market infrastructure have grown in size, scope, and influence, the consequences of their failures have increased commensurately. Thus, there is rising fear about the potential impact of these technological vulnerabilities. On a positive note, securities market and payment infrastructure have to date been resilient in the face of the COVID-19 stress test.⁶ Nevertheless, a range of emerging risks and vulnerabilities in the asset management industry have

4. See Patrick Gillespie, Matt Egan & Heather Long, *Trading Resumes on NYSE After Nearly 4-hour Outage*, CNN BUS. (July 8, 2015, 7:23 PM), <https://money.cnn.com/2015/07/08/investing/nyse-suspends-trading/> [<https://perma.cc/DM2W-QMSK>] (reporting that a software update prompted the NYSE to halt trading for four hours, which contributed to the Dow losing 1.5% in a single day).

5. See JOSEPH A. SCHUMPETER, *THE THEORY OF ECONOMIC DEVELOPMENT - AN INQUIRY INTO PROFITS, CAPITAL, CREDIT, INTEREST, AND THE BUSINESS CYCLE* (Redvers Opie trans., Harvard Univ. Press ed. 1934) (discussing the importance of financial intermediation for economic prosperity). See Robert G. King & Ross Levine, *Finance and Growth: Schumpeter Might Be Right*, 108 Q. J. ECON. 717 (1993), (discussing a contemporary assessment).

6. Jacob Manoukian, *3 Reasons Why the Stock Market Has Shrugged off the COVID Surge*, J.P.MORGAN (July 17, 2020), <https://www.jpmorgan.com/securities/insights/3-reasons-why-stock-market-shrugged-off-covid-surge> [<https://perma.cc/SR7K-Z2GZ>].

emerged, which are being monitored by the Securities Exchange Commission and others.⁷ Of concern, the largest financial and technology firms have only increased their concentrations of power during COVID-19: Jeff Bezos has added almost \$60 billion to his personal wealth in 2020 alone, while America's leading banks have grown even bigger,⁸ and BlackRock, the world's largest asset manager and operator of the world's largest risk management platform – “Aladdin”⁹ – is reported to have had a “very good pandemic” as it has, once again, been allocated a central role in orchestrating financial and economic intervention programs for the Federal Reserve.¹⁰

This Article analyzes the technological platforms which underpin our financial system and create risks and vulnerabilities of *systemic* dimensions, so far largely overlooked by scholars and supervisory authorities. In fact, all leading U.S. financial institutions¹¹ and many large technology firms (“BigTechs”) including Alibaba, Amazon, Apple, Facebook,¹² Google, and

7. See Meeting Notice, SEC Asset Management Advisory Committee, 85 Fed. Reg. 37705 (June 23, 2020) (notifying that a public discussion on matters in the asset management industry such as “data and technology” will be held). For global work on market infrastructure, see BANK FOR INT’L SETTLEMENTS & INT’L ORG. OF SEC. COMM’NS, PRINCIPALS OF FINANCIAL MARKET INFRASTRUCTURES (2012), <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD350.pdf> [<https://perma.cc/W4PP-JNPE>].

8. Zack Budryk, *Jeff Bezos’s Wealth Hits Record High \$171B*, THE HILL (July 1, 2020, 7:35 PM), <https://thehill.com/policy/finance/505543-jeff-bezoss-wealth-hits-record-high-171-billion> [<https://perma.cc/WM4M-98H5>] (“The Bloomberg Billionaires index previously put Bezos’s net worth at \$167.7 billion in September 2018, but he is estimated to have accrued at least \$56.7 billion in 2020 alone, Bloomberg reported.”); David Benoit, *Coronavirus Made America’s Biggest Banks Even Bigger*, WALL ST. J. (Apr. 23, 2020), <https://www.wsj.com/articles/coronavirus-made-america-s-biggest-banks-even-bigger-11587639602> [<https://perma.cc/2ZVH-VJAF>] (explaining companies and consumers inundated U.S. banks with “\$1 trillion of deposits in the first quarter, when markets went haywire and America went dark to stop the spread of the new coronavirus,” more than half of which “went to the four largest banks in America”).

9. For a comprehensive discussion of Aladdin as an archetype of back-end financial operating systems, see *infra* Part I.B.

10. Kate Aronoff, *Is BlackRock the New Vampire Squid?*, THE NEW REPUBLIC (June 26, 2020), <https://newrepublic.com/article/158263/blackrock-climate-change-fossil-fuel-investments> [<https://perma.cc/C6CJ-MA59>].

11. Financial institutions that have launched a digital finance platform include banks such as J.P. Morgan and Goldman Sachs; asset manager giants like BlackRock, Fidelity, and Vanguard; and broker-dealers such as Charles Schwab. Leading internationally, in terms of its system integration and customer base, is the Chinese Alibaba group, with its payment app, Alipay, and its investment arm, Ant Financial. See *infra* Parts II.B.-E.

12. See Dirk Zetzsche, Ross Buckley & Douglas Arner, *Regulating Libra*, 40 OXFORD J. LEGAL STUD. (forthcoming 2020) (discussing Facebook’s Libra project); Daniel Keyes, *WhatsApp Pay is on the Verge of Launching in India*, BUS. INSIDER (July 2, 2019, 9:55 AM), <https://www.businessinsider.com/whatsapp-pay-ready-for-india-launch-2019-7?IR=T> [<https://perma.cc/L85Z-VMD6>] (discussing the introduction of Facebook’s WhatsApp Pay in India where the chat app’s user base is estimated to be “between 350 million and 400 million

Tencent,¹³ are investing billions of dollars to create dominant information technology systems, platforms, and ecosystems across the financial universe, to the point where today financial platforms Visa and MasterCard are the largest financial institutions globally by market capitalization. Looking first at asset management, we consider BlackRock's Aladdin and similar platforms by Vanguard, Fidelity, Goldman, and J.P. Morgan Chase as striking examples of growing size and dominance. These American models largely attempt to emulate another BigTech turned finance giant which operates the archetypal financial ecosystem: Ant Group. An affiliate of Jack Ma's Alibaba and formerly named Ant Financial, Ant has over 1.2 billion clients and was valued at \$280 billion, over three times that of Goldman Sachs, immediately prior to its planned initial public offering (IPO) in November 2020. This IPO was halted at the time of writing because of concerns from Chinese financial regulators.¹⁴ Whether and how these platforms should be regulated – the central concern of this Article – is thus a matter of high priority, made more so by their strong growth as a result of the COVID-19 pandemic.

In many ways, the rise of digital finance platforms reflects the powerful response of massive, established financial institutions to efforts by FinTech start-ups to disrupt the industry. Indeed, financial services cannot meaningfully be analyzed today without considering FinTech;¹⁵ and any such analysis requires an understanding of the underlying technologies: Big

users”).

13. See BANK OF INT'L SETTLEMENT, ANNUAL ECONOMIC REPORT 55–79 (2019), <https://www.bis.org/publ/arpdf/ar2019e.pdf> [<https://perma.cc/9WY2-GL83>] (detailing financial services-related activities of big technology firms such as Apple, Amazon, Alibaba, Google and Facebook, and discussing opportunities and risks of BigTech in finance).

14. *AntGroup's Stalled IPO Seen Slashing its Value by \$140 Billion*, BLOOMBERG (Nov. 9, 2020), <https://www.bloomberg.com/news/articles/2020-11-09/ant-group-s-stalled-ipo-seen-slashing-its-value-by-140-billion?sref=IP8hg7Cm> [<https://perma.cc/7J6C-CXDL>]; *Jack Ma's Ant Group Raises IPO Valuation Target to \$280 Billion*, BLOOMBERG NEWS (Oct. 16, 2020), <https://www.bloomberg.com/news/articles/2020-10-16/jack-ma-s-ant-group-raises-ipo-valuation-target-to-280-billion> [<https://perma.cc/8LA6-2DX2>]. According to Forbes, Goldman Sachs has a market capitalization of \$80.57 billion. *Goldman Sachs Group (GS)*, FORBES, <https://www.forbes.com/companies/goldman-sachs-group/#2e9741f32773> [<https://perma.cc/29ZU-YKJX>] (last visited Nov. 20, 2020).

15. See generally Chris Brummer, *Disruptive Technology and Securities Regulation*, 84 FORDHAM L. REV. 977 (2015) (arguing that securities regulation must be adapted to FinTech); Chris Brummer & Yesha Yadav, *FinTech and the Innovation Trilemma*, 107 GEO. L.J. 235, 248–49 (2019) (describing FinTech regulation as a trilemma where regulators must ensure innovation, simple rules and market integrity at the same time); Kathryn Judge, *Investor-Driven Financial Innovation*, 8 HARV. BUS. L. REV. 291, 343–48 (2018) (arguing that FinTech should be used to avoid suboptimal regulation-inspired over-demand); Dirk Zetsche, Ross Buckley, Douglas Arner & Janos Barberis, *From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance*, 14 N.Y.U. J.L. & BUS. 393, 435–43 (2018) (arguing in favor of data-specific adjustments to financial regulations).

Data¹⁶ and artificial intelligence,¹⁷ distributed ledger technology and blockchain,¹⁸ smart contracts¹⁹ and cloud-based services. But existing scholarly attention has too often focused on the consumer end of financial services, such as new modes of mobile payment,²⁰ robo-advice,²¹ initial coin

16. See generally Solon Barocas & Andrew D. Selbst, *Big Data's Disparate Impact*, 104 CALIF. L. REV. 671, 677 (2016) (highlighting data dependency and the risk that algorithms reinforce existing biases); Julie E. Cohen, *What Privacy Is For*, 126 HARV. L. REV. 1904, 1918 (2013) (arguing that Big Data furthers surveillance of individuals and asking to strengthen privacy); Stacy-Ann Elvy, *Paying for Privacy and the Personal Data Economy*, 117 COLUM. L. REV. 1369, 1400–28 (2017) (highlighting tensions between a commercial data market and consumer privacy).

17. See generally Anthony J. Casey & Anthony Niblett, *Self-Driving Contracts*, 43 J. CORP. L. 1, 13–26 (2017) (arguing that technology will lead to subject-specific, self-completing contract law); Anthony J. Casey & Anthony Niblett, *A Framework for the New Personalization of Law*, 86 U. CHI. L. REV. 333 (2019) (developing preconditions for AI-based reconfiguration of the law); Mark Lemley & Bryan Casey, *Remedies for Robots*, 86 U. CHI. L. REV. 1311 (2019) (conceptualizing compensation and sanction systems for artificial intelligence); Bryan Casey & Mark Lemley, *You Might Be a Robot*, 105 CORNELL L. REV. 287 (2020) (analyzing definitions of AI for the purpose of regulation); Harry Surden, *Machine Learning and Law*, 89 WASH. L. REV. 87, 102–10 (2014) (discussing how AI may affect the practice of the law).

18. See generally PRIMAVERA DE FILIPPI & AARON WRIGHT, *BLOCKCHAIN AND THE LAW: THE RULE OF CODE* (Harvard Univ. Press 2018) (acknowledging the opportunities of blockchain technologies and arguing that the law needs to catch up because blockchain could undermine the capacity of governmental authorities to supervise commercial activities and vital government-provided services); Usha Rodrigues, *Law and the Blockchain*, 104 IOWA L. REV. 679, 708–27 (2019) (analyzing default rules from corporate, partnership and contract law that could fill the gaps in smart contracts); Dirk Zetsche, Ross Buckley & Douglas Arner, *The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain*, 2018 U. ILL. L. REV. 1361, 1382–1402 (2018) (arguing that existing doctrines of contract, corporate and partnership law apply to distributed ledgers and could establish a participant's liability).

19. See generally Jeremy M. Sklaroff, *Smart Contracts and the Cost of Inflexibility*, 166 U. PA. L. REV. 263 (2017) (examining the disadvantages to smart contracts and the costs that may outweigh the benefits); Kevin Werbach & Nicolas Cornell, *Contracts Ex Machina*, 67 DUKE L.J. 313 (2017) (analyzing the potential and the limitations of smart contracts and the relationship to contract law).

20. See Adam J. Levitin, *Pandora's Digital Box: The Promise and Perils of Digital Wallets*, 166 U. PA. L. REV. 305 (2017) (analyzing the risks and benefits that digital wallets pose to consumers and merchants).

21. See Tom Baker & Benedict G. C. Dellaert, *Regulating Robo Advice Across the Financial Services Industry*, 103 IOWA L. REV. 713 (2018) (“identifying the core components of robo advisors, key questions that regulators need to be able to answer about them, and the capacities that regulators need to develop in order to answer those questions”); Megan Ji, *Are Robots Good Fiduciaries? Regulating Robo-Advisors Under the Investment Advisers Act of 1940*, 117 COLUM. L. REV. 1543 (2017) (arguing that robo-advisers are not structurally incapable of exercising care and calling for a shift in regulatory focus to address robo-advisor conflicts of interest). See generally INT’L ORG. OF SEC. COMM’NS, RESEARCH REPORT ON FINANCIAL TECHNOLOGIES (FINTECH) 24–26, 29–36 (2017), <https://www.iosco.org/library/publications/pdf/IOSCOPD554.pdf> [<https://perma.cc/7V6Q-D468>] (discussing regulatory challenges relating to robo-advice); U.S. TREASURY, A FINANCIAL SYSTEM THAT CREATES

offerings (“ICOs”),²² and crowdfunding.²³

While the focus of commentators and scholars worldwide has been on the rise of innovative and disruptive FinTech *startups*, incumbents and BigTechs have been doing what they do best – working quietly to build the essential infrastructure and scale necessary to counter the start-ups’ strategies, and build on their own advantages in financial resources and large-scale client access. These efforts, as this Article shows, have created digital finance leviathans, which now dominate the wealthiest portion of the financial system: the \$89 trillion asset management industry.²⁴

We focus on the asset management industry, in particular, as FinTech scholarship in this massive sector is particularly underdeveloped. Scholars, to date, have largely neglected the intersection of finance, regulation, and technology that is rapidly transforming the global investment fund industry, America’s financial system, and society more broadly.

This neglect is surprising for two reasons. First, the assets held by investment funds today exceed and are growing more quickly than those held by the banking sector: the U.S. mutual fund market grew from \$9.6 trillion to \$21.3 trillion from 2008 to 2019.²⁵ In the same period, U.S. bank assets

ECONOMIC OPPORTUNITIES: NONBANK FINANCIALS, FINTECH, AND INNOVATION 159–64 (2018), <https://home.treasury.gov/sites/default/files/2018-07/A-Financial-System-that-Creates-Economic-Opportunities---Nonbank-Financials.pdf> [https://perma.cc/H8CF-9ND7] (proposing to streamline licensing in an effort to allow financial planners’ platform-based financial advice in all U.S. states).

22. See Shaanan Cohny, David A. Hoffman, Jeremy Sklaroff & David Wishnick, *Coin-Operated Capitalism*, 119 COLUM. L. REV. 591 (2019) (describing ICO technology and its limitations); Randolph Robinson, *The New Digital Wild West: Regulating the Explosion of Initial Coin Offerings*, 85 TENN. L. REV. 897 (2018) (discussing the impact of the decentralized nature of blockchain and blockchain’s compatibility with the traditional securities law framework); Dirk Zetzsche, Ross Buckley, Douglas Arner & Linus Föhr, *The ICO Gold Rush*; 60 HARV. INT’L L. J. 267 (2019) (examining the various forms of ICOs and regulatory challenges and suggesting steps for regulators to take).

23. See C. Steven Bradford, *Crowdfunding and the Federal Securities Laws*, 1 COLUM. BUS. L. REV. 1 (2012) (analyzing the costs and benefits of crowdfunding and proposing an exemption that would free crowdfunding from registration requirements); Joseph M. Green & John F. Coyle, *Crowdfunding and the Not-So-Safe SAFE*, 102 VA. L. REV. ONLINE 168 (2016) (criticizing the terms of the SAFEs offered by funding portals and offering solutions to the identified problems); Darian M. Ibrahim, *Equity Crowdfunding: A Market for Lemons?*, 100 MINN. L. REV. 561 (2015) (defining crowdfunding and its interaction with the JOBS Act); Jason W. Parsont, *Crowdfunding: The Real and the Illusory Exemption*, 4 HARV. BUS. L. REV. 281 (2014) (discussing the impact of accredited crowdfunding on retail crowdfunding).

24. BOSTON CONSULTING GROUP, GLOBAL ASSET MANAGEMENT 2020: PROTECT, ADAPT AND INNOVATE 3 (May 2020), https://image-src.bcg.com/Images/BCG-Global-Asset-Management-2020-May-2020-r_tcm9-247209.pdf [https://perma.cc/9THU-7GSB].

25. Jennifer Rudden, *Total Net Assets of US-Registered Mutual Funds Worldwide from 1998 to 2019*, STATISTA (May 8, 2020), <https://www.statista.com/statistics/255518/mutual-fund-assets-held-by-investment-companies-in-the-united-states/> [https://perma.cc/36YK-AWRV]; INV. CO. INST., INVESTMENT COMPANY FACTBOOK 56 (60th ed. 2020),

grew only 62%, from roughly \$11 trillion to \$17.8 trillion.²⁶ Thus, although U.S. bank assets exceeded investment funds in 2008, by 2019 the opposite was true. And by year-end 2019, an estimated 103.9 million individual Americans in 59.7 million households (46.4% of all U.S. households) owned mutual funds.²⁷ These investment funds are the central vehicle for people to manage their life savings for retirement, education, home purchase, and emergencies. Though banks remain important sources of lending, many of their loans are in fact funded by investment funds, particularly money market and bond funds. The investment industry is also a major provider of payments, competing directly with banks and other payment services.²⁸

Second, the impact of technology is particularly visible. Although regulatory and financial theory often focus on the role of individuals who invest in individual stocks, the reality today is dominated by individuals investing through largely passive funds, which are controlled by a small number of investment services firms.²⁹ Passive funds invest by allocating their funds to a pre-defined basket of securities, called an “index.” Their buying and selling are entirely tech-driven, powered by data, algorithms, and computer systems. In light of this automation, we provide an answer to one of the largest questions in corporate governance and investment scholarship: *why* do we see rapid growth of passive investment funds? Investor appetite driven by low fees and diversification, as is often presumed,³⁰ provides only

https://www.ici.org/pdf/2020_factbook.pdf [<https://perma.cc/8878-RFNG>].

26. *Total Assets, All Commercial Banks*, FED. RESERVE BANK OF ST. LOUIS, <https://fred.stlouisfed.org/series/TLACBW027SBOG> [<https://perma.cc/6G3Z-SE6X>] (last updated Oct. 9, 2020).

27. INV. CO. INST., *supra* note 25, at ii.

28. Some U.S. money market funds offer access to the investors’ fund by ATM, check, or bill pay, very similar to more conventional payment systems. See Money Market Fund Reform, 74 Fed. Reg. 32,688 (July 8, 2009) (“Commonly offered features, such as check-writing privileges, exchange privileges, and near-immediate liquidity, have contributed to the popularity of money market funds.”); William A. Birdthistle, *Breaking Bucks in Money Market Funds*, 2010 WIS. L. REV. 1155, 1161 (stating that “money market funds look and feel a great deal more like bank savings accounts than the mutual funds they are”).

29. Last year, six of the articles voted for inclusion in the Corporate Practice Commentator’s top ten corporate and securities articles of 2019, dealt with passive funds or index investing. *The Top 10 Corporate and Securities Articles of 2019*, CORPORATE PRACTICE COMMENTATOR, http://www.professorthompson.com/uploads/2/1/4/7/21478240/best_article_s_list_2019_final_.pdf [<https://perma.cc/9F8B-LHMQ>]; see also Lucian Bebchuck & Scott Hirst, *The Specter of the Giant Three*, 99 B.U. L. REV. 721 (2019) (arguing that the three largest index fund managers – BlackRock, Vanguard, and State Street Global Advisors – will continue to grow); John C. Coates, *The Future of Corporate Governance Part I: The Problem of Twelve 2* (Harvard Pub. Law, Working Paper No. 19-07, 2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3247337 [<https://perma.cc/H4TX-994N>] (arguing that control of most public companies will soon be concentrated in the hands of a very small number of people, *i.e.* large management companies).

30. See Coates, *supra* note 29, at 13 (stating that “few active managers will be able to

one part of the answer. The other – we argue – is technology. Without digitalization, and their related economies of scope, scale and network effects analyzed here, the low fees that trigger investor appetite would be economically unviable. *Technology platforms* are the most important driver of growth in the investment-fund – and indeed every – financial industry today. Thus, we have urgent cause to examine the policy implications of these systems. By focusing on the technological core of the financial system *and* the asset management industry, we thus fill two fundamental gaps in the literature.

The Article is organized as follows. In Part I, we conceptualize digital finance platforms and describe the magnitude of the most prominent examples. We argue that essential functions for investment funds are increasingly aggregated and performed by digital finance platforms, which we differentiate from other forms of technological evolution in finance. Doing so, we introduce three archetypes that play increasingly critical roles in financial services: (1) the back-office infrastructure that links the largest asset managers globally (studying the platform appropriately named Aladdin as the preeminent example); (2) investment platforms that bundle customer liquidity at the consumer-facing, front-end (such as those operated by Charles Schwab, Fidelity, J.P. Morgan Chase, Goldman Sachs, and others), which link public investment funds to an ever-increasing portion of investments in global financial markets; and (3) comprehensive financial ecosystems that combine the front-end and back-end of the asset management industry into a single platform, linking vast numbers of individuals to finance through technology (with China’s Ant leading the way and many U.S. examples following suit).

In Part II, we analyze the consequences of categorizing these financial technology systems as examples of platform industries (demonstrating network effects and economies of scope and scale), and predict that a small number of digital finance platforms – or perhaps even only one – is likely to become dominant in any given sector, integrating more and more functions of financial intermediation as they grow. We show how technology and platform concentration challenge the traditional regulatory paradigm for asset management and investment funds, highlighting the need for a new approach in order to address the transformation of asset management into a platform industry.

In Part III, we argue that digital finance platforms currently escape meaningful regulation, triggering significant risks, because the traditional paradigm was not designed to address issues arising in the context of a world

convincingly make the case that they can do better than the market, net of fees, for most indexed fund investors”).

of increasingly dominant platforms. By scrutinizing national security, consumer protection, antitrust, systemic risk and cross-border coordination perspectives, we find traditional securities regulation – with its focus on disclosure, intermediaries, and distribution – to be ill-equipped to deal with the new reality presented by increasingly concentrated and dominant operating systems, platforms, and ecosystems.

In Part IV, we evaluate possible alternative regulatory approaches, which range from adopting a wait-and-see approach (with or without pro-innovative tools such as regulatory sandboxes and special charters) to a strong interventionist approach that would treat these platforms as utilities (and thus possibly even trigger nationalization). Between those extremes lie regulatory efforts that could enhance competition and moderate interventions through indirect regulation by targeting delegation arrangements and involving a public agency in the partial or full ownership of each platform. We argue that the optimal approach will turn on the stage of evolution of the platform: the stronger the position of the platform in any given financial services market, the stronger the case for an interventionist approach.

Part V concludes.

I. THE RISE OF DIGITAL FINANCE PLATFORMS

Our starting point is a theoretical conceptualization of technology in asset management, looking at financial operating systems and their evolution into platforms, contrasting these systems from each other and from existing discussions of FinTech and financial market infrastructure. This approach provides the basis for our taxonomy of the evolution of digital finance platforms in the asset management industry more broadly: back-end systems (which focus on largely unseen operations), front-end platforms (which focus on client interactions), and full financial ecosystems (which attempt to do both).

A. Conceptualizing Digital Finance Platforms

The theoretical conceptualization of digital finance platforms begins by crafting a working definition of digital finance platforms (“DFPs”), before then focusing upon critical distinctions between them and “traditional” FinTechs and treatments of financial market utilities.

1. Digital Finance Platforms

Digital finance platforms are multilateral IT systems that connect a network of participating institutions to one another and to the operator of each system for the purpose of conducting financial transactions. At first glance, they may appear similar to digital e-commerce platforms, but we make clear the distinctions *infra* (at Part I.A.3.). Chief among them, the DFP does not become a party of the financial transactions performed on it; rather with multiple applications connected to and run on it, each DFP facilitates or executes decisions for financial transactions taken by third parties (*e.g.*, the payer, the investor, the broker, etc.) or separate entities related to the platform provider.

DFPs can take various legal and organizational forms.³¹ Examples include bank or non-bank service entities (where all linked intermediaries are contracting partners to the service entity)³² or mutual associations, typically of financial institutions.³³ The DFP can be owned and operated by one private entity where the entity is in sole³⁴ or dispersed ownership,³⁵ or mutualized, with the users as members³⁶; we also see public entities (such as

31. See BANK FOR INT’L SETTLEMENTS & INT’L ORG. OF SEC. COMM’NS, *supra* note 7, at 7 (detailing variety of financial market infrastructure).

32. Visa is structured as a bank while SWIFT is not. See BANK FOR INT’L SETTLEMENTS, PAYMENT AND SETTLEMENT SYSTEMS IN SELECTED COUNTRIES 455–57 (2003), <https://www.bis.org/cpmi/publ/d53.pdf> [<https://perma.cc/6EA4-WF3G>] (describing the structure of SWIFT).

33. The stock exchanges as constituted until recent decades were the standard example. *Electronic Stock Exchange*, ECON. TIMES, <https://economictimes.indiatimes.com/e/electronic-stock-exchange/articleshow/51194360.cms?from=mdr> [<https://perma.cc/TF3T-7T99>] (last updated Feb. 29, 2016).

34. For example, the NYSE today, with the trading conglomerate Intercontinental Exchange as sole owner. *NYSE, INTERCONTINENTAL EXCHANGE*, <https://www.nyse.com/index> [<https://perma.cc/5QUB-J37A>] (last visited Oct. 19, 2020).

35. For example, Nasdaq, Inc. and Euronext S.A. *Investor Relations*, NASDAQ, <http://ir.nasdaq.com/> [<https://perma.cc/TB32-UX2L>] (last visited Oct. 19, 2020); *Corporate Governance*, EURONEXT, <https://www.euronext.com/en/investor-relations/corporate-governance> [<https://perma.cc/RP6W-XHA5>] (last visited Oct. 19, 2020).

36. For example, the user-owned Depository Trust & Clearing Corporation (DTCC), located in New York City, the world’s largest financial value processor. *DTCC’s Businesses, Subsidiaries and Joint Ventures*, DTCC, <https://www.dtcc.com/about/businesses-and-subsidi>

central banks³⁷) running systemically important DFPs (*e.g.*, real-time gross settlement (“RTGS”) payment systems).

2. DFPs vs. Financial Market Utilities

A “financial market utility” (“FMU”), as defined by the Bank for International Settlements and encoded in various parts of U.S. securities and banking regulation,³⁸ is “a multilateral system among participating institutions, including the operator of the system, used for the purposes of recording, clearing, or settling payments, securities, derivatives, or other financial transactions.”³⁹ FMU systems in the United States include the payment system run by the Federal Reserve (the National Settlement Service⁴⁰) and Visa, which link banks executing payment transactions from payer to payee, and connect to the central bank to ensure liquidity.⁴¹ NASDAQ’s systems, similarly, link brokerage firms with traded securities and their central clearing houses; and the electronic information exchange and messaging system, SWIFT, connects more than 11,000 financial institutions around the world.⁴² The Depository Trust and Clearing

aries [<https://perma.cc/QV58-G3VY>] (last visited Oct. 19, 2020).

37. For example, the U.S. Federal Reserve currently functions as operator of the National Settlement Service (NSS), the Fedwire[®] Funds Service as well as, together with the Electronic Payments Network (EPN), the Automated Clearing House (ACH) system, through which depository institutions send each other batches of electronic credit and debit transfers. The Federal Reserve committed to develop and operate the FedNow Service, a real-time payment and settlement service starting operations in 2023. Press Release, Bd. of Governors of the Fed. Rsrv. Sys., Federal Reserve Announces Plan to Develop a New Round-the-Clock Real-Time Payment and Settlement Service to Support Faster Payments (Aug. 5, 2019), <https://www.federalreserve.gov/newsevents/pressreleases/other20190805a.htm> [<https://perma.cc/E6NK-VR27>]. Other examples include the ECB’s payment-vs-delivery system, Target-2-Securities, and the Bank of England’s CHAPS system. *What is TARGET2-Securities (T2S)?*, EUROPEAN CENTRAL BANK, <https://www.ecb.europa.eu/paym/target/t2s/html/index.en.html> [<https://perma.cc/77A8-4HW9>] (last visited Oct. 19, 2020); *CHAPS*, BANK OF ENGLAND, <https://www.bankofengland.co.uk/payment-and-settlement/chaps> [<https://perma.cc/H6RK-B89X>] (last updated Oct. 5, 2020).

38. See *infra* note 168 and accompanying text.

39. BANK FOR INT’L SETTLEMENTS & INT’L ORG. OF SEC. COMM’NS, *supra* note 7, at 7.

40. See *National Settlement Service*, BD. OF GOVERNORS OF THE FED. RSRV. SYS., https://www.federalreserve.gov/paymentsystems/natl_about.htm [<https://perma.cc/JFW7-HQ5A>] (last updated Jan. 15, 2015) (providing information on the National Settlement Service, a multilateral settlement service offered by the Federal Reserve Banks).

41. BANK FOR INT’L SETTLEMENTS, PAYMENT, CLEARING AND SETTLEMENT SYSTEMS IN THE UNITED STATES (2012) https://www.bis.org/cpmi/publ/d105_us.pdf [<https://perma.cc/T2RK-2JR6>]; THE COUNCIL OF INSPECTORS GENERAL OF FINANCIAL OVERSIGHT, AUDIT OF THE FINANCIAL STABILITY OVERSIGHT COUNCIL’S DESIGNATION OF FINANCIAL MARKET UTILITIES (July 2013), https://www.fdicioig.gov/sites/default/files/publications/CIGFO_AUDIT_71713.pdf [<https://perma.cc/5AYD-SZQG>].

42. *About Us*, SWIFT, <https://www.swift.com/about-us> [<https://perma.cc/2YWA-QGR8>]

Corporation (“DTCC”)⁴³ ensures the transfer of securities and derivatives among local and global custodians and central securities depositories.⁴⁴

DFPs may be a form of FMUs, yet FMUs, in their classic incarnation, differ from our focus: existing FMUs are too narrow, too mechanical, and too limited in scope to serve as fully fledged service platform. In particular, FMUs’ focus has been to make markets and processes more efficient and secure by targeting pain points – on trust and transaction costs – within the financial system, while generally avoiding direct contact with the retail client base. The FMU serves the intermediary so that the *intermediary* can offer better products less expensively; hence, profitability is not the main concern of FMUs.

A DFP, by contrast, aims to provide an entire ecosystem with multiple services between clients and regulated intermediaries, either directly (where the client is a DFP client) or indirectly, in an effort to make a profit.⁴⁵

3. DFPs vs. FinTech

Digital finance platforms possess three critical differences from traditional FinTechs (typically defined as new challengers focused on application of technology to some aspect of financial services). First, archetypal FinTechs focus on disruption – challenging incumbents – while DFPs bet on an intense form of cooperation with incumbents.⁴⁶ Second, most FinTech applications link retail and small and medium enterprises to FinTech firms.⁴⁷ DFPs, by contrast, link multiple *financial intermediaries* together, in an effort to create an entire financial ecosystem.

Third, in an effort to disintermediate, the most high-profile FinTech businesses take the form of a marketplace, brokering various services and goods and taking a commission on it.⁴⁸ DFPs, by contrast, function as *innovation* platforms comprising “a technology, product or service that serves as a foundation on top of which other firms (loosely organized into an

(last visited Sept. 29, 2020).

43. See *supra* note 36.

44. See *supra* note 36.

45. Derryl D’Silva, Zuzana Filková, Frank Packer & Siddharth Tiwari, *The Design of Digital Financial Infrastructure: Lessons from India*, Bank for Int’l Settlements Papers 6 (2019), <https://www.bis.org/publ/bppdf/bispap106.pdf> [<https://perma.cc/M7RU-B6QD>].

46. Douglas W. Arner, János Barberis & Ross P. Buckley, *FinTech, RegTech and the Reconceptualization of Financial Regulation*, 37 *NW. J. INT’L L & BUS.* 371, 381 (2017); *supra* note 45 at 6–7.

47. See *supra* note 21 to 23 and accompanying text.

48. See PETER C. EVANS & ANNABELLE GAWER, *THE RISE OF THE PLATFORM ENTERPRISE: A GLOBAL SURVEY* 14 (2016), https://www.thecge.net/app/uploads/2016/01/PDF-WEB-Platform-Survey_01_12.pdf [<https://perma.cc/8MC2-DYJU>] (stating that of the 176 platform firms that were surveyed in 2015 globally, 160 platforms were transaction platforms).

innovative ecosystem) develop complementary technologies, products or services.”⁴⁹ A DFP is at its core similar to Apple, Microsoft, SAP, Oracle, and Intel, all offering the core innovation platforms on which various applications run. DFPs thus “establish a core of tools and standards that serve as a foundation for third-party software or content,”⁵⁰ where content can include data of all kinds and data-analytic tools, as well as contracting, execution, and settlement systems.

B. Aladdin: The Paradigmatic Back-end Platform

Currently, BlackRock’s Aladdin is the platform with by far the greatest impact on asset management.

1. Aladdin’s Activities

Aladdin – short for “Asset, Liability, Debt and Derivative Investment Network” – is at its core a technology tool that allows asset managers to “communicate effectively, address problems quickly, and make informed decisions at every step of the investment process.”⁵¹ BlackRock started to develop Aladdin, called “one of the earliest fintechs,”⁵² for its own portfolio and risk management, investment processes, and trade execution in 1993. From there, Aladdin moved into automatic position-keeping, record-keeping, and the control of risk exposure.⁵³ In 1994, BlackRock was engaged to price and manage General Electric’s complex bond portfolio, and integrated a broker-dealer system into Aladdin, allowing for automatic portfolio rebalancing by the mid-1990s.⁵⁴ Aladdin’s capabilities became known outside of the asset management community during the 2008 Global Financial Crisis, when governments globally struggled to evaluate the risk

49. *Id.* at 9.

50. Daniel Haberly et al., *Asset Management as a Digital Platform Industry: A Global Financial Network Perspective*, 106 *GEOFORUM* 167, 168 (2019).

51. *Aladdin® Enterprise Overview*, BLACKROCK, <https://www.BlackRock.com/aladdin/offerings/aladdin-overview> [<https://perma.cc/F5EG-SV5Z>] (last visited Sept. 29, 2020). See also *The Monolith and the Markets: BlackRock*, *THE ECONOMIST* (Dec. 7, 2013), https://link.gale.com/apps/doc/A351771715/AONE?u=upenn_main&sid=AONE&xid=16bd353d [<https://perma.cc/SCS5-CUEZ>] (describing the asset management company BlackRock, and its trading platform, Aladdin).

52. See Will Dunn, *Meet Aladdin, the computer “more powerful than traditional politics.”* *NEW STATESMAN* (Apr. 6, 2018), <https://www.newstatesman.com/spotlight/2018/04/meet-aladdin-computer-more-powerful-traditional-politics> [<https://perma.cc/3QNZ-9T5T>] (citing Jody Kochansky, BlackRock’s managing director and head of the Aladdin Product Group, a division of BlackRock).

53. *See Id.*

54. *See Id.*

exposure underlying the portfolios of global investment banks. By excluding the investment banks themselves, due to their obvious conflicts, and by using the reach of Aladdin's data and analytical tools, BlackRock was able to execute the multi-billion-dollar refinancing transactions necessary to prevent the U.S. financial system from collapsing,⁵⁵ turning BlackRock into "the leading manager of Washington's bailout of Wall Street."⁵⁶

The platform has since expanded into risk analysis and other parts of the investment process, and evolved into an end-to-end investment platform that, according to BlackRock, "combines sophisticated risk analytics with comprehensive portfolio management, trading and operations tools on a single platform to power informed decision-making, effective risk management, efficient trading and operational scale."⁵⁷ Today, serving clients that range from private to institutional funds, "Aladdin is an operating system for investment managers that seeks to connect the information, people and technology needed to manage money in real time."⁵⁸

2. The Power and Reach of Aladdin

Aladdin is a hosted service: the technical infrastructure, system administration, and interfacing with data providers and industry utilities are operated by BlackRock's IT and technical staff of more than 600, who focus on creating data and analyses for clients.⁵⁹

The scale of Aladdin is undeniably impressive, inspiring descriptions like "the Android of finance"⁶⁰ or "Amazon of Wall Street."⁶¹ More than \$20 trillion in assets, around ten percent of the world's financial assets, depend on Aladdin's services – this figure is equal to four times the value of all cash in the world,⁶² the annual GDP of the United States, or the total U.S. stock market capitalization.⁶³ Approximately 55,000 investment

55. *Id.*

56. Suzanna Andrews, *Larry Fink's \$12 Trillion Shadow*, VANITY FAIR (Mar. 2, 2010), <https://www.vanityfair.com/news/2010/04/fink-201004> [<https://perma.cc/H4NB-PF29>].

57. *Solutions: Aladdin®*, BLACKROCK, <https://www.blackrock.com/institutions/en-us/solutions/aladdin> [<https://perma.cc/D4VW-HTNR>] (last visited Oct. 10, 2020).

58. *See Aladdin® Enterprise Overview*, *supra* note 51.

59. *See Aladdin® Enterprise Overview*, *supra* note 51.

60. Erik Schatzker, *Larry Fink Q&A: "I don't identify as powerful"*, BLOOMBERG (Apr. 18, 2017), <https://www.bloomberg.com/features/2017-blackrock-larry-fink-interview/> [<https://perma.cc/BTE4-F5A2>].

61. Antoine Gara, *BlackRock's Edge: Why Technology Is Creating the Amazon of Wall Street*, FORBES (Dec. 26, 2017), <https://www.forbes.com/sites/antoinegara/2017/12/19/blackrock-edge-why-technology-is-creating-a-6-trillion-amazon-of-wall-street/#58212ce0561b> [<https://perma.cc/966E-SQ9C>].

62. Dunn, *supra* note 52.

63. Haberly, et al., *supra* note 50, at 172.

professionals globally rely on Aladdin and Aladdin Wealth.⁶⁴ More than 1,000 internal and external developers work continuously on enhancing its services.⁶⁵ Overall, Aladdin hosts the portfolios of 210 institutions worldwide, including some of the largest asset owners (e.g., California State Teachers' Retirement System (CalSTRS)) and competitors including Schroders and Vanguard.⁶⁶

Aladdin had its origin in risk management, and in that arena, it remains particularly effective. It became a powerful tool through its early introduction of Monte Carlo simulations. These replicate the unpredictability of the real world within a deterministic order of mathematics, by using random numbers rather than data reflecting past events. These simulations produce more comprehensive and more granular risk reports than other systems.⁶⁷ Today, in its risk management capacity, Aladdin monitors more than 2,000 "risk factors each day – from interest rates to currencies – and performs 5,000 portfolio stress tests and 180 million option-adjusted calculations each week."⁶⁸

3. Aladdin's Advantage: Data Control

Aladdin's greatest competitive advantage is its control over financial data. Insights from other network and data economies demonstrate that ownership of data produces economies of scale: the more data Aladdin can collect and analyze, the better the services Aladdin can provide to the portfolios of BlackRock and its clients. This data-driven scale inheres in the network effects and scale economics embedded in software generally, where the costs of all design, development, and coding are borne by the first version, while all subsequent copies can be produced at practically zero further cost.⁶⁹ The data-driven scale also underlies its evolution into a digital finance platform.

64. *Aladdin® Enterprise Overview*, *supra* note 51.

65. *Aladdin® Enterprise Overview*, *supra* note 51.

66. Amy Whyte *Can Anyone Bury Aladdin*, INST. INVESTOR (Oct. 1, 2018), <https://www.institutionalinvestor.com/article/b1b672fxttfp11/Can-Anyone-Bury-BlackRock> [<https://perma.cc/89AR-NDMZ>].

67. *See* Dunn, *supra* note 52.

68. *Benefits for Risk Managers*, BLACKROCK, <https://www.BlackRock.com/aladdin/benefits/risk-managers> [<https://perma.cc/94GZ-DEPP>] (last visited Sept. 29, 2020).

69. Michael L. Katz & Carl Shapiro, *Antitrust in Software Markets*, in COMPETITION, INNOVATION AND THE MICROSOFT MONOPOLY: ANTITRUST IN THE DIGITAL MARKETPLACE 34–35 (Jeffrey A. Eisenbach & Thomas M. Lenard eds., 1999); Richard A. Posner, *Antitrust in the New Economy* 3 (John M. Olin Program in Law and Economics Working Paper No. 106, 2000).

4. Aladdin's Competitors

Aladdin is not short of competitors, though most are unknown to the millions of retail investors who rely upon their services. Copenhagen-based SimCorp, for example, established its Dimension platform as a challenger, claiming that Dimension would compete with Aladdin on a global basis.⁷⁰ Other providers of risk-data modelling include MSCI Barra, Bloomberg, and Refinitiv.⁷¹ When Refinitiv was recently acquired by the London Stock Exchange (“LSE”), the LSE’s CEO justified this \$27 billion acquisition by stressing – consistent with our analysis – that “data capabilities will define the success of financial market infrastructure business.”⁷² The goal is clear: to develop the LSE, a financial market infrastructure, into a digital finance platform. J.P. Morgan Chase is also now licensing its trading and investment analytics platform, Athena, to third parties.⁷³ We believe this move to be an effort to capitalize on the trading and investment data created by clients of J.P. Morgan Chase’s \$25 trillion custody business and simultaneously to defend their clients against data-only competitors.⁷⁴

C. Front-End Investment Platforms

If Aladdin is fundamentally about integrating active asset managers, data, analytics, and market infrastructure in order to enhance efficiency and performance, then investment platforms are fundamentally about building an underlying operating system to link individual investors to information and products. The products are typically investment funds – increasingly passive investment funds – such as the ever-growing universe of exchange-traded funds (“ETFs”), which hold \$6.1 trillion⁷⁵ in U.S. and international markets.

70. Whyte, *supra* note 66.

71. See Dunn, *supra* note 52 (citing Aladdin’s Jody Kochansky who mentions MSCI Barra and Bloomberg as risk model providers that may have “still greater influence” than Aladdin); *Model Risk Management*, REFINITIV, <https://www.refinitiv.com/en/products/connected-risk-management/model-risk-management#> [<https://perma.cc/MHC3-V4D6>] (last visited Oct. 19, 2020).

72. Philip Stafford, *LSE needs to Beat Bloomberg at its Own Game*, FIN. TIMES (Aug. 19, 2019), <https://www.ft.com/content/bcd57f62-bda1-11e9-b350-db00d509634e> [<https://perma.cc/U878-5VP8>].

73. Hugh Son, *JP Morgan is Letting Clients Access Its Trading Software in a Glimpse of Wall Street’s Tech Future*, CNBC (Nov. 5, 2018), <https://www.cnbc.com/2018/11/05/jp-morgan-selling-trading-software-in-glimpse-of-wall-streets-future.html> [<https://perma.cc/5U8U-XX5D>].

74. *J.P. Morgan Sells Trading Software to Custody and Fund Services Clients*, J.P.MORGAN (Nov. 6, 2018), <https://www.jpmorgan.com/country/AU/en/detail/1320570868855> [<https://perma.cc/73K6-KXJD>].

75. M. Szmigiera, *Worldwide ETF Assets Under Management 2003-2019*, STATISTA

1. Incumbents

We observe particularly noticeable growth in the scale and size of certain front-end platforms in the fund industry, where major fund distribution platforms have expanded.⁷⁶ For instance, fund management giant Fidelity provides its clients an investment platform through which they can steer their investment streams, analyze their portfolios, and access advisory services by Fidelity, including receiving a “retirement score in 60 seconds.”⁷⁷ Another fund management giant, Vanguard, provides a system for accessing Vanguard’s universe of passive funds. Services for professional investors include the creation and evaluation of client portfolios, a product comparison with Vanguard and non-Vanguard products, as well as the provision of a model portfolio – in short, robo-advisory services.⁷⁸ Similar front-end systems are being developed by broker-dealers including Charles Schwab, whose platform provides access to Schwab’s and others’ financial products, advisory services, and analytical tools. Schwab’s platform stresses the fact that it charges “\$0 commissions on online stock, ETF, and options trades” and has “2,000+ commission-free ETFs and 4,000+ no-load, no-transaction-fee mutual funds,” aimed at cost-sensitive clients.⁷⁹ Through its merger with TD Ameritrade,⁸⁰ the joint Schwab-TD-platform promises to expand its reach over retail users and assets dramatically.

J.P. Morgan Chase has acquired a number of innovative investment firms,⁸¹ combining them with its own operations to form the new platform,

(Feb. 24, 2020), <https://www.statista.com/statistics/224579/worldwide-etf-assets-under-management-since-1997/#:~:text=The%20statistic%20presents%20the%20development,approximately%206.18%20trillion%20U.S.%20dollars> [<https://perma.cc/99E7-QQ34>].

76. On the emerging trend to fund distribution platforms, see INT’L ORG. OF SEC. COMM’NS, RESEARCH REPORT ON FINANCIAL TECHNOLOGIES (FINTECH) 22, 25, 68 (2017), <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD554.pdf> [<https://perma.cc/7V6Q-D468>] (discussing fund distribution platforms).

77. FIDELITY, <https://www.fidelity.com/> [<https://perma.cc/2C2Z-VLRV>] (last visited Sept. 29, 2020).

78. VANGUARD, <https://advisors.vanguard.com/advisors-home> [<https://perma.cc/NQN9-K7MB>] (last visited Sept. 29, 2020).

79. *Why Schwab: How We Compare*, SCHWAB, https://www.schwab.com/public/schwab/investing/why_choose_schwab/compare_us [<https://perma.cc/T9RC-ZFV5>] (last visited Sept. 29, 2020).

80. Maggie Fitzgerald, *Shares of Charles Schwab jump after sources say DOJ approves deal for TD Ameritrade*, CNBC (June 4, 2020, 8:58 AM), <https://www.cnbc.com/2020/06/04/shares-of-charles-schwab-jump-after-sources-say-doj-approves-deal-for-td-ameritrade.html> [<https://perma.cc/PQ4S-4DWM>].

81. The You Invest formation came on top of a number of start-up acquisitions in the payment sector that serve to strengthen J.P. Morgan’s technology core, including InstMed, a solutions provider for health care related payments for more than \$500 million in June 2019

You Invest.⁸² The services, again, include financial products, advice, and analysis. As a bank, J.P. Morgan can expand its system to be a full-service digital finance platform, covering deposit, lending, payment, investment, trading, and insurance. It also provides access to J.P. Morgan's lending and asset management operations to support the firm's business clients.⁸³

Another U.S. firm particularly active in creating a front-end platform is Goldman Sachs. Goldman used the online deposit platform, bank license, customers, and \$16 billion deposits from its 2016 acquisition of GE Capital Bank to create its digital platform, Marcus.⁸⁴ And by way of "acqui-hire," it added a small business lending P2P team from Bond Street Marketplace in 2017; the consumer FinTech team from credit card startup, Final, in January 2018; and Clarity Money with its personal financial management tool as a mobile storefront and one million customers for \$100 million in April 2018.⁸⁵

In addition, Goldman acquired the wealth platform United Capital for \$750 million, completing the cornerstones of a digital platform.⁸⁶ Although the United Capital acquisition may seem unrelated to Marcus, Goldman's 2019 press release reveals an intention to a digital finance platform:

and, in an effort to improve services for its 4 million small business clients, WePay, a competitor to PayPal and Stripe, for approximately \$220 million in 2017. *About*, INSTAMED, <https://www.instamed.com/about/> [<https://perma.cc/PJK4-NXJS>] (last visited Oct. 20, 2020); *About Us*, WEPAY, <https://go.wepay.com/about-wepay/> [<https://perma.cc/99DU-VS87>] (last visited Oct. 20, 2020).

82. *Overview: You Invest by J.P. Morgan*, CHASE, <https://www.chase.com/personal/investments/you-invest> [<https://perma.cc/W425-UR5H>] (last visited Sept. 29, 2020).

83. *You Invest Overview*, CHASE, <https://www.chase.com/personal/investments/you-invest> [<https://perma.cc/W425-UR5H>] (last visited Oct. 1, 2020).

84. MARCUS, <https://www.marcus.com/us/en> [<https://perma.cc/BHY8-AVKM>] (last visited Oct. 1, 2020); *Marcus by Goldman Sachs Leverages Technology and Legacy of Financial Expertise in Dynamic Consumer Finance Platform*, GOLDMAN SACHS, <https://www.goldmansachs.com/our-firm/history/moments/2016-marcus.html> [<https://perma.cc/YU7F-7ZRY>] (last visited Oct. 20, 2020); Press Release, Goldman Sachs, Goldman Sachs Bank USA Completes Acquisition of Online Deposit Platform from GE Capital Bank (Apr. 18, 2016), <https://www.goldmansachs.com/media-relations/press-releases/archived/2016/announcement-gs-bank.html> [<https://perma.cc/4BRH-4WSW>].

85. Peter Rudegeair & Liz Hoffman, *Goldman Nabs FinTech Group in Push to Boost Online Lending*, WALL ST. J. (Sept. 13, 2017, 5:11 PM), <https://www.wsj.com/articles/goldman-nabs-fintech-group-in-push-to-boost-online-lending-1505337060> [<https://perma.cc/BE69-JTEC>]; Ainsley Harris, *Goldman Sachs Acquires Team behind Credit Card Startup Final*, FAST COMPANY (Jan. 30, 2018) <https://www.fastcompany.com/40523758/goldman-sachs-buys-credit-card-startup-final> [<https://perma.cc/D7GK-4RRD>]; Luisa Beltran, *Goldman closes buy of Clarity Money*, PE HUB (Apr. 15, 2018), <https://www.pehub.com/2018/04/goldman-closes-buy-clarity-money/> [<https://perma.cc/SM7N-PV8G>].

86. *Goldman Sachs to Buy Wealth Manager United Capital for \$750 Million*, REUTERS (May 16, 2019, 9:11 AM), <https://www.reuters.com/article/us-unitedcapitalfinancial-m-a-goldmansac/goldman-sachs-to-buy-wealth-manager-united-capital-for-750-million-idUSKCN1SM1IH> [<https://perma.cc/3FTT-3ARJ>].

United Capital will enhance Goldman Sachs' ability to cover a broad range of clients in Ayco's growing corporate client base with financial planning solutions through an advisor-led, tech-enabled platform with considerable scale and geographic footprint. These efforts will complement the digitally-empowered consumer platform for individuals from Marcus by Goldman Sachs, and will ultimately provide a full-range of services across the wealth spectrum.⁸⁷

Fidelity and Vanguard are, at their core, investment advisers (*i.e.*, managers of mutual funds), Charles Schwab is originally a broker-dealer, J.P. Morgan a bank, and Goldman Sachs – until 2008 – an investment bank. Notwithstanding these entirely different core businesses, evolutionary trajectories, and regulatory regimes, the digital finance platforms of all five look remarkably similar. We discuss this important convergence in further detail below.⁸⁸

2. The Size and Growth of Investment Platforms

The sheer size and growth of Charles Schwab, Fidelity, and Vanguard are impressive, particularly relative to other parts of the economy: Vanguard's assets under management have dramatically increased to \$6.2 trillion today from \$1.6 trillion as of December 31, 2013 – a 288% increase⁸⁹ – with \$3 trillion of that growth due to flows into passive index funds.⁹⁰ In the period from December 31, 2013, to June 30, 2020, Fidelity generated 638% growth (from \$1.3 trillion to \$8.3 trillion).⁹¹ Though smaller, Schwab's 78% increase in assets under management over six years (from \$2.3 trillion to \$4.1 trillion)⁹² is still remarkable. Schwab's recent TD

87. Press Release, Goldman Sachs, Goldman Sachs Announces Acquisition of United Capital (May 16, 2019), <https://www.goldmansachs.com/media-relations/press-releases/archived/2019/announcement-16-may-2019.html> [<https://perma.cc/AR7G-SKLLK>].

88. See *infra* Part III.

89. See Jonathan Williams, *AUM Growth at 10 Largest Fund Managers Outstrips Sector – Top 400*, IPE.COM (June 10, 2013), <https://www.ipe.com/top-400/aum-growth-at-10-largest-fund-managers-outstrips-sector-top-400/53219.article> [<https://perma.cc/SV6H-8FXD>] (showing data for 2013); *Fast Facts About Vanguard*, VANGUARD, <https://about.vanguard.com/who-we-are/fast-facts/> [<https://perma.cc/N26S-5H24>] (last visited Sept. 29, 2020).

90. Landon Thomas Jr., *Vanguard is Growing Faster Than Everybody Else Combined*, CNBC (Apr. 17, 2017, 12:12 PM), <https://www.cnbc.com/2017/04/16/vanguard-is-growing-faster-than-everybody-else-combined.html> [<https://perma.cc/W2GP-YB28>].

91. See Williams, *supra* note 89; FIDELITY, <https://www.fidelity.com/about-fidelity/our-company#ourcompanybynumberstitleNCL> [<https://perma.cc/W5H7-HVES>] (last updated June 30, 2020).

92. See Press Release, Charles Schwab, Schwab Reports Fourth Quarter Net Income Up 51% Year-Over-Year (Jan. 16, 2014), <https://pressroom.aboutschwab.com/press-releases/press-release/2014/Schwab-Reports-Fourth-Quarter-Net-Income-Up-51-Year-Over-Year/default>

Ameritrade acquisition added another twelve million customers and \$1.2 trillion in assets, resulting in total assets of \$5.3 trillion (and total growth of 130% as compared to six years ago).⁹³ Together, Schwab/TD Ameritrade serve a total of more than twenty-six million customers, Vanguard more than thirty million customers, and Fidelity more than thirty-two million customers.⁹⁴

These huge numbers have prompted concerns about undue concentration of equities in the hands of such a small number of institutional investors⁹⁵ as well as increasing industry concentration.⁹⁶ These concerns reflect the cost sensitivity of investors as a major cause of this exceptional concentration, yet fail to analyze *why* Vanguard and others are able to offer such funds at very competitive terms. We argue that the effectiveness of their underlying digital finance platforms explains much of the success of these entities.

3. The Investment Platform Advantage: Liquidity Control

Though driven by a desire to monopolize critical data, the major advantage of investment platforms stems from their aggregation of liquidity:

t.aspx [<https://perma.cc/JH7E-KHEE>] (detailing figures per Dec. 31, 2013); Press Release, Charles Schwab, Schwab Reports Second Quarter Earnings Per Share Of \$.48, Including \$.06 Per Share Of Acquisition-Related Expenses (July 16, 2020), https://content.schwab.com/web/retail/public/about-schwab/schw_q2_2020_earnings_release.PDF [<https://perma.cc/Z8C3-5UNP>] (detailing figures per June 30, 2020).

93. *TD Ameritrade to Announce Fiscal Third Quarter Earnings*, TD AMERITRADE (July 7, 2020), <https://www.amtd.com/news-and-stories/press-releases/press-release-details/2020/TD-Ameritrade-to-Announce-Fiscal-Third-Quarter-Earnings/default.aspx> [<https://perma.cc/96JU-MXVF>]; *Charles Schwab Corporation to Acquire TD Ameritrade*, TD AMERITRADE (Nov. 25, 2019), <https://www.amtd.com/news-and-stories/press-releases/press-release-detail/s/2019/The-Charles-Schwab-Corporation-to-Acquire-TD-Ameritrade/default.aspx> [<https://perma.cc/EC6X-862H>].

94. *See supra* notes 87, 88, 90, and 91; *Corporate Statistics*, FIDELITY, https://www.fidelity.com/bin-public/060_www_fidelity_com/documents/about-fidelity/corporate-statistics-infographic.pdf [<https://perma.cc/C3WQ-5SKA>] (last visited Oct. 9, 2020).

95. *See supra* note 29 (supplying a corporate governance perspective). *See also* Int'l Monetary Fund, *Global Financial Stability Report: Navigating Monetary Policy Challenges and Managing Risks* (Apr. 2015), <https://www.imf.org/en/Publications/GFSR/Issues/2016/12/31/Navigating-Monetary-Policy-Challenges-and-Managing-Risks> [<https://perma.cc/39FS-LANX>] (offering a market stability perspective); Sophie Steins Bisschop, Martijn Boermans & Jon Frost, *European bond markets: Do illiquidity and concentration aggravate price shocks?*, 141 *Econ. Letters* 141, 143 (2016) (analyzing the effects of market liquidity and ownership structure on European bond markets).

96. Kenekukwu Anadu et al., *The Shift from Active to Passive Investing: Risks to Financial Stability?* 16–20 (Fed. Rsrv. Bank of Bos., Working Paper SRA 18-04, 2020), <https://www.bostonfed.org/publications/risk-and-policy-analysis/2018/the-shift-from-active-to-passive-investing.aspx> [<https://perma.cc/4A8J-8FVY>].

that is, they essentially control the flow of their clients' money. Clients are attracted by the prospect of low fees for transactions and advice, and willingly relinquish control over their asset streams to the platform providers, which then control the liquidity to negotiate advantageous contract terms with custodians, other advisers, broker-dealers, and stock exchanges. The main threat investment platforms employ – to ensure optimal terms for themselves and their clients – is not necessarily the threat of defection to a different service provider; rather with sufficient clients on the platform, the platform provider itself can offer custodial, advisory, broker-dealer, and even exchange services. The true value, hence, is their clients' bundled spending power that can be employed either to extract better terms from counterparties or to assume the counterparty's functions if the counterparty does not give in to the investment platform's pressure. In this way, investment platforms squeeze the profit margins out of the back-end of the investment chain and counter the threat of getting squeezed and automated away by back-end platforms like Aladdin gradually approaching their clients by integrating ever more front-end institutions. For this strategy to succeed, client numbers and asset streams on the front-end are crucial, which explains the universal race for client numbers and asset size.

D. Financial Ecosystems

While Aladdin's strength lies in data control, and investment platforms aggregate data, investments, and liquidity control, some digital finance platforms – which we call financial ecosystems – benefit from the control of *both* data and liquidity via the provision of comprehensive front-to-back financial services. That is, they cover the full value chain of asset management, from customers' payment and custodial accounts to broker-dealer, advisory, and exchange services. While many incumbents such as BlackRock and Goldman Sachs are seeking to pursue this strategy (*see infra*, at Part I.E.), the big platform technology firms (“BigTechs”) are leading the way, particularly Ant Group.

1. The Ant Ecosystem

Though not well known in the United States, the most extensive financial ecosystem has been created by Ant Group, the financial arm of the Chinese BigTech, Alibaba.⁹⁷ Developed originally as a support function for

97. See FIN. STABILITY BD., BIGTECH IN FINANCE: MARKET DEVELOPMENTS AND POTENTIAL FINANCIAL STABILITY IMPLICATIONS 4–11 (Dec. 9, 2019), <https://www.fsb.org/wp-content/uploads/P091219-1.pdf> [<https://perma.cc/63W9-6MSY>] (discussing Ant's role in

e-commerce in an emerging environment (Alipay), Ant (until July 2020, named Ant Financial) today comprises a payment system, a custody function for its clients, robo-advisory and asset management services, and credit, investment, and insurance products of its own and other firms.⁹⁸ A particularly interesting service within the Ant ecosystem is the money market mutual fund Yu'e Bao, which at its largest reached \$250 billion in assets from 600 million clients, making it by far the world's largest money market fund, at the time outdistancing the second-largest fund of this kind by a margin of \$100 billion.⁹⁹ Most recently, Ant has entered into a joint venture with Vanguard to combine Vanguard's investment platform and passive investment fund ecosystem with the Ant / Alibaba ecosystem.¹⁰⁰ Ant has also become one of the largest providers of both consumer and SME lending in China.¹⁰¹

Ant's objective is to provide a comprehensive ecosystem that allows customers to buy whatever they want through e-commerce platforms and physical and virtual merchants throughout the world via Alipay, which now has more than 700 million Chinese active users.¹⁰² Those individuals and firms can, in turn, use the funds in Ant's Alipay system for other payments or investment, earning attractive returns through money market funds, an increasing range of ETFs, and other investment products including insurance.

Ant funds itself through fees,¹⁰³ sales of data,¹⁰⁴ and borrowing in

finance); Jon Frost, Leonardo Gambacorta, Yi Huang, Hyun Song Shin & Pablo Zbinden, *BigTech and The Changing Structure of Financial Intermediation* 7–10 (BIS, Working Paper No. 779, 2019), <https://www.bis.org/publ/work779.pdf> [<https://perma.cc/V3RX-8STN>] (detailing the impact of Ant on the Chinese credit market).

98. See FIN. STABILITY BD, *supra* note 97.

99. *World's No. 1 Money Market Fund Shrinks By \$120 Billion*, BLOOMBERG (Sept. 5, 2019, 6:00 PM), <https://www.bloomberg.com/news/articles/2019-09-05/world-s-no-1-money-market-fund-shrinks-by-120-billion-in-china> [<https://perma.cc/QYV2-GBLW>].

100. Reuters Staff, *China's Ant Financial, Vanguard Form Shanghai-Based Venture: Government Records*, REUTERS (June 10, 2019), <https://www.reuters.com/article/us-vanguard-china/chinas-ant-financial-vanguard-form-shanghai-based-venture-government-records-idUSKCN1TB178> [<https://perma.cc/KF4J-L2PT>].

101. See Stella Yifan Xie, *A \$7 Credit Limit: Jack Ma's Ant Lures Hundreds of Millions of Borrowers*, WALL ST. J. (Dec. 8, 2019, 8:33 AM), <https://www.wsj.com/articles/a-7-credit-limit-jack-mas-ant-lures-hundreds-of-millions-of-borrowers-11575811989> [<https://perma.cc/7NK9-HJRC>] (stating that Ant's "mega microlending business has ballooned by offering tiny loans of up to \$7, turning Ant "into one of China's largest providers of personal credit lines").

102. *China's Alipay Now Has Over 900m Users Worldwide*, CHINA DAILY (Nov. 30, 2018, 10:34 AM), <http://www.chinadaily.com.cn/a/201811/30/WS5c00a1d3a310eff30328c073.html> [<https://perma.cc/9996-9RAU>].

103. Ryan McMorro, Nian Liu & Sherry Fei Ju, *The Transformation of Ant Financial*, FIN. TIMES (Aug. 26, 2020), <https://www.ft.com/content/c636a22e-dd3f-403e-a72d-c3ffb375459c> [<https://perma.cc/6XG6-46AF>].

104. Gabriel Wildau and Yizhen Jia, *China Fintech Lending Boom Fuels Risks of Data*

China's Interbank Bond Market, China's electronic bond and money market platform. It then lends to individuals to help them buy products through Alibaba and other vendors while also providing credit to businesses to enable them to expand their operations, income, and profits. Ant in turn securitizes those loans and is one of the largest issuers of asset-backed securities in China, which it in turn sells to investors in the Interbank Bond Market.¹⁰⁵ Ant also now sells insurance, including a new mutual-aid platform that gained one hundred million customers in a year.¹⁰⁶ The funds paid in premia are of course invested via its platform to generate investment returns to support payouts. The Ant ecosystem thus covers all aspects of finance – Ant calls it “Digital Life” – from hundreds of millions of individuals and firms through its financial ecosystem, integrating directly with third-company providers and funding commercial borrowers both directly and through the capital markets.¹⁰⁷

2. Size and Scope of Ant

Ant is anything but a financial ant – it is one of the highest valued financial companies in the world. At its height in November 2020, immediately prior to its planned IPO in Hong Kong and Shanghai, it had a valuation of \$280 billion. Had that IPO taken place, it would have been the world's largest, raising \$35 billion.¹⁰⁸ For comparison, this size would have

Theft, FIN. TIMES (Nov. 29, 2017), <https://www.ft.com/content/2d2f6012-d4dc-11e7-8c9a-d9c0a5c8d5c9> [<https://perma.cc/FS79-5HWK>].

105. Daniel Ren, *Ant Financial to Issue China's First Security Backed by Loans to Online Retailers*, SOUTH CHINA MORNING POST (Mar. 16, 2018) <https://www.scmp.com/business/companies/article/2137594/ant-financial-issue-chinas-first-security-backed-loans-online> [<https://perma.cc/9T8C-SHVA>]; ORIENT CAPITAL RESEARCH, *ANT FINANCIAL'S AGGRESSIVE STRATEGY* (Mar. 19, 2018), <http://www.orientcapitalresearch.com/wp-content/uploads/2020/09/Ants-Aggressive-Strategy-1.pdf> [<https://perma.cc/TQ8P-NEYF>].

106. Georgina Lee *Ant Financial's Mutual-Aid Platform Xiang Hu Bao Attracts 100 Million Users, Boosts Insurers' Sales by 60 per cent in First Year*, SOUTH CHINA MORNING POST (Nov. 27, 2019), <https://www.scmp.com/business/companies/article/3039554/ant-financials-mutual-aid-platform-xiang-hu-bao-attracts-100> [<https://perma.cc/G58M-CY4U>].

107. *Digital Daily Life*, ANT GROUP, <https://www.antgroup.com/en/digital-life> [<https://perma.cc/4PVB-TX3C>] (last visited Oct. 20, 2020).

108. See Anais Concepcion, *How Ant Financial Became the Largest FinTech in the World*, APPLICO (Mar. 4, 2019), <https://www.applicoinc.com/blog/ant-financial-services-platform-largest-FinTech-in-world/> [<https://perma.cc/KB9R-LAYG>]; Nisha Gopalan, *Ant Will Have an Elephant-Sized Coming Out Party*, BLOOMBERG (July 21, 2020, 12:51 AM), <https://www.bloomberg.com/opinion/articles/2020-07-21/ant-will-have-an-elephant-sized-coming-out-party?srnd=premium-asia&sref=IP8hg7Cm> [<https://perma.cc/SZ9E-6CV3>]; *Jack Ma's Ant Group Raises IPO Valuation Target to \$280 Billion*, BLOOMBERG NEWS (Oct. 16, 2020), <https://www.bloomberg.com/news/articles/2020-10-16/jack-ma-s-ant-group-raises-ipo-valuation-target-to-280-billion> [<https://perma.cc/8LA6-2DX2>]; Lulu Yilun Chen, *Jack Ma's Ant Set to Raise \$35 Billion in Biggest-Ever IPO*, YAHOO FIN. (Oct. 26, 2020), <https://finance.yahoo.com/new>

given Ant approximately the same market capitalization as PayPal, about two-thirds that of JP Morgan, about one-third that of Facebook, or about one fifth that of Google, though Ant and Alibaba combined would not be far behind these US companies. Amazon and Microsoft, however, dwarf everything else, a point we will return to in Part IV. In 2018, Ant raised \$14 billion in venture capital financing, or 35% of all VC funding worldwide that year, more than all U.S. FinTech companies combined.¹⁰⁹ Alipay, its payments services, had more than 1.2 billion active users worldwide as of June 30, 2019 and a share in the Chinese payments market of 54.2%, executing more than \$16 trillion in transactions,¹¹⁰ equivalent to four times China's nominal GDP.¹¹¹

The reach of Ant extends beyond payments. It “also owns and operates an open insurance marketplace with over 80 insurance companies on the platform that reaches over 400 million users. . . . All of China's 116 mutual fund managers are on the platform that reaches 180 million users.”¹¹²

The potential scope of economic and financial disruption caused by a failure or hacking of Ant's platform is immense, and these concerns – among others – led to a decision to subject it to increased regulation, causing the IPO in November 2020 to be suspended indefinitely by mainland Chinese and Hong Kong regulators.¹¹³

3. Liquidity and Data Control

When compared to back-end and front-end systems, the striking factor about Ant is that it exercises control over clients' liquidity *and* data.

s/jack-ma-ant-raises-34-113651223.html [https://perma.cc/GTQ4-PRXB].

109. Anna Irrera, *FinTech Companies Raised a Record \$39.6 billion in 2018*, REUTERS (Jan. 19, 2019, 12:39 AM), <https://www.reuters.com/article/us-fintech-funding/fintech-companies-raised-a-record-396-billion-in-2018-research-idUSKCN1PN0EL> [https://perma.cc/28QF-2MSQ].

110. Raymond Zhong, *Ant Group, the Alibaba Payment Affiliate, Files to Go Public*, N.Y. TIMES (Aug. 25, 2020), <https://www.nytimes.com/2020/08/25/technology/ant-alibaba-ipo-filing.html> [https://perma.cc/C93B-9N6R].

111. See CBNEditor, *Q2 Mobile Payments Transaction Volume in China Rises 22.6% YoY: iResearch Report*, CHINA BANK. NEWS (Oct. 17 2019), <http://www.chinabankingnews.com/2019/10/17/q2-mobile-payments-transaction-volume-in-china-rises-22-6-yoy-iresearch-report/> [https://perma.cc/K8P2-KLZZ]; *Alipay reports 1.2 bln users*, XINHUANET (Oct. 1, 2019, 3:00 PM), http://www.xinhuanet.com/english/2019-10/01/c_138440413.htm [https://perma.cc/Y9UW-SY6V]; *China Nominal GDP*, CEIC, <https://www.ceicdata.com/en/indicator/china/nominal-gdp> [https://perma.cc/VT22-7WTB] (last visited Oct. 22 2020).

112. Concepcion, *supra* note 108.

113. See David Scanlon, *Everything You Need to Know About Ant's Pulled IPO*, BLOOMBERG (Nov. 4, 2020), <https://www.bloomberg.com/news/articles/2020-11-04/here-s-everything-you-need-to-know-about-ant-s-pulled-ipo?sref=IP8hg7Cm> [https://perma.cc/35YN-W7MR] (summarizing key elements and reports).

Employing its data power, Ant can offer – where profitable, based on client and transaction data – any financial services to any client at any time. Employing its liquidity power, Ant can push insurance companies or asset management firms for rebates, discounts, and commissions. That liquidity power means that no financial services firm targeting the Chinese market can afford to be removed from Ant’s platform.

Ant can capitalize on the liquidity and data control even where it forgoes the provision of financial services (which would come most often with capital requirements and strict regulation). This flexibility explains why Ant’s current focus is on providing a mere platform on which others can offer their services, similar to the Apple App store, but focusing on finance.

4. The Ant Clones: The Ecosystem Business Model

Unsurprisingly, in light of the high value assigned by investors to large financial ecosystems like that of Ant, a range of firms are seeking to mimic Ant’s business model. For example, Charles River – a competitor of Aladdin – has joined with State Street to deliver the “first-ever global, front-to-back, client servicing platform from a single provider.”¹¹⁴ This claim is obviously ill-founded given its belated emulation of Ant’s ecosystem, not to mention the competing financial ecosystems provided by Tencent¹¹⁵ and Baidu in China which – even though much smaller than that of Ant – are giants in terms of user numbers.¹¹⁶ Ping An, the world’s largest insurance company, is building a similar integrated ecosystem for its 570+ million internet users, integrating finance, insurance, health care, and property, following the adage “one customer, multiple products, and one-stop services.”¹¹⁷

All manners of U.S. financial institutions are attempting to follow Ant’s example to establish and expand financial ecosystems. Most notably, the world’s largest asset manager, BlackRock, has introduced a front-end system following its 2015 acquisition of robo-advisory firm Future Advisor,¹¹⁸ and

114. Whyte, *supra* note 66.

115. Tencent currently is discussing cooperation with BlackRock in the Chinese asset management market. See Annie Mass, *BlackRock in Talks With Tencent to Explore China Expansion*, BLOOMBERG (Oct. 2, 2019, 10:00 AM), <https://www.bloomberg.com/news/articles/2019-10-02/blackrock-in-talks-with-tencent-to-explore-expansion-in-china> [<https://perma.cc/Z5QW-CEWM>].

116. See FIN. STABILITY BD., *supra* note 97, at 5–11; Frost, et al., *supra* note 97, at 7–10.

117. PING AN, <https://www.pingan.com/us-en.shtml> [<https://perma.cc/KNR7-Z2VF>] (last visited Oct. 9, 2020).

118. See Samantha Sharf, *BlackRock To Buy FutureAdvisor, Signaling Robo-Advice Is Here To Stay*, FORBES (Aug. 26, 2015, 04:02 PM), <https://www.forbes.com/sites/samanthasharf/2015/08/26/blackrock-to-buy-futureadvisor-signaling-robo-advice-is-here-to-stay/#7df91bc63023> [<https://perma.cc/KC83-4GTY>] (discussing BlackRock’s acquisition of RoboAdvisor).

American BigTechs are pursuing similar ecosystem models: Apple is seeking to build a financial ecosystem with Apple Pay as a key access point for retail consumers; expansion into other financial services has started with the Apple Card announced in August 2019.¹¹⁹ Facebook's intended launch of Libra also forms the basis of a similar strategy, while Amazon appears to be focusing on building a financial services marketplace, similar to Ant's current direction.¹²⁰

E. Neo-Investment Platforms

The examples we have provided are the most obvious and enormous in terms of scale and numbers but are by no means the only ones currently in operation. Investment platforms similar to those of Fidelity, Schwab, Vanguard, and J.P. Morgan Chase, created by financial entrepreneurs, have emerged recently under the label of "robo-adviser."¹²¹ Some robo-advisers, including Robinhood,¹²² have collected several million clients, primarily attracted by low or even zero asset management fees.¹²³ We observe a similar tendency of Coinbase, a cryptobroker that claims to have over thirty million clients.¹²⁴ These firms are often seeking to build large digital finance platforms. They are, however, at a huge disadvantage of scale in terms of assets under management compared with incumbents like BlackRock, Fidelity, Schwab, Vanguard, Goldman Sachs, and J.P. Morgan Chase.

119. See Ben Gilbert, *The Apple Card is a Brilliant Move by Apple to Keep People Shackled to The iPhone*, BUS. INSIDER (Aug. 12, 2019, 4:19 PM), <https://www.businessinsider.com/apple-card-only-works-with-iphone-2019-8?r=DE&IR=T> [<https://perma.cc/KU8U-NJHV>] (exploring the impact of the launch of the Apple Card).

120. See Dirk Zetzsche, Ross Buckley & Douglas Arner, *supra* note 12 (in relation to Libra); Ron Shevlin, *Amazon and Goldman Sachs: A Small Business Lending Wake-Up Call for Banks*, FORBES (June 15, 2020, 8:00 AM), <https://www.forbes.com/sites/ronshevlin/2020/06/15/amazon-and-goldman-sachs-a-small-business-lending-wake-up-call-for-banks/#754664b17891> [<https://perma.cc/H6SR-Z2JR>] (in relation to Amazon).

121. Tom Baker & Benedict G. C. Dellaert, *supra* note 21; Megan Ji, *supra* note 21.

122. See Tyler Clifford, *Reaching 10 million users is a 'testament' to our mission to democratize investing, Robinhood co-CEO says*, CNBC (Dec. 4, 2019 6:54 PM), <https://www.cnbc.com/2019/12/04/robinhood-co-ceo-10-million-users-are-a-testament-to-our-mission.html> [<https://perma.cc/7Z3S-BB5B>] (stating that Robin Hood has more than 10 million client accounts).

123. See, e.g., William A. Birdthistle, *Free Funds: Retirement Savings as Public Infrastructure*, in RESEARCH HANDBOOK ON THE REGULATION OF MUTUAL FUNDS 267 (William A. Birdthistle & John Morley eds., 2018); William A. Birdthistle & Daniel J. Hemel, *Next Stop for Mutual-Fund Fees: Zero*, WALL ST. J. (June 10, 2018, 1:42 PM), <https://www.wsj.com/articles/next-stop-for-mutual-fund-fees-zero-1528652532> [<https://perma.cc/X9QZ-KYJR>].

124. COINBASE, <https://www.coinbase.com> [<https://perma.cc/B4HY-Z9R7>] (last visited Oct. 9, 2020).

Consequently, many of these FinTech startups are being acquired by, or cooperating with, incumbents looking to build proprietary systems, by combining the FinTech's technology with the scale of customers, assets, and brand of the established incumbent to compete with the other major players. Robinhood, for instance, cooperates with Citadel Securities' back-end platform, now underlying over 40% of U.S. retail equities trading volume and 15% of trading volume.¹²⁵

As we discuss in more detail in Part III, scale is central to network and data effects, so the trend is already very much toward concentration. The critical question will be how far this process can go.

II. DIGITAL FINANCE, ASSET MANAGEMENT & THE PLATFORM ECONOMY

In this Part, we argue that digital finance platforms share technical and economic characteristics sometimes associated with other technological "platform industries." To display their unique attributes, we show how they function in the world of asset management, which typically rests upon a foundation of investment funds. We argue that *technology* has enabled the evolution of scale and concentration in the asset management industry, most recently and most visibly in the rise of passive investment funds. As with other platforms, digital finance platforms benefit from ever-greater concentrations of customers and counterparties, even if that development is not optimal for customers and society. We then advance a three-stage argument for the proposition that a small number of digital finance platforms are likely to become dominant, not only in asset management but across the financial system more widely. Such oligopolistic tendencies will trigger important implications for the financial system, the economy, and our societies more generally, and require reforms to our regulatory system.

A. *The Traditional Theory: Investment Funds as Networks of Contracts*

Investment funds are the primary way in which most investors connect to the financial system. As a result of technology combined with economies of scale and network effects, the functions provided by investment funds are increasingly dominated by digital finance platforms. To the extent these

125. Richard Henderson, *Zero-Fee Trading Helps Citadel Securities Cash in on Retail Boom*, FIN. TIMES (June 21, 2020), <https://www.ft.com/content/4a439398-88ab-442a-9927-e743a3ff609b> [https://perma.cc/H92G-TBNU].

platforms are vulnerable, nothing less than the trillions of dollars under management are at risk.

For all the popularity and ubiquity of these funds, they remain a curious species, and for a good reason: investment funds are, structurally and operationally, not like stocks and bonds, ordinary businesses, or bank accounts with which consumers are more familiar. To understand funds, we must understand the cast of specialist economic actors who, closely cooperating, form a complex network of contracts that we together call “a fund” and which underlie traditional business models and regulatory approaches to the industry.¹²⁶ In so doing, we highlight how technology has transformed these models and assumptions resulting in ever-increasing concentration.

1. Investment Companies, Investment Advisers, and Custodians

Investment companies, investment advisers and custodians form the core of a fund structure. If one invests money to buy shares of equity (“stock”) in Ford or Exxon, one expects those companies to use the money to build more cars or to drill for more oil. As such, shareholders will benefit if the company’s performance – or, perhaps more accurately, its perceived performance – improves. Mutual funds do not provide goods or services to customers in this way but, rather, as *investment companies*, they provide their users with a means of investing in other securities.

In mutual funds, the *investment adviser* is the central actor charged with investment decisions on behalf of the fund. But they do more: investment advisers run mutual funds. They manage and direct almost every facet of the business. The SEC has noted that “the term ‘investment adviser’ is to some extent a misnomer” because an adviser is “no mere consultant” but “almost always controls the fund.”¹²⁷ In return, these advisers owe fiduciary duties to their own shareholders and to the funds they manage.

The term *investment adviser* usually refers not to an individual human being but to a professional investment organization with many employees. Many investment advisers are household names, such as Fidelity Management and Research, which manages the Fidelity funds; the Vanguard Group, which manages the Vanguard funds; Pacific Investment Management Company, which manages the PIMCO funds; and Franklin Advisers, which manages the Franklin Templeton funds; as well as T. Rowe Price Associates,

126. See generally RESEARCH HANDBOOK ON THE REGULATION OF MUTUAL FUNDS, *supra* note 123; see John Morley, *The Separation of Funds and Managers: A Theory of Investment Fund Structure and Regulation*, 123 YALE L. J. 1118, 1243–67 (2014) (discussing investment funds).

127. *In re Steadman Sec. Corp.*, 46 S.E.C. 896, 920 n.81 (1977).

BlackRock Advisors, J.P. Morgan Asset Management; and many others.

So, in whom or what do fund investors invest? Not the investment adviser, as one might expect, given the names of funds that seem to indicate the contrary.¹²⁸ Instead, mutual fund investors are shareholders in the new, separate *investment company* that the investment adviser creates. Adviser and fund are linked through the *investment advisory agreement*, which is a contract pursuant to which the adviser operates the fund in exchange for a percentage of the assets of the fund. Investors in a fund are not generally shareholders of the investment adviser; rather, they are related to the adviser only through a contractual arrangement. The shares investors hold are a separate pool of assets legally owned by the investment company, yet managed by the investment adviser. The sums fund shareholders contribute go into a combined pool of money that the adviser then uses to buy and sell other investments, such as shares, bonds, and real estate: these investments are called *portfolio securities*.

So, fund shareholders own shares of the mutual fund (such as the Vanguard Total Stock Market Index Fund), while the mutual fund owns the portfolio securities (such as Ford or IBM). And each fund shareholder invests in the hope that a fund's portfolio securities will increase in value in order to raise the corresponding value of her fund shares, after fees.¹²⁹

Mutual funds are legally obliged to retain the services of a *custodian*.¹³⁰ This custodian is usually a large financial institution charged with taking legal custody of a fund's assets, in an effort to hold and safeguard these assets on behalf of the fund and its investors during the lifetime of the fund.¹³¹ Typically, this role is filled by a major commercial bank, not necessarily because banks are impregnable but because banks are intensely regulated by federal banking laws.¹³² As the legal holder of a fund's cash and portfolio investments, a custodian must segregate the fund's assets from the adviser's

128. The funds managed by investment advisers almost always come with the advisers' names on them. In turn, one might reasonably believe that handing over \$1,000 to Fidelity constitutes, if not a bank-like promise, then some sort of investment in Fidelity itself; after all, Fidelity is the name on the investment. Funds managed by Fidelity include hundreds of other funds with the name *Fidelity*. Funds managed by Janus include the Janus Fund, the Janus Enterprise Fund, the Janus Venture Fund, and approximately thirty other funds with the name *Janus* in their titles.

129. Note: the custodian, considered in this Part, holds the portfolio securities on behalf of the investor/fund.

130. 15 U.S.C. § 80a-17(f).

131. COMPTROLLER OF THE CURRENCY ADM'R OF NAT'L BANKS, CUSTODY SERVICES 1 (2002), <https://www.occ.gov/publications-and-resources/publications/comptrollers-handbook/files/custody-services/pub-ch-custody-services.pdf> [<https://perma.cc/8VAY-KUY8>].

132. THE CLEARING HOUSE, THE CUSTODY SERVICES OF BANKS 10 (2016), https://www.davispolk.com/files/20160728_tch_white_paper_the_custody_services_of_banks.pdf [<https://perma.cc/S476-NJQY>].

assets. In order for any transactions to occur in the fund's portfolio, the custodian must receive lawful instructions from a fund's investment adviser.

This choreography, in which an adviser must transmit orders to the custodian instructing the custodian to release certain fund assets for the acquisition of particular securities for the fund's portfolio, is intended to thwart fraud or theft in a fund. A custodian also stands as a heavily regulated, and usually financially stable, third party between the adviser and the fund, ensuring that in a legal proceeding, the custodian's large balance sheet may well be more attractive as a defendant than the investment adviser's smaller one. Custodians may be the likeliest targets to sue if assets are lost or stolen.

These separate roles evolved as specialist economic roles, but which also provided for added security and confidence for investors. Each of these roles is a licensed activity, subject to regulation by – in most cases – the *Securities and Exchange Commission* (SEC) and/or *Commodities and Futures Trading Commission* (CFTC). The combination of separate functions, isolation of risks, and regulations are intended to help reduce cases in which an investment adviser simply pockets investors' money and flees with it to an undisclosed island in the Caribbean. Bernie Madoff's Ponzi schemes were operated in lightly regulated or, indeed, unregulated private investment funds that did not require custodians.¹³³ We cannot know whether Madoff's perverse ambitions would have foiled even a diligent custodian, but the presence of any custodian might have made his machinations more difficult to perpetrate or more easily traceable. Indeed, of the problems from which mutual funds suffer, rarely have they had anything to do with corrupt custodians.

2. Distributor, Administrator, and Transfer Agents

A number of other service providers perform important functions for the contract network that is a fund. The *distributor* assists in taking a fund public by distributing the shares of the fund. Parties to whom the distributor distributes those shares are investors who wish to become shareholders in the mutual fund; *i.e.*, the distributor persuades investors to place their money in the fund. An investment adviser often chooses to outsource some of the back-office tasks to an *administrator*; this entity will then be responsible for preparing and filing materials with regulators such as the SEC, with taxing authorities such as the Internal Revenue Service, and with any other governmental agencies. A *transfer agent* must manage the quotidian requirements of administering potentially millions of client accounts for all

133. *Madoff: New Victims, Old Scam*, THE WEEK (Jan. 22, 2009), <https://theweek.com/articles/509260/madoff-new-victims-old-scam> [<https://perma.cc/KN7B-EBDQ>].

of the shareholders in a fund, provide regular statements of their holdings and sporadic shareholder notices, access to websites with disclosures about the funds, and toll-free telephone numbers for the investing public. The fund also needs *brokers* for trading securities for their portfolios, accountants to conduct periodic audits of all the money flowing in and out of the fund and the public statements of the fund's financial condition, and last but not least, legal counsel to ensure compliance with the complex web of investment fund regulations, and deal, at certain challenging times, with litigation.

3. Provider Collaboration: Technology and Platform Evolution

Each of the service providers serves a special function and each of these functions depends on data access, connectivity, and algorithmic support. The investment adviser needs to select investments, instruct the broker, and measure and control the risks taken. The quicker this process, the better, with all of it now performed digitally and often in milliseconds. When a custodian controls whether the adviser has complied with investment limits, when an accountant reviews valuations, and a transfer agent manages investors' deposits based on the inflows on the fund's accounts, they do so digitally and in a real-time exchange with the other providers. This intense level of collaboration is the unique feature of funds, which makes their structure particularly receptive to datafication: taking human agents out of the loop enhances speed and reduces human-related agency costs, in terms of wages, errors, self-interest, and bias. But this is also why digital finance platforms raise such significant concerns in the investment fund industry.

B. Asset Management as a Platform Industry

Processes of digitization and datafication – combined with technological evolution – are transforming the asset management industry into a platform industry. In common language, platforms are “a place or opportunity for communicating ideas and information.”¹³⁴ In the digital finance context, the term “platform” refers to a systems architecture where multiple applications are linked to and through one technical infrastructure so that users can use one major integrating software system in order to run all applications written for that system.¹³⁵

134. *Platform*, MERRIAM-WEBSTER, <https://www.merriam-webster.com/thesaurus/platform> [<https://perma.cc/799M-HMTN>] (last visited Sept. 30, 2020).

135. See also MARC H. MEYER & ALVIN P. LEHNERD, *THE POWER OF PRODUCT PLATFORMS* 7 (1997) (defining a platform as “a set of common components, modules, or parts from which a stream of derivative products can be efficiently created and launched”).

1. Winner-Takes-All in Asset Management?

Functioning as “spider in the web,” a digital finance platform gathers data concerning users and their activities, and in turn enjoys the best information for further developing platform applications and services to users, resulting in a gradual expansion of the platform in scale and scope. In turn, the overhead costs of the services provided experience gradual decline, compared to the socio-economic value provided. We observe “some mixture of both technology-enabled efficiency enhancement, and technology-enabled organizational arbitrage,” enabled by the control the platform providers gain over markets while enhancing their efficiency.¹³⁶

Risk management systems drawing on deep data pools, for instance, are expected to gain ever-greater predictive powers; platform providers can generate additional returns by leveraging this data power into related, yet new, types of business (in the absence of legal restrictions). If Aladdin’s risk management data reflect the exposure of the portfolios managed by the world’s largest asset managers (although in an anonymized way and with information barriers preventing the transfer of inside information), these data form the basis of “collective intelligence.” That is, they are the very reason that other clients seek to license Aladdin’s services.¹³⁷

If the growth of digital finance platforms is becoming a winner-takes-all race in asset management, resulting in technology-induced centralization in the hands of the platform provider,¹³⁸ defying FinTech’s tendency toward disintermediation and decentralization,¹³⁹ this is a very significant concern.

136. See Haberly et al., *supra* note 50, at 168 (discussing cost reductions and efficiency enhancements resulting from disruptive platforms in markets not traditionally centered around information and communications technology).

137. And of course, these data could be used for front running the strategies of these managers, hence rules addressing data confidentiality, use, and protection are key.

138. See *More Knock-On than Network*, THE ECONOMIST, June 30, 2018, at S5 (explaining concentration of power in big tech).

139. See Max Kanaskar, *The Five D’s of Fintech: Disintermediation*, MAX KANASKAR’S BLOG (Jan. 9, 2018), <https://maxkanaskar.wordpress.com/2018/01/09/the-five-ds-of-fintech-disintermediation/> [<https://perma.cc/T7KV-YM9C>] (discussing disintermediation in FinTech). Certainly, cloud computing and open-source software have both served to lower the barriers to entry that FinTechs face. As against this, however, are the incredible economies of scope and scale that digital finance platforms offer. And not to forget the challenges decentralization provides for effective regulation and supervision. See Dirk A. Zetsche, Douglas W. Arner & Ross P. Buckley, *Decentralized Finance*, 6 J. FIN. REGUL. 172 (2020) (analyzing how decentralization could undermine the effectiveness of traditional financial regulation and enforcement).

2. The Digital Platform Economy

The debate over whether information markets are unique, and thus whether their legal ordering must also be unique, dates back to the debate between Judge Frank H. Easterbrook and Professor Lawrence Lessig over “The Law of the Horse.”¹⁴⁰ Contemporary scholarship, it seems, sides with Professor Lessig. Features of technology platforms are an increasingly major focus of interest of contemporary legal scholarship with the evolution of BigTech platform firms such as Amazon, Microsoft, Google and Facebook.¹⁴¹ In considering the evolution of platforms, scholars first examined why platform firms give away access to core technologies¹⁴² and concluded that “open source” enables rapid innovation, while retaining some profits by restricting access to useful innovators.

As has become obvious in the COVID-19 pandemic, e-commerce platforms provide unique benefits – centralized shopping and decentralized access through delivery of goods. They also require e-payments, thus bridging to digital finance. At the same time, the platform economy is seen as catalyst for social issues that touch all aspects of society, on topics ranging

140. Compare Frank H. Easterbrook, *Cyberspace and the Law of the Horse*, 1996 U. CHI. LEGAL F. 207, 207 (1996) (arguing that discussing the law of computer systems results in “multidisciplinary dilettantism,” since “[b]eliefs lawyers hold about computers, and predictions they make about new technology, are highly likely to be false” and arguing that there is no more a “law of cyberspace” than there is a “law of the horse”), with Lawrence Lessig, Commentary, *The Law of The Horse: What Cyberlaw Might Teach*, 113 HARV L. REV. 501, 502 (1999) (responding and arguing that thinking about how law and cyberspace connect would assist in illuminating the entire law, as Judge Easterbrook had demanded).

141. The platform economy is sometimes also called the gig economy or sharing economy. Shu-Yi Oei, *The Trouble with Gig Talk: Choice of Narrative and the Worker Classification Fights*, 81 L. & CONTEMP. PROBS. 107, 107 (2018); see also Vassilis Hatzopoulos & Sofia Roma, *Caring for Sharing? The Collaborative Economy under EU Law*, 54 COMMON MKT L. REV. 81 (2017) (referring to the platform economy euphemistically as the collaborative economy). However, using different terms interchangeably can have practical consequences. See Shu-Yi Oei, *The Trouble with Gig Talk: Choice of Narrative and the Worker Classification Fights*, 81 L. & CONTEMP. PROBS. 107, 118 (2018) (arguing that euphemistic terms such as sharing economy influence the outcome of legal classification issues); Abbey Stemler, *The Myth of the Sharing Economy and its Implications for Regulating Innovation*, 67 EMORY L.J. 197, 197 (2017) (arguing that the term supports the claim that platforms are unique and should be subject to new and different regulation or no regulation at all). We prefer the term platform economy due to its technical, non-political character, and its widespread acceptance in business-focused academic circles. See DAVIS S. EVANS & RICHARD L. SCHMALENSEE, *MATCHMAKERS: THE NEW ECONOMICS OF MULTISIDED PLATFORMS* (2016).

142. Jonathan M. Barnett, *The Host’s Dilemma: Strategic Forfeiture in Platform Markets for Informational Goods*, 124 HARV. L. REV. 1861, 1874 (2011).

across privacy,¹⁴³ product liability,¹⁴⁴ public housing,¹⁴⁵ discrimination,¹⁴⁶ labor and employment law,¹⁴⁷ and tax law.¹⁴⁸ Platforms are also at the heart of the discussions on “fake news” and electoral manipulation¹⁴⁹ as well as manipulation of consumer prices,¹⁵⁰ search results¹⁵¹ and scoring power.¹⁵²

143. See Mary Madden et al., *Privacy, Poverty, and Big Data: A Matrix of Vulnerabilities for the Poor*, 95 WASH. L. REV. 53 (2017) (examining relationships between data, privacy, and economic inequality); Anita L. Allen, Commentary, *Protecting One’s Own Privacy in a Big Data Economy*, 130 HARV. L. REV. F. 71 (2016) (discussing moral and ethical obligations to protect one’s own privacy and challenges posed by Big Data).

144. See David Berke, *Products Liability in the Sharing Economy*, 33 YALE J. ON REG. 603 (2016) (analyzing products liability issues in the sharing economy).

145. See Nestor M. Davidson & John Infranca, *The Sharing Economy as an Urban Phenomenon*, 34 YALE L. & POL’Y REV. 215 (2016) (describing relationship between urban conditions and the sharing economy).

146. See Sandra G. Mayson, *Bias In, Bias Out*, 128 YALE L.J. 2122 (2019) (discussing inequality and racial disparity in predictions); Nancy Leong & Aaron Belzer, *The New Public Accommodations: Race Discrimination in the Platform Economy*, 105 GEO. L.J. 1271 (2017) (discussing race discrimination); Arianne Renan Barzilay & Anat Ben-David, *Platform Inequality: Gender in the Gig-Economy*, 47 SETON HALL L. REV. 393 (2017) (discussing gender discrimination in the sharing economy).

147. See Brishen Rogers, *Employment Rights in the Platform Economy: Getting Back to Basics*, 10 HARV. L. & POL’Y REV. 479 (2016) (examining employment status of platform economy workers); Matthew T. Bodie, *Lessons from the Dramatists Guild for the Platform Economy*, 2017 U. CHI. LEGAL F. 17 (2017) (exploring worker categorization issues in the platform economy).

148. From a scholarly perspective see Kathleen DeLaney Thomas, *Taxing the Gig Economy*, 166 U. PA. L. REV. 1415, 1428, 1454 (2018) (discussing current taxation of online workers as “business owners” and proposing a taxation model closer to that of wage earners, based on a “standard business deduction” irrespective of the legal form of work); Shu-Yi Oei & Diane Ring, *Can Sharing be Taxed?*, 93 WASH. U. L. REV. 989, 1028–29 (2016) (analyzing online firms’ first mover advantage and rent seeking through regulatory arbitrage, gaps and ambiguities in the law); Shu-Yi Oei & Diane Ring, *The Tax Lives of Uber Drivers: Evidence from Internet Discussion Forums*, 8 COLUM. J. TAX L. 56, 60 (2017) (analyzing a series of postings by rideshare drivers on internet discussion forums and arguing that forum participants had difficulties understanding fundamental business taxation concepts, such as expenses and deductions).

149. See, e.g., Kate Klonick, *The New Governors: The People, Rules, and Processes Governing Online Speech*, 131 HARV. L. REV. 1598 (2018); Jack M. Balkin, *Free Speech in an Algorithmic Society: Big Data, Private Governance, and New School Speech Regulation*, 51 U.C. DAVIS L. REV. 1149 (2018); Nabihah Syed, *Real Talk About Fake News: Towards a Better Theory for Platform Governance*, 127 YALE L.J.F. 337 (2017).

150. Oren Bar-Gill, *Algorithmic Price Discrimination When Demand is a Function of Both Preferences and (Mis)Perceptions*, 86 U. CHI. L. REV. 217 (2019).

151. FRANK PASQUALE, *THE BLACK BOX SOCIETY* 59–100 (2015).

152. Ryan Calo, *Digital Market Manipulation*, 82 GEO. WASH. L. REV. 995 (2014); Ryan Calo, *Response, Consumer Subject Review Boards: A Thought Experiment*, 66 STAN. L. REV. ONL. 97 (2013); Danielle K. Citron & Frank A. Pasquale, *The Scored Society: Due Process for Automated Predictions*, 89 WASH. L. REV. 1 (2014). See on remedies Andrew D. Selbst, *Disparate Impact in Big Data Policing*, 52 GA. L. REV. 109 (2018); Frank A. Pasquale & Oren Bracha, *Federal Search Commission? Access, Fairness, and Accountability in the Law of*

These concentrations thus bring benefits but also raise many concerns, particularly in the context of dominant platforms.

C. *Pro-Concentration Effects*

Notwithstanding scholarly interest in the subject, “[a]lthough platforms form the backbone of the internet economy, the way that platform economics implicates existing laws is relatively undertheorized,”¹⁵³ though this has been changing rapidly in the past two to three years, *outside* of finance. In the context of finance and asset management, in particular, digital finance platforms have not been sufficiently examined from a legal perspective.¹⁵⁴

Three factors together lead to a friction in the market that prevents private ordering from leading to socially optimal outcomes, in the sense that market forces ensure competition among digital asset management providers: traditional scale economies, data-driven economics of scale, and network effects.¹⁵⁵

1. Conventional Scale Economies

Economies of scale refer to the reduction of per-unit production costs as a consequence of producing units in larger quantities.¹⁵⁶ Digital finance platforms exhibit conventional economies of scale created by the primarily fixed costs of providing the service to an unlimited number of users. They are based on applications and interfaces operating on high-frequency servers. Once the interfaces have been defined, the applications coded, and the servers set up, connecting all additional clients comes at very low marginal costs. Where additional users mean additional marginal costs for energy and data warehousing, these additional costs per user are offset by the additional data these users create, allowing the platform provider to choose, more or less freely, which services the platform charges clients for, and which

Search, 93 CORN. L. REV. 1149 (2008).

153. Lina M. Khan, *Amazon’s Antitrust Paradox*, 126 YALE L.J. 710, 789 (2017); see also David Singh Grewal, *Before Peer Production: Infrastructure Gaps and the Architecture of Openness in Synthetic Biology*, 20 STAN. TECH. L. REV. 143, 196 (2017) (arguing that platforms are “relatively under-theorized”).

154. The platform perspective of digital finance has been analyzed from a geographical perspective, see Haberly, et al., *supra* note 50, at 169.

155. Haberly, et al., *supra* note 50, at 169.

156. These scale economies are particularly present in software markets where the costs of the original application (“first copy”) are enormous, while the costs of the second through N copies are minimal and become close to zero. While licensing models and modern anti-piracy devices restrict software users from making use of these characteristics, the software producer and licensor are not bound by these restrictions and is free, in principle, if pressed by its competitor to reduce the price.

services are provided to them apparently for free.

This practice is particularly true in the asset management industry – particularly the investment fund industry and even more so in the context of passive investment – where large entities can invest in software programming and development themselves, while small asset managers are usually price takers (unless they have in-house software programming expertise) who must pay (in proportion to their business size) high software licensing and data warehousing fees. The more important the technology is for the industry, and the more software tools are required, the higher these costs are in proportion to other expenses, and the greater the incentive to sign up to an existing platform that relieves the small managers of this burden.

Given that technology is swiftly rising in importance, smaller asset managers have no choice but to contract with a platform or to accept the fate of being inhibited in their growth by IT limitations and costs. This forms the economic rationale of the 210 asset managers using BlackRock’s Aladdin. In turn, Aladdin not only provides savings for BlackRock’s own funds, but also generates licensing fees from competing asset managers.

2. Data-driven Economies of Scale

The second type of scale economies result from the data collected and used for the application. In simple terms: “[m]ore information lets firms develop better services, which attracts more users, which in turn generate more data.”¹⁵⁷ Where risk management depends on data, we would expect better predictions if the digital finance platform can collect more and better structured data. To ensure this sequence, Aladdin’s AI laboratory in California exists to prepare Aladdin for the AI future, by creating new, AI-based services.¹⁵⁸

3. Network Effects

Digital platforms also exhibit network effects. Network effects occur where an additional user of a service adds value to that product for other users. So, the more users, the greater the benefit.¹⁵⁹ For instance, a telephone

157. *A New School in Chicago*, THE ECONOMIST, June 28, 2018, <https://www.economist.com/special-report/2018/06/28/how-regulators-can-prevent-excessive-concentration-online> [https://perma.cc/SQL3-3F9D].

158. *History*, BLACKROCK, <https://www.blackrock.com/corporate/about-us/blackrock-history> [https://perma.cc/7BQV-8HCJ] (last visited Oct. 19, 2020).

159. See AMRIT TIWANA, PLATFORM ECOSYSTEMS: ALIGNING ARCHITECTURE, GOVERNANCE, AND STRATEGY 33–48 (2014) (analyzing the benefits to users of greater total users).

is of little use unless it can be used to call other people. The more people who can be called, the more valuable the phone. Applied to the fund context, the more a software program can communicate with other participants in fund administration, the more valuable the virtual network created by the platform becomes. With funds, software typically focuses upon fund administration, asset management, or depositary functions and communicates with depositaries, stock exchanges, and alternative markets.

Network effects are particularly prominent in the asset management context. First, the value of the software based “network” grows in proportion to the numbers of copies installed in fund firms; the look and feel of software becomes embedded in human processes. Users know where to click, which shortcuts to use, and how to upload data or link to the internet. The more software is used among fund administrators and asset managers, the more those users expect this software and their features in their work environment.

Second, any additional user adds data to the existing pool. Where risk management can draw on more data from more firms, the predictive power of the platform’s algorithms improves. Take again the example of BlackRock’s Aladdin: firm-specific data pools suffer from data shortages in relation to low frequency risk events. Among these, internal fraud, business disruption, and IT failures are potentially of “high severity”; that is, these operational risks could threaten the existence of a financial institution.¹⁶⁰ Aladdin’s predictive power is not impaired by such data shortages when it can use the data of all its asset manager clients rather than just that those generated by BlackRock itself. In this case, *all* network participants benefit from pooling risk data.

BlackRock is very clear in stressing these network effects of Aladdin:

More than just technology, Aladdin powers your firm’s Collective Intelligence by providing tools to help your organization communicate effectively, address problems more quickly, and make decisions at every step of the investment process. And Aladdin’s Collective Intelligence gets better with every new user, and every new asset that joins the platform.¹⁶¹

It is thus clear that the asset management industry increasingly shows

160. See BASEL COMMITTEE ON BANKING SUPERVISION (“BCBS”), SOUND PRACTICES FOR THE MANAGEMENT AND SUPERVISION OF OPERATIONAL RISK, at 18 (2001) (stating that “banks may not have much internal data for certain low frequency operational risk loss types”); BCBS, OPERATIONAL RISK – SUPERVISORY GUIDELINES FOR THE ADVANCED MEASUREMENT APPROACHES 49–50 (June 2011) (stating that “many banks have limited high severity internal loss events to inform the tail of the distribution(s) for their capital charge modelling”).

161. *Aladdin - Powering Collective Intelligence*, BLACKROCK, <https://www.BlackRock.com/aladdin/benefits/organizations> [<https://perma.cc/RPH8-3QVY>] (last visited Oct. 14, 2020).

the concentration characteristics of other platform industries, with trends in consolidation and emergence of a small number of major players already clearly taking place.

III. THE NEED FOR REGULATING DIGITAL FINANCE PLATFORMS

While network effects, conventional economics of scale, and data-driven scale economies explain the dramatic rise and scope of digital platforms, their success raises questions about how they ensure that investor protection, market efficiency, national security, and systemic financial stability can be maintained under conditions of ever-increasing market concentration. We outline, first, their positive effects, then argue that traditional regulatory approaches to asset management do not address the changing reality of the industry, before considering a variety of regulatory approaches available to address the increasing range of risks raised by their evolution.

A. *Optimizing Tech-Based Fund Services*

From the perspective of end-user clients, digital finance platforms can reduce their costs by bundling all platform clients' purchasing power, by improving performance through tech-driven customization, by reducing inefficiencies stemming from manual work and data shortages, and by reducing search and transaction costs. At the same time, such platforms can enable entirely new markets and rapidly enhance innovation, by offering innovations developed by one participant to all other platform users.¹⁶² All of these benefits come with little operational effort on the clients' part, as the platform acts as meta-integrating technology, or "super applications." Digital finance platforms "could be the steady hand that the markets of the future will need. A powerful stabilizing technology such as Aladdin could yet be the source of 'Great Moderation' that neoliberalism tried to deliver."¹⁶³

Fields that might embrace this kind of innovation include, for instance, robo-advice for specialist strategies, automated fund formation, and valuation of illiquid assets. In particular, smaller specialist firms that focus on non-core parts of the investment value chain could capitalize on scale

162. For studies on the platform economy dating back to the early 2000s, see Jean-Charles Rochet & Jean Tirole, Platform Competition in Two-Sided Markets, 1 J. EUR. ECON. ASS'N 990 (2003); for contemporary works see DAVIS S. EVANS & RICHARD L. SCHMALENSEE, *supra* note 141; ANNABELLE GAWER, PLATFORMS, MARKETS AND INNOVATION (2009); AMRIT TIWANA, PLATFORM ECOSYSTEMS: ALIGNING ARCHITECTURE, GOVERNANCE, AND STRATEGY 61–69 (2014).

163. Dunn, *supra* note 52, at 10.

economies created through access to larger numbers of clients via the platform, if their services can be efficiently integrated into the client's existing business model. Back-end platforms also enable the separation of front and back end businesses, as in the case of Robinhood and Citadel, whose ecosystem platforms support the widest possible access to customers and products.

Although robo-advice has been discussed most prominently from the retail perspective as a disruptor of traditional asset management, for instance, financial platforms support the optimization of wholesale and institutional asset management strategies. This development is not a surprise: already today, most investment decisions with regard to liquid financial assets rely on technological support. Algorithms select potential assets according to a number of predetermined preference values, such as valuation in correlation to peers, liquidity on exchanges, profit per share, etc.¹⁶⁴ The same level of tech support exists in risk management systems where warnings inform the risk manager that a risk budget has been depleted and risk mitigation, through hedging or closing of positions, is necessary. Without tech support, human decision makers are slower and more error-prone due to human foibles, and – in markets where algorithmic trading prevails – doomed to lose out to their tech-powered competitors.¹⁶⁵ The acquisition of robo-advisors by asset management giants Vanguard, BlackRock, Charles Schwab, and Fidelity can be understood in this light, as can the dominance in U.S. trading of a small number of tech focused quantitative firms, in particular, Citadel.

The same trend towards digitalization is noteworthy for transfer agents. For instance, Delaware has taken steps to ensure that shareholder identification can take place in real time using blockchain technology, via which all investor data are spread over a network.¹⁶⁶ If broker-dealers and banks in which investors hold their deposit accounts submit data of those buying and selling fund units immediately via blockchain to the fund manager, the register of fund investors will be more complete and more up-to-date. The register function will be replaced by a data feed connecting it to the blockchain, unless the law allows for the blockchain to *be* the register itself.¹⁶⁷

164. Regulators distinguish between fully automated robo-adviser platforms and human assisted robo-advisory platforms. INT'L ORG. OF SEC. COMM'NS, *supra* note 76, at 25–26.

165. JON BECKETT, NEW FUND ORDER – A DIGITAL DEATH FOR FUND SELECTION?, 32 *et seq.* (2016).

166. Federico Panisi, Ross P. Buckley & Douglas Arner, Blockchain and Public Companies: A Revolution in Share Ownership Transparency, Proxy Voting and Corporate Governance?, 2 *STAN. J. BLOCKCHAIN L. & POL'Y* 189, 206 (2019).

167. *See generally* George S. Geis, *Traceable Shares and Corporate Law*, 113 *NW. U.L. REV.* 227 (2018) (analyzing the profound impact blockchain technology will have on corporate law).

B. The Traditional Asset Management Regulatory Paradigm

The traditional regulatory approach to asset management is based on a combination of disclosure (to support appropriate investor choice), external review by a range of gatekeepers (accountants, auditors, lawyers, exchanges, etc.), regulatory licensing and supervision (to address the fitness of market participants), private and public enforcement of both informational and conduct rules, structural requirements (in particular asset segregation), private ordering, and self-regulation. This approach – while sufficient to support the evolution of the world’s deepest capital markets and largest asset management industry – evolved in the context of a traditional understanding of the asset management industry and does not fully address the issues resulting from concentration.

As one example, regulators around the world have worked to identify nonbank systemically important financial institutions (“SIFIs”).¹⁶⁸ Yet, the federal watchdog for systemic risk, the Financial Stability Oversight Council (“FSOC”), has not determined that any of the world’s largest asset managers is a non-bank SIFI (and, at this time, no other institution is designated as a non-bank SIFI). In addition, none of the U.S. digital finance platforms has been determined to be a systemically important Financial Market Utility, and hence subject to the heightened prudential, risk management and supervisory provisions of Title VIII of the Dodd-Frank Act for important market infrastructure.¹⁶⁹ Those determinations, however, were based on a traditional analysis looking at the nature, scope, size, scale, concentration, and interconnectedness of the institution; *i.e.*, its balance sheet size, assets held, and exposures to counterparties.¹⁷⁰ The point we stress in this Article, however, is that platforms function as a liquidity bundler, data warehouse, *and* financial infrastructure.

168. See Authority to Require Supervision and Regulation of Certain Nonbank Financial Companies, 84 Fed. Reg. 9028 (proposed March 13, 2019) (to be codified at 12 C.F.R. pt. 1310) (authorizing certain designated nonbank financial companies to be overseen by the Federal Reserve).

169. Reflecting its size, scope, and scale, Ant was reportedly designated a systemically important financial institution (“SIFI”) by the PBoC in late 2018. Gabriel Wildau, *China to Designate More Financial Groups as “Too Big To Fail,”* FIN. TIMES (Nov. 27, 2018), <https://www.ft.com/content/22279e54-f22d-11e8-ac55-df4bf40f9d0d> [<https://perma.cc/CYL8-HS96>]. Concerns about its potential to impact financial stability are central to increasing Chinese regulatory attention to Ant and other digital financial platforms, necessitating the suspension of Ant’s planned listing in November 2020. *Beijing Says It Halted \$37bn Ant IPO to Protect Market Stability*, FIN. TIMES (Nov. 4, 2020), <https://www.ft.com/content/eb0746f1-51fe-438d-886b-18bb7cc9456f> [<https://perma.cc/C7QH-LTTJ>].

170. *Designations*, U.S. DEP’T OF THE TREASURY, <https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/fsoc/designations> [<https://perma.cc/c6HQ3-HTAW>] (last visited Oct. 28, 2020).

The emerging digital finance platforms in the asset management industry thus escape regulation appropriate to their nature. Such a result is in line with scholarship analyzing platform environments, which finds traditional regulation fails because of circumvention and regulatory arbitrage.¹⁷¹ The main reason for *financial* regulation's failure is that three disparate sources contribute to the role of the platform as "spider in the web": applications, data and servers. These three together create the network effects, yet neither data collection, software ("app") development, nor server processing qualifies as a licensed activity, so bundling the three functions likewise does not trigger the need for any special financial regulatory license.

Though some believe turning entity-focused regulation into activity-based regulation would address these issues, that would not be so for digital finance platforms. In a typical digital finance platform, *institutional clients* perform the regulated activity, while the platform primarily provides the IT backbone. Even if operating a digital finance platform were defined as a regulated activity (as is the case with the operation of payment or securities settlement systems), regulating one platform provider based on its regulated activities is rarely sufficient to reflect the exposures and dependency of all users. This would be further complicated for cross-border platforms, with a fully developed financial ecosystem needing multiple licenses from multiple regulators across many jurisdictions. With such a patchwork of multiple licenses, none of the regulators is likely to have full oversight of all the financial activities.

C. Regulating Digital Finance Platforms

The arguments in favor of regulating digital finance platforms in asset management as well as in other financial sectors flow from four main established rationales of financial law: market efficiency, financial stability,

171. See Orly Lobel, *The Law of the Platform*, 87 MINN. L. REV. 101 (2016) (analyzing the effectiveness of regulation in a platform environment, arguing that the platform economy defies conventional regulatory theory, and holding that legal disruption by the platform economy should be viewed as a feature rather than a bug of regulatory limits); Julie E. Cohen, *Law for the Platform Economy*, 51 U.C. DAVIS L. REV. 133, 133 (2017) (arguing that the platform is the core organizational form of the informational economy, replacing and rematerializing existing traditional markets, and that "legal institutions, including both entitlements and regulatory institutions, have systematically facilitated the platform economy's emergence," and analyzing challenges that platform-based information intermediation has posed for regulatory institutions); Jordan Barry & Elizabeth Pollman, *Regulatory Entrepreneurship*, 90 S. CAL. L. REV. 383, 385 (2017) (dubbing the platform businesses as "regulatory entrepreneurs" that seek to initiate tailor-made regulation in their favor); Paul Ohm & Blake E. Reid, *Regulating Software When Everything Has Software*, 84 GEO. WASH. L. REV. 1672 (2016) (analyzing the challenges regulators and coders face given the proliferation of software and code).

national security, and client and investor protection.

1. Market Efficiency

Within the market efficiency paradigm, the concentration of many services in the hands of one platform, and the dependency of the clients on it, provide valid reasons for concern. In financial ecosystems, clients will be served literally from their birth to death by one platform providing not only financial, but also many other, services ranging from transport to food supply. At the same time, if the growth factors discussed *supra* exhibit their true power, only a very limited number of platforms will survive to provide these services, perhaps only three to five. The corollary of “winner-takes-all” is “everyone-else-loses.”

This prediction is not unique to digital finance platforms, but a well-discussed characteristic of all platform industries.¹⁷² With general use applications like search engines, social media, and so forth, consumers twenty years ago had a choice between many different platforms, including Netscape, Yahoo and others. Today, for mass scale applications, only one or two dominant platforms are used by the overwhelming majority of users: Google is the dominant search engine, Facebook the dominant social media platform, MS Office the dominant office platform, Amazon the dominant e-commerce platform, and so forth. As a historical matter, all American information markets have turned into monopolies or oligopolies over time,¹⁷³ and this increasingly appears to describe the evolution of cloud services markets.¹⁷⁴

In the same way, one or two of the finance platforms will most likely emerge as winners in a winner-take-all competition. Those will be the ones that can best capitalize on the three growth factors discussed above: conventional and data-driven economies of scope, scale, and network effects.

Financial law so far does little to hinder market concentration; quite the opposite. When the law asks for new reports and processes, some (particularly larger) firms will technologize and comply, expanding the platform’s service range. Others, in particular small and mid-size entities

172. See Khan, *supra* note 153, at 785 (examining the winner-take-all nature of online platforms).

173. See TIM WU, THE MASTER SWITCH: THE RISE AND FALL OF INFORMATION EMPIRES 280-299 (2010) (arguing that American information industries tend to press towards monopolies); see also ARIEL EZRACHI & MAURICE E. STUCKE, VIRTUAL COMPETITION: THE PROMISE AND PERILS OF THE ALGORITHM-DRIVEN ECONOMY (2006) (discussing the promise and perils of technology-driven competition).

174. See FIN. STABILITY BD., THIRD-PARTY DEPENDENCIES IN CLOUD SERVICES: CONSIDERATIONS ON FINANCIAL STABILITY IMPLICATIONS (Dec. 2019) (analyzing risks to financial stability of high concentration in cloud services).

incapable of meeting reporting demands on their own, will rely on the platform to comply in return for ceding a part of their profits. This dynamic will effectively turn the reliant providers into a part of the larger platform ecosystem, a merger not in name but in function. A larger entity will, part-by-part, consume opportunities made consumable by their activities. Ever-fewer entities with larger scale economies will capitalize on more expensive-to-build and higher value technology. Initial evidence of this trajectory already exists in how the ten largest asset managers including BlackRock, Vanguard, and Fidelity have outgrown the remainder of the industry.¹⁷⁵ In the period of 2009 to 2019, the market share of the five largest managers offering passive funds grew from 27% to 47%.¹⁷⁶ This projected trajectory is likely to occur, in the absence of legal barriers (such as the prohibition of bundling of certain functions) or disruptive technological innovations that reduce the platform's usefulness.

Most scholarship so far has turned to antitrust law in order to address such concerns. For instance, while government agencies such as the Department of Justice often treat platform-based products and non-platform goods alike, antitrust scholarship increasingly treats platforms as unique.¹⁷⁷ Specifically, scholars note the attractiveness of network participation achieved through data collection, and that network effects erect insurmountable barriers to entry for new competitors.¹⁷⁸ Where investors – due to data and network effects – reward size over profit, predatory pricing

175. See Pooneh Baghai, Onur Erzan & Ju-Hon Kwek, *North American Asset Management in 2018: The New Great Game*, MCKINSEY & COMPANY (Nov. 2018), <https://www.mckinsey.com/~media/McKinsey/Industries/Financial%20Services/Our%20Insights/The%20new%20Great%20Game%20in%20North%20American%20asset%20management/North-American-asset-management-2018-vf.ashx> [<https://perma.cc/4LXR-AZJ6>] (stating that “the industry’s largest firms accounted for a disproportionate share of growth, with a set of ‘trillionaires’ generating over 80 percent of all positive organic growth and several making significant gains in share even outside of passive products”).

176. Anadu et al., *supra* note 96, at 18.

177. See generally David S. Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, 20 YALE J. ON REG. 325 (2003) (providing an overview of the unique antitrust economic principles of multi-sided platform markets); Khan, *supra* note 153, at 784 (2017) (discussing how platform markets may pose unique challenges for antitrust analysis); Frank Pasquale, *Two Narratives of Platform Capitalism*, 35 YALE L. & POL’Y REV. 309, 311 (2016) (developing a counter-narrative to the dominant neo-liberal view on the platform economy).

178. See Adam Candebub, *Behavioral Economics, Internet Search, and Antitrust*, 9 I/S 407, 409 (2014) (arguing that switching costs prevent users from selecting new service providers in the absence of widespread malfunctioning of the system); Nathan Newman, *Search, Antitrust, and the Economics of the Control of User Data*, 31 YALE J. REG. 401, 404 (2014) (arguing in favor of a stronger focus on the anticompetitive effects of a firm’s control of the users’ personal data); Frank Pasquale, *Privacy, Antitrust, and Power*, 20 GEO. MASON. L. REV. 1009, 1015–16 (2013) (arguing that it is difficult for consumers to switch to a new social platform because of the high cost of transferring one’s network of friends).

becomes highly rational (even as the prevailing doctrine treats it as irrational and therefore implausible).¹⁷⁹ Thus, striving for dominance today, even where costly, is a worthwhile strategy, since it ensures monopoly rents in the future. Platforms are further able to “exploit information collected on companies using its services to undermine them as competitors.”¹⁸⁰

In turn, economists have started to model platforms as two-sided markets, where the client demand side is subject to different assumptions than the platform provider supply side.¹⁸¹

For our purposes, we need here simply stress that market concentration provides not only an antitrust but also a financial law challenge: the fewer asset management providers that compete, the fewer incentives to innovation that will exist, and the greater the potential systemic risks from size (“too-big-to-fail”) or interconnection (“too-connected-to-fail”). While platforms assist in optimizing fund services in the short term, benefits may be reversed once the provider gains a dominant position. A major concern is that innovation is likely to be slower than in the absence of a dominant platform. Consequently, the financial regulatory rationale of securing long-term market efficiency justifies platform oversight.

2. Systemically Important Digital Finance Platforms (SI-DFP)

A central concern of financial regulation relates to the stability of the financial system. This stability is threatened if an entity that is important for the financial system fails, as demonstrated in the 2008 crisis.¹⁸²

Generally speaking, an entity is systemically important if it is of such size or level of interconnectedness that its failure or default would put at risk the wider functioning of the financial system or significant numbers of other financial institutions. Size-related systemic risk is traditionally covered in

179. See Khan, *supra* note 153, at 710.

180. See Khan, *supra* note 153, at 710, 754–87 (2017) (arguing that Amazon uses the information it gathers from competitors as a service provider to gain an advantage over them); K. Sabeel Rahman & Lina Khan, *Restoring Competition in the U.S. Economy*, in UNTAMED: HOW TO CHECK CORPORATE, FINANCIAL AND MONOPOLY POWER 18, 18 (Nell Abernathy, et al., eds.) (2016) (finding that the harms from dominant platform firms include lower wages for employees, lower rates of new business creation, lower rates of local ownership, and concentration of power); MARK R. PATTERSON, ANTITRUST LAW IN THE NEW ECONOMY: GOOGLE, YELP, LIBOR, AND THE CONTROL OF INFORMATION 1–4 (2017) (arguing in favor of conceptualizing data as a product, since data, although different from traditional goods, poses similar problems in antitrust terms, such as monopoly and collusion).

181. See Rochet & Tirole, *supra* note 162, *passim*.

182. See Howell Jackson, *Thinking Hard About Systemic Risk*, in SYSTEMIC RISK IN THE FINANCIAL SECTOR 2–3 (Arner et al. eds., 2019) (discussing the systemic risks to the financial system that manifested during the financial crisis).

discussions of too-big-to-fail (“TBTF”¹⁸³) risks. Large banks governed under special regulations for global systemically important financial institutions (“G-SIFIs”) provide the most important example. Another source of systemic risk stems from interconnectivity, referred to as too-connected-too-fail (“TCTF”). Consider, as examples, a stock exchange or a central securities depository (“CSD”). All financial institutions that trade rely on both a stock exchange and a CSD for trading, clearing, and settlement. If a stock exchange or a CSD defaults, trading of products may stop due to loss of pricing and liquidity functions from which all market participants benefit. This failure would impact a wide range of counterparties and potentially impact the overall functioning of, or confidence in, the system.

Digital finance platforms in the asset management industry are not exposed to financial risk in the same sense as banks, and hence have been regulated differently. All losses and profits of a bank accumulate on the bank’s own balance sheet. If a bank client defaults, the bank will write off the credit, and the principal written off will be much higher than the bank’s income generated through provision of the credit. By contrast, asset managers and the related service providers’ services are, for the most part, off-balance sheet; that is, losses and profit accumulate in separate accounts held in the clients’ names. Digital finance platforms do, however, generate a significant degree of operational risk, particularly risks that the system fails for human or, increasingly, technical reasons.¹⁸⁴

These operational risks are increasingly of systemic dimensions, under both the TBTF and the TCTF paradigms. As to TBTF, the sheer size and scope of financial ecosystems indicate the potential of platform businesses to jump from too-small-too-care to TBTF within a short time. Consider, again, the magnitude of Ant,¹⁸⁵ which required only a few years of uninhibited growth to become systemically significant; or the assets served by BlackRock’s Aladdin, which all but dwarf the assets of the largest banks globally; and the quite astonishing growth rates of both front-end and back-end platform providers.¹⁸⁶

183. See Saule T. Omarova, *The “Too Big To Fail” Problem*, 103 MINN. L. REV. 2495, 2499–2504 (2019), for a classification of TBTF.

184. See Ross P. Buckley et al., *TechRisk*, SING. J. LEGAL STUD. 35, 39 (2020) (incorporating technological and data issues into the operational risk framework of FinTech).

185. Recall Ant’s SIFI designation and the rationale underlying the suspension of its IPO in November 2020. See *supra* note 169.

186. As to front-end platforms, IOSCO, the global standard setter for securities regulation (including asset and fund management), examining the impact of fund distribution platforms on the asset management industry, found that these platforms have experienced rapid growth in recent years. See INT’L ORG. OF SEC. COMM’NS, *supra* note 76, at 22, 25, 68–69 (reporting the recent rapid growth of retail trading and investment platforms).

As to TCTF, digital finance platforms provide the core functions of their clients' business. If the platform fails, its clients will often be hindered from communicating with *their* clients, nor will the clients be able to perform the services their clients expect. Losses generated by platform malfunctions will thus spread to their clients' clients into the overall financial and non-financial economy. This domino effect will be so because Aladdin connects people and processes of various asset managers, a fact BlackRock refers to as "Collective Intelligence."¹⁸⁷ All those connected may suffer from Aladdin's temporary service interruption, experiencing a state of "Collective Stupidity." More generally, digital finance platforms— as the spider in the web — represent the single point of failure for not only one, but many institutional and retail clients. As the CEO of New York Life Investors, an Aladdin client managing \$238 billion in assets, states, "Aladdin is like oxygen. Without it we wouldn't be able to function."¹⁸⁸ Furthermore, the value managed using Aladdin increases the risk of investor herding behavior since these amounts may have the ability to set market trends. Aladdin's clients, implicitly coordinated through Aladdin's risk analysis, may find the same type of assets attractive, or unattractive, at the same time.¹⁸⁹ If this is the case, Aladdin's risk analysis needs to be accurate, or wide-spread asset mispricing and misallocation may occur. Regulators need to be aware of what to do in case Aladdin gets it wrong, producing potentially systemic mispricing and trading activity.

Both the TBTF and TCTF perspective explain filmmaker Adam Curtis' description of Aladdin as "a kind of power never seen before . . . more powerful in some respects than traditional politics."¹⁹⁰

3. National Security

Within the market integrity paradigm, digital finance platforms may attract illicit activity. Putting money laundering and terrorist financing concerns aside,¹⁹¹ more importantly, as an extension of systemic importance, digital finance platforms may constitute a challenge to national security simply because they represent a single point of failure. Any foreign or terrorist power interested could focus on a single platform and are

187. *Aladdin® Enterprise Overview*, *supra* note 51.

188. Gara, *supra* note 61.

189. See Dunn, *supra* note 52 (explaining how Aladdin uses Monte Carlo simulations to value every individual security for clients).

190. Dunn, *supra* note 52.

191. In most cases, AML/CTF concerns relate to client onboarding. The KYC processes could be performed by the platform itself or its clients. In this regard few *additional* risks stem from the fact that a platform stands at the center of many financial service relationships.

increasingly doing so. Cyber risks in particular raise significant national security concerns, making resilience a first order focus.

In line with this analysis, FSOC has warned that the “financial system’s increasing reliance on information technology, particularly across a broader array of interconnected platforms, increases the risk that a cybersecurity event could have severe negative consequences for the provision of financial services” and even “threaten the stability of the broader financial system.”¹⁹²

4. Client and Investor Protection

Digital finance platforms also create a variety of risks for investors. The number of investors who directly rely upon the current financial order for their personal fiscal health has increased dramatically over time as ever more investors now direct their retirement savings through defined contribution plans. As many as 46% of households in the United States alone direct their personal savings into mutual funds.¹⁹³ Thus, the financial landscape features increasing numbers of participants with decreasing degrees of financial sophistication. Accordingly, the number and vulnerability of targets to the risks of platform failure are high and rising each year.

Where the fund is essentially the product of a network of contracts, the core issue of fund governance is aligning the multiple intermediaries’ interest with the investors’ interest.¹⁹⁴ Adding a digital platform in between investor/clients on one side, and the portfolio assets on the other, creates benefits for clients (where the bundling of data and liquidity generates returns),¹⁹⁵ but may also add one layer of complexity that could increase risks for investors.

Scholars stress that platforms enhance both information asymmetries and the opportunity for manipulation on the side of the platform providers, arguing that the consumer-clients of platforms are at the platform providers’ mercy.¹⁹⁶ The situation is not entirely the same in the investment fund

192. FIN. STABILITY OVERSIGHT COUNCIL (FSOC), 2018 ANNUAL REPORT 7 (June 2019), <https://home.treasury.gov/system/files/261/FSOC2018AnnualReport.pdf> [<https://perma.cc/4763-7CMG>].

193. Jennifer Rudden, *Share of Households Owning Mutual Funds in the U.S. 1980-2019*, STATISTA (May 7, 2020), <https://www.statista.com/statistics/246224/mutual-funds-owned-by-american-households/> [<https://perma.cc/4WKE-UNET>].

194. JON BECKETT, NEW FUND ORDER – A DIGITAL DEATH FOR FUND SELECTION?, 32 *et seq.* (2016).

195. *See infra* Part IV.A.

196. *See Ryan Calo & Alex Rosenblat, The Taking Economy: Uber, Information, and Power*, 117 COLUM. L. REV. 1623, 1650–54 (2017) (arguing that firms use consumers’ information to nudge consumers to behave in ways that advantage the firm); Giancarlo Frosio, *Reforming Intermediary Liability in the Platform Economy: A European Digital Single Market Strategy*, 112 NW. U. L. REV. 19, 20 (2017) (describing how “[s]afe harbor legislation

context, since the investment advisors' and custodians' clients are at times sophisticated regulated financial intermediaries, including pension funds. Regulated intermediaries are by law required to understand the technology used and engage with platform providers about service quality and stability. Where consumers are present, mandatory financial legislation addresses typical consumer related risks such as fraud and excessive, sometimes hidden, fees charged by intermediaries to consumers. In some cases, the additional transparency of platform technologies paired with mandatory disclosure requirements of financial law and financial supervision might improve the situation for consumers. At the very least, we expect typical consumer-related risks such as fraud and excessive or hidden fees charged by intermediaries to be less important. For instance, the front-end platforms discussed *supra* compete today with regard to the best costs analysis tools. We expect this trend to continue.

Notwithstanding the foregoing, an obvious additional risk centers on the technology: all clients are linked through the platform. Algorithms must be sufficiently mature to reflect the interests of a large number and potentially diverse group of clients, ranging from consumers, sophisticated investors, and wholesale clients to other financial intermediaries, and sufficiently robust to withstand a number of unforeseen events, ranging from natural disasters resulting in power outages to cyberattacks.

Another source of risk comes from the platform user guidelines, such as with soft commissioning based on platform turn-over. Many front-end platforms require providers of fund products to offer any product offered via the platform to the platform's clients for a certain amount of time and ensure a minimum amount of investment on offer. The same is true for soft commissions where the shelf time granted by the platform depends on the overall volume on offer by any given fund manager. The motive for including such clauses lies in the platform providers' costs structure: including a new product on the platform generates some fixed costs on the side of the platform provider. The minimum requirements should ensure that those fixed costs are recovered, usually through distribution fees, sales commissions, or some type of soft dollars (such as research).

Minimum requirements relating to time and volume (or related sales incentives), however, can come with downsides for investors. Imagine a small and mid-cap fund investing in enterprises up to 1,000 employees, and with a maximum firm value of \$10 million. The investment opportunities in such markets are limited. A fund manager driven only by its investors' interests would stop issuing units once the investment opportunities become

usually does not require intermediaries to monitor the information that they transmit or store, or to actively seek facts or circumstances indicating illegal activity”).

less attractive. Although bonus structures (through carried interest and other means) align fund managers' and investors' interests, the minimum requirements defined in the platform user guidelines can conflict with these. If, in compliance with such guidelines, the fund collects more inflows than can be invested profitably, the returns for the funds' investors will be diluted, and all investors will suffer.

Further complexity comes from the competition among some of the platform clients simultaneously served by the very same digital finance platform. The divergent interests of clients require strictly segregated handling of clients' data. For instance, if both BlackRock and Schrodgers use Aladdin, they must ensure that BlackRock's trading data are not accessible to Schrodgers, and vice versa, to avoid market manipulation or insider trading. While easy to say, this segregated treatment is hard to achieve. Some technology experts might have access to the two (or multiple) data streams, since they are used by the same algorithm; otherwise the economies of scale which drive platform growth will not materialize.

In addition, there are non-fund specific downsides of platforms. For instance, platforms disrupt the existing legal governance of contractual relationships by artificially imposing a tech intermediary between the parties.¹⁹⁷ In turn, contractual safeguards and other tools of private ordering may prove less effective.

IV. A NEW APPROACH TO REGULATING DIGITAL FINANCE PLATFORMS

In this Part, we grapple with the regulatory implications of the risks digital finance platforms raise for investors, market structures, national security and financial stability.¹⁹⁸ Given the increasing issues posed by platform concentration in asset management, regulatory approaches need to be revisited before these risks fully mature. We argue that successfully regulating digital finance platforms in asset management and more broadly will involve defining the limits of technological concentration to ensure prudent investor protection and to maintain well-functioning markets, even in the face of our current trajectory towards ever larger platforms, an approach which China now appears to be following in the context of Ant and other digital finance platforms in China.

197. See Lobel, *supra* note 171, at 143–44 (concluding that legal disruption is a common feature of platform economies).

198. See Dirk Zetzsche, Ross Buckley, Janos Barberis & Douglas Arner, *Regulating a Revolution: From FinTech and Regulatory Sandboxes to RegTech and Smart Regulation*, 18 *FORDHAM J. CORP. & FIN. L.* 31, *passim* (2018) (discussing new regulatory approaches to financial technology).

Regulators could adopt, first, a wait-and-see approach. And they could do so with or without pro-innovative regulatory tools, such as regulatory sandboxes, test-and-learn methodologies, or special charters. Second, regulatory efforts could focus on enhancing competition. Third, regulators could intervene moderately, by regulating delegation arrangements. Fourth, regulators could require a public agency's partial or full ownership of certain systems or platforms. While the full ownership of a digital finance platform by a regulator (such as the Federal Reserve) could be forced upon the provider ex-post, via nationalization, another strong interventionist approach discussed in Part IV.D. would treat certain systems and/or platforms as utilities. All of these, however, are fundamentally based on disclosure to and information gathering by supervisors: if supervisors do not build their knowledge about these sorts of systems as they evolve, they will not be able to take appropriate judgements in balancing risks and benefits.¹⁹⁹

From the outset, we exclude a potential fifth response: prohibition. Given that digital finance platforms are both crucial infrastructure for financial markets and provide enormous cost savings for investors, prohibition is inappropriate. This conclusion contrasts with other areas of FinTech innovation in which in certain cases, prohibition may be an advisable response to abuses or risks.²⁰⁰

A. Fostering Innovation: Do Nothing or Test-and-Learn

1. Do Nothing

The first possible approach to digital finance platforms in asset management or otherwise would simply be not to regulate them. By doing nothing, the result would be either rigorous or laissez-faire depending upon whether current financial regulation applies to the operations of a particular platform. Doing nothing might involve requiring new entrants to comply with existing financial regulations, often with highly restrictive results and adverse effects on financial innovation.

Alternately, a do-nothing approach could simultaneously accelerate financial innovation *and* exacerbate data-driven market dynamics. China, especially before 2015, is often highlighted as the leading, and a highly successful, example of the permissive approach with regard to FinTech.²⁰¹

199. See Kathryn Judge, *Information Gaps and Shadow Banking*, 103 VA. L. REV. 411, 466–80 (2017) (arguing that information asymmetry is a meaningful source of systemic risk and demanding that regulators should focus on reducing information gaps).

200. See Zetzsche, Buckley, Arner & Föhr, *supra* note 22, at 305–06 (discussing prohibition as one policy choice regarding initial coin offerings).

201. See Weihuan Zhou, Douglas Arner & Ross Buckley, *Regulation of Digital Financial*

While the soundness of the Chinese financial system prior to the FinTech boom may explain the benefits of doing nothing for innovation and development in this particular case,²⁰² and while non-legal means allowed political control over the emerging providers of financial ecosystems, the Chinese example also demonstrates the systemic risks that can arise from unexpected and uninhibited growth of certain market participants. That growth has led, since 2015, to a much more cautious regulatory approach.²⁰³ Most notably, during its unregulated period, Alibaba laid the foundation for forming the world's largest financial ecosystem (measured by its number of clients). In our context, a laissez-faire approach would be likely to further the growth of existing platforms. This approach has largely been the one taken in most countries so far but still has the potential to result in undesirable winner-take-all outcomes.

2. Test-and-Learn: Sandboxes, Special Charters and Licenses, and Innovation Hubs

In the specific context of FinTech innovation, test-and-learn approaches – including regulatory sandboxes, innovation hubs, and special charters and licenses²⁰⁴ – have been discussed as methods to support balanced innovation.²⁰⁵ These tools, while far from being a panacea, do enhance the

Services in China: Last Mover Advantage?, 8 TSINGHUA CHINA L. REV. 25, 27–28 (2015) (alleging that the Chinese regulations of digital financial services before 2015 lack detailed and comprehensive provisions) ; Douglas Arner, Janos Barberis & Ross Buckley, *The Evolution of FinTech: A New Post-Crisis Paradigm?*, 47 GEO. J. INT'L L. 1271, 1298–99 (2017) (arguing that due to the adoption of a largely commercialized financial system, there is a rapid growth of P2P lending platforms in China since 2009); Weihuan Zhou, et al., *China's Regulation of Digital Financial Services: Some Recent Developments*, 90 AUSTL. L.J. 297 (2016) (arguing that the regulatory work has progressed slowly to enable the rapid growth of digital financial service in China).

202. See Christian Haddad & Lars Hornuf, *The Emergence of the Global FinTech Market: Economic and Technical Determinants* 20 (CESifo, Working Paper No. 6131, 2016), <https://ssrn.com/abstract=2830124> [<https://perma.cc/Y528-7U79>] (arguing that the soundness of the financial system has a negative effect on FinTech start-up dynamics; *i.e.* financial systems with many deficits provide a vibrant environment for start-ups).

203. Zhou, Arner & Buckley, *supra* note 201, at 27.

204. A regulatory sandbox is a safe space in which innovative FinTech applications can be tested with sharply reduced regulatory requirements (subject to certain pre-conditions). An innovation hub is a portal that facilitates access of industry to regulators and seeks to promote bespoke regulation, no-action letters, and other dispensations on a case-by-case basis. Special charters are authorizations to conduct FinTech type businesses without having to comply with the full panoply of financial regulation, though subject to special limits. See generally Ross P Buckley et al., *Building FinTech Ecosystems: Regulatory Sandboxes, Innovation Hubs and Beyond*, 61 WASH. J. L. & POL'Y 55, 56–61 (2020) (introducing regulatory sandboxes and innovation hubs in fintech regulations).

205. See Hilary J. Allen, *Regulatory Sandboxes*, 87 GEO. WASH. L. REV. 579–645 (2019)

flow of information between innovative firms and their regulators. These tools may prove of little value, however, since they are designed to promote testing of new technologies and business models rather than regulate global players.

B. Supporting Competition

A second regulatory approach could focus on enhancing competition to ensure competitive market forces play a beneficial role rather than contribute to an already concentrated financial sector. Pro-competition measures have been considered with regard to IT/software,²⁰⁶ critical FMIs such as payment, clearing, and settlement systems,²⁰⁷ and in “open banking” initiatives.²⁰⁸

1. Mandating Access

Regulation could aim at securing objective, transparent, and fair risk-based rather than profit-based conditions of access. Open interfaces, open source code of the technology core, fair and non-discriminatory access requirements, and a transparent fee structure enable third-party developers

(“Regulatory sandboxes offer an environment in which fintech entrepreneurs can conduct limited tests of their innovations with fewer regulatory constraints, real customers, less risk of enforcement action, and ongoing guidance from regulators.”); Chris Brummer, *Disruptive Technology and Securities Regulation*, 84 *FORDHAM L. REV.* 977, 1047–51 (2015) (arguing that innovation hubs provide businesses with individual guidance and additional support in order to help developers understand the regulatory framework); Chris Brummer & Yesha Yadav, *FinTech and the Innovation Trilemma*, 107 *GEO L.J.* 235–307 (2019) (offering a general introduction of innovative regulatory strategies to navigate the policy trilemma in regulating fintech); Kathryn Judge, *Investor-Driven Financial Innovation*, 8 *HARV. BUS. L. REV.* 291, 334–341 (2018) (providing an overview of the different innovative regulations in fintech); Saule Omarova, *New Tech v. New Deal: FinTech As A Systemic Phenomenon*, 36 *YALE J. ON REG.* 735–793 (2019) (introducing how fintech has eroded the New Deal settlement and the need for a novel conceptual framework); W.J. Magnuson, *Regulating FinTech*, 71 *VANDERBILT L. R.* 1168–1226 (2018) (calling for a wide-ranging reconceptualization of financial regulation in fintech); Zetsche, Buckley, Barberis & Arner, *supra* note 198, *passim* (discussing new regulatory approaches in fintech).

206. See, e.g., *MICROSOFT ON TRIAL: LEGAL AND ECONOMIC ANALYSIS OF A TRANSATLANTIC ANTITRUST CASE passim* (Luca Rubini ed., 2010) (introducing the pro-competition measures used to regulate dominant technology players like Microsoft).

207. See, in particular, *BANK FOR INT’L SETTLEMENTS & INT’L ORG. OF SEC. COMM’NS*, *supra* note 7, at 101 (discussing access conditions by providers of Financial Market Infrastructure).

208. See Markos Zachariadis & Pinar Ozcan, *The API Economy and Digital Transformation in Financial Services: The Case of Open Banking 2–23* (SWIFT Inst., Working Paper No. 2016-001, 2017), <https://ssrn.com/abstract=2975199> [<https://perma.cc/5N4L-VHFV>] (discussing the challenges and opportunities that open application programming interfaces bring to the open banking sector).

to write proprietary applications for platform clients.²⁰⁹ In this regard, Principle 18 of the IOSCO principles on access to the services of critical infrastructure providers is relevant:

[a]n FMI's participation requirements should be justified in terms of the safety and efficiency of the FMI and the markets it serves, be tailored to and commensurate with the FMI's specific risks, and be publicly disclosed. Subject to maintaining acceptable risk control standards, an FMI should endeavor to set requirements that have the least-restrictive impact on access that circumstances permit.²¹⁰

2. Diversification

Regulators could also ask clients to diversify their own risks from their dependency on the platform. Regulation could require that any *financial* firm must employ at least two or more providers/systems, and that these be unrelated to each other. While mandatory diversification has some positive effects on market structure, it also comes with increased costs, imposed redundancy, additional cybersecurity risks (given that multiple systems would have access to the firm's client data), and reduced benefits of datafication (because of slowed IT processes). Most importantly, mandated diversification could reduce platform benefits for clients: one look and feel, one service level, and one service quality, as well as the accumulation and best use of a client's liquidity for ensuring lower costs on the back-end. Mandatory diversification, if imposed, might work only on the back-end.

An alternative to this mandatory diversification suggestion might be limiting a platform's maximum share of clients in a given market; we discuss this more interventionist approach *infra*, at Part IV.D.

3. Rotation

Instead of diversification and following the Sarbanes-Oxley Act's provisions on auditors, clients could be required to switch providers every few years. Rotation would likely be costly: all weblinks, data interfaces, and

209. See, e.g., *United States v. Microsoft Corp.*, 231 F. Supp. 2d 144 (D.D.C. 2002) (settling the year-long U.S. Department of Justice's antitrust litigation against Microsoft on abusive terms for third-party web browser software and requiring Microsoft to make available for use by third parties on reasonable and non-discriminatory terms certain technology used by Microsoft server operating system products to interoperate with Windows operating system products).

210. BANK FOR INT'L SETTLEMENTS & INT'L ORG. OF SEC. COMM'N, PRINCIPLES FOR FINANCIAL MARKET INFRASTRUCTURES 101 (Apr. 2012), <https://www.bis.org/cpmi/publ/d101a.pdf> [<https://perma.cc/9VH5-5TQK>].

brokerage connections would need readjustment after each switch, giving the institution's clients even more reason to contract directly with the platform provider. Providers will also find it difficult to negotiate fee reductions based on liquidity streams if the law mandates regular displacements of the very liquidity for which the discount provides an incentive to stay. Further, if the technology of *their* clients is linked – either technically or economically – to the platform, an institution's clients will have even more reason to contract directly with the platform, thereby exacerbating, rather than slowing, market concentration.

4. Open Data

Regulators could mandate that incumbents grant new entrants access to client account data; the new entrant could then reduce a client's switching costs by securing smooth tech migration. While standardization of client data is a crucial precondition for smooth migration,²¹¹ doubts remain about whether in fact small new entrants would benefit from such a rule. In particular, in the case of the EU's Open Banking Initiative, access to client data appears to facilitate the market access of large technology companies that have resources to (1) attract a sufficient number of new clients *and* (2) program large scale data transfer interfaces.²¹²

We thus propose requiring open client data only from firms with a strong, potentially dominant position. In an effort to hamper the further concentration in the asset management industry, an open data requirement paired with a data governance requirement could be attached once market share exceeds, say, five percent in any asset management market, in order to break into the data-based economies of scale and allow easier entry for smaller competitors.

5. Unbundling of Services and Prices

Another regulatory strategy would be to mandate separate service pricing and an option for clients to source distinct and separate services from a digital finance platform. Unbundling seeks to separate fees for different

211. See Giuseppe Colangelo & Oscar Borgogno, *Data, Innovation and Transatlantic Competition in Finance: The Case of the Access to Account Rule 22–26* (Eur. Union Law Working Paper No. 35, 2018) (observing that an EU-wide FinTech market requires standardization to simplify data transmission and facilitate competition and interoperability).

212. See Dirk Zetsche, Douglas Arner, Ross Buckley & Rolf Weber, *The Evolution and Future of Data-Driven Finance in the EU*, 57 COMMON MARKET L. REV. 331 (2020) (analyzing the facilitation of open banking in the EU to enhance competition in banking and payments).

services previously sold as a package and prohibit hidden bundling rebates (“tying”). Unbundling aims at two different goals. First, the price of a single service becomes transparent, allowing new entrants to review whether they can compete by offering a better single service, if they cannot compete with the whole platform. Second, unbundling prohibits the cross-subsidization of some services from the proceeds of other services for which there may be more competition.

Unbundling as a regulatory requirement, however, must be handled with care. Unbundling reduces some efficiencies that stem from bundled client contacts and the better data inherent in handling more and related services simultaneously.²¹³ After all, unbundling involves ripping the integrated platform apart, though its very integration is one of its main benefits. Regulators imposing unbundling requirements face the further difficulty of determining which part of a service may be untied at what point in time, without impeding innovation based upon *disintermediation*. We discuss the more interventionist variant of unbundling in which offering of some services together with others would be prohibited *infra*, at Part IV.

6. Merger Control

Merger control is the standard antitrust approach to overly concentrated markets. Though antitrust law’s main rationale is market efficiency, our analysis of digital finance platforms suggests that merger control can also be justified from a financial regulation perspective: mergers of very large platforms could be prohibited not only because of antitrust concerns, but also for client protection, innovation, and especially, financial stability concerns.

C. Moderate Regulatory Interventions

As moderate regulatory interventions, regulators have at their disposal various types of command-and-control, self-regulatory, and co-regulatory approaches. The approach will depend on the stage of evolution of any given platform. As a general matter, the greater the scale and/or significance of a digital finance platform, the stronger the case for an intervention.²¹⁴

213. There is a wide body of antitrust literature discussing tying practices and unbundling requirements. See Keith N. Hylton & Michael Salinger, *Tying Law and Policy: A Decision-Theoretic Approach*, 69 ANTITRUST L.J. 469, 469–526 (2001) (reviewing post-Chicago tying law and theory and analyzing tying doctrine using decision theory); see also Nicholas Economides & Ioannis Lianos, *The Elusive Antitrust Standard on Bundling in Europe and in the United States in the Aftermath of the Microsoft Cases*, 76 ANTITRUST L.J. 483, 483–567 (2009) (analyzing the bundling approaches of Europe and the United States and advocating for a unified test for bundling and tying).

214. For guidance, see BANK FOR INT’L SETTLEMENTS & INT’L ORG. OF SEC. COMM’NS,

1. Command-and-Control Regulation

a. Regulating Financial Data Gathering and Analytics

A standard response of regulators to increasing concentration within a given industry includes adding an additional layer of regulation upon participants, particularly through licensing as a regulated activity. In doing so, they enhance control over the sector and obtain better data for regulatory decisions. The difficulty in submitting digital finance platforms to regulation is finding a common denominator of activities that accurately describes the range of activities potentially involved.

Given that the core of platform activity is data collection and processing, regulators could define “financial data gathering and analytics” as a regulated activity and provide exemptions to participants that do not meet certain size or scope requirements. The result of such regulation could be a differentiated regime with tiered rules for large platforms, similar to the rules applicable to SIFIs: moderate reporting requirements for mid-size platforms and a mere registration requirement with no additional disclosures for small ones.

b. Indirect Regulation: Delegation and/or Counterparties

An alternative approach focuses on the regulated clients of any given platform. Requiring regulated users to ensure a number of prerequisites would create advantages, particularly in cross-border settings, where only parts of the platform are located within a regulator’s ambit. For instance, regulations often require regulated entities to ensure compliance with the laws of their home jurisdiction, even where they delegate services to entities located in other jurisdictions. Limits of indirect regulation arise, however, when the delegating firm depends on the delegate’s services but not vice versa. This one-sided dependency can be due to a delegate’s size (rendering the delegate less dependent on a single client), the outsourcing firm’s lack of alternatives in a given sector, or significant transaction costs hindering an easy switch. The first concern is possibly – and the following two concerns are certainly – present in the case of digital finance platforms.

A closer look reveals that regulated firms have very few means to ensure platform stability and honest conduct. How can a client of Aladdin ensure that Aladdin performs its technology job properly? The value of many firms today is in the data, which Aladdin possesses. Clients cannot credibly put firms under pressure whose market value is many times larger

supra note 7, at 12–13 (discussing applicability and proportionality of the FMI principles).

than their own (BlackRock could, for instance, readily buy G-SIFI Deutsche Bank). Nor can clients apply controls that *ensure* the technology works. In the end, financial institutions are at the mercy of dominant platforms.

In the context of dominant digital finance platforms, the outsourcing relationship is inverted, and the tail wags the dog: indirect regulation is ill-equipped to counter the fact that the platform is the heart of many financial firms, particularly in asset management.

c. Code Review by FSAs

A different regulatory approach could focus on the underlying code, *i.e.* its technical functionality. Supervisory agencies could seek to understand the technology and require additional code aimed at meaningfully balancing private incentives with public interests. Such a code-focused approach would ask much from regulators trained in financial and legal matters.²¹⁵ To our knowledge, a review tool for the functionality and limits of self-learning algorithms has yet to be developed,²¹⁶ while model risk assessment is among the most complex tasks in modern finance; even the best funded and most sensitive organizations – including the Department of Defense and CIA – fail, at times, to combat cyber threats.²¹⁷

2. *Self-Regulation*

Self-regulation is a critical means of drawing upon the knowledge of participants when regulators reach the limits of their own expertise. FMI providers thus typically establish a common set of rules and procedures for all participants, a technical infrastructure, and a specialized, customized risk management framework.²¹⁸ While these rules and procedures often take a contractual format, a self-regulatory approach could formalize the adoption and amendment of these rules and establish a minimum publication and notice period. Regulators could use these frameworks to enhance control over platforms.

215. We have considered the issues of how regulators can address cyber risks elsewhere, see Buckley et al., *supra* note 184 (offering ways to address the emerging security risks that result from technical innovation and digitization of finance).

216. See Joshua Kroll et al., *Accountable Algorithms*, 165 U. PA. L. REV. 633, 633–705 (2017) (proposing a technological toolkit to verify and review automated decision systems).

217. See *Significant Cyber Incidents*, CTR. FOR STRATEGIC & INT’L STUD., <https://www.csis.org/programs/strategic-technologies-program/significant-cyber-incidents> [<https://perma.cc/P9MC-ZMQM>] (last visited Oct. 28, 2020) (providing details about significant cyber-attacks on government agencies).

218. BANK FOR INT’L SETTLEMENTS & INT’L ORG. OF SEC. COMM’NS, *supra* note 7, at 7 (defining FMIs and describing their function and the range of their features).

The downside of self-regulation is the dependency of the “self-regulated constituency” on adopting rules. Where the collective private and public interests collide, we might expect few serious efforts at self-regulation. In particular, although we might see the establishment of basic investor protections, the provider and its participants have little interest in slowing growth by curtailing the network effects from which they benefit, and so will do little to combat antitrust concerns and size-based systemic risk. Self-regulatory organizations thus face the tension between remaining light-touch and interest-friendly or turning, like FINRA,²¹⁹ into more of a public oversight body focused on technicalities *in addition to* mandatory regulation.

3. Co-Regulation

Regulators could pursue a co-regulation strategy. Co-regulation has been defined as a

“mechanism whereby [a] legislative act entrusts the attainment of the objectives defined by the legislative authority to parties which are recognized in the field (such as economic operators, the social partners, non-governmental organizations, or associations)” by setting “objectives to be attained but their achievement is entrusted to non-public actors in economic and social domains.”²²⁰

Co-regulation has been discussed as potentially effective for non-financial platform industries, through its inclusion of a broad pool of innovators “in the articulation, execution and evolution of policy, law, norms development, oversight and regulation,”²²¹ leading to more balanced views. Examples include agreements between local authorities and Airbnb on the collection of tourist tax.²²²

For digital finance platforms, regulators could seek to enter into co-regulation agreements with operators that reflect public concerns such as systemic risk, customer protection, market integrity, and national security. As with any other regulatory tool, however, co-regulation has its limits when the public interest collides with the provider’s private interest in making

219. See William A. Birdthistle & M. Todd Henderson, *Becoming a Fifth Branch*, 99 CORNELL L. REV. 1, 12–23 (2013) (analyzing the evolution of FINRA from a self-regulatory organization to a quasi-governmental organization).

220. See Michèle Finck, *Digital Co-Regulation: Designing a Supranational Legal Framework for the Platform Economy* 15 (LSE Legal Stud. Working Paper No. 15, 2017), <https://ssrn.com/abstract=2990043> [<https://perma.cc/55E5-EQUD>] (defining co-regulation).

221. See Raymond Brescia, *Regulating the Sharing Economy: New and Old Insights into an Oversight Regime for the Peer-to-Peer Economy*, 95 NEB. L. REV. 87, 134 (2015) (recognizing the benefits of decentralized policymaking and regulatory pluralism).

222. See the list of examples by Finck, *supra* note 220, at 15–18.

profits. Thus, although co-regulation could be a way to implement moderate investor protection and national security measures, it may be less effective with regard to the antitrust and financial stability concerns we have outlined.

D. Regulation as Public Utilities

1. Public Utility Status

In line with scholarship on platform industries,²²³ digital finance platforms could be regulated as public utilities. Regulation characteristics of public utilities include, for instance, rate regulation, minimum service level and quality assurance prescriptions, and a defined or capped rate of return on investments. This list demonstrates that traditional public utility regulation fits best for highly standardized services such as energy and water supply. Regulators seeking to set the aforementioned limits in a highly innovative, rapidly growing environment such as asset management and finance more generally will face potentially insurmountable challenges.

A less intrusive form of public utility status is the designation of certain systems as Financial Market Utilities under Title VIII of the Dodd-Frank Act, asking for advanced risk-management methods, intensified supervision, and advance notice of rule changes.²²⁴ These rules were drafted for clearing organizations and central counterparties and would need amendments to reflect the data and liquidity dimension of digital finance platforms stressed in this Article. This is the approach being taken in China in the context of Ant and other digital finance platforms: designating them as systemically important financial institutions – for instance at the holding company level where a new group regulatory approach has been introduced – and subjecting them to higher regulatory and supervisory attention.

2. Participation / Ownership of Public Agencies

As a form of indirect regulation, supervisory authorities could become significant shareholders or operators of a digital finance platform. Examples

223. See K. Sabeel Rahman, *The New Utilities: Private Power, Social Infrastructure, and the Revival of the Public Utility Concept*, 39 CARDOZO L. REV. 1621, 1634 (2018) (arguing that public utility concepts offer a framework for understanding and contesting private power in a variety of sectors, including the financial and platform markets); K. Sabeel Rahman, *Regulating Informational Infrastructure: Internet Platforms as the New Public Utilities*, 2 GEO. L. TECH. REV. 234, 240–46 (2018) (detailing how the utility concept applies to internet platforms).

224. *Designated Financial Market Utilities*, BD. OF GOVERNORS OF THE FED. RESRV. SYS., <https://www.federalreserve.gov/paymentsystems/title-viii-dfa.htm> [<https://perma.cc/G7PQ-WDP3>] (last visited Oct. 28, 2020).

include RTGS payment systems in which the technology core is developed with the involvement of central banks that, in some cases, also engage in operations. Similar approaches are now being seen in an increasing number of jurisdictions at the retail level with “fast payment systems.”²²⁵ Putting aside the obvious capacity constraints of many competent authorities, having a stake in a digital finance platform at the same time brings potential informational advantages for a central bank or other regulatory agency.

On the downside, authority stakes in a platform create a potentially undesirable outcome: the platform in which a central bank or other authorities take a stake is likely to be a monopolist. This monopolist will likely leave little room for additional market-led innovation. Governmental investment makes the most sense in markets where competition is unlikely to develop in the first place, such as where existing financial institutions are insufficiently funded or tech expertise is scarce,²²⁶ or where competition is undesirable because all financial institutions must meet the same standard in order to reduce *their customers’* transaction costs (such as in payment systems).

E. Unbundling

A more interventionist approach would mandate unbundling. Unbundling is well established as an antitrust measure, yet financial law also frequently imposes separation and unbundling. Some contend, indeed, that a “core principle[.]” of banking law is the “separation of banking and commerce.”²²⁷ At least in the U.S., pursuant to the Bank Holding Company Act of 1956, firms that own or control a U.S. bank are prohibited from

225. Anton Didenko, Dirk A. Zetzsche, Douglas W. Arner & Ross P. Buckley, *After Libra, Digital Yuan and COVID-19: Central Bank Digital Currencies and the New World of Money and Payment Systems* 9 (European Banking Inst., Working Paper Series 65, 2020), <https://ssrn.com/abstract=3622311> [<https://perma.cc/UQN9-T6Y3>].

226. We find these preconditions often met in developing and emerging economies. This explains why India’s central bank has developed and functions as operator of core infrastructure for financial services through public-private partnerships such as the National Payments Corporation of India. See *About Us*, NAT’L PAYMENTS CORP. OF INDIA, <https://www.npci.org.in/who-we-are/about-us> [<https://perma.cc/G8NR-TU6M>] (last visited Oct. 28, 2020) (describing NPCI as a not-for-profit umbrella organization for all retail payments in India).

227. See Saule T. Omarova, *The Merchants of Wall Street: Banking, Commerce, and Commodities*, 98 MINN. L. REV. 265, 268, 274–75 (2013) (outlining the policy rationale for separating banking from certain commercial activities); see also Khan, *supra* note 153, at 794; Bernard Shull, *Banking and Commerce in the United States*, 18 J. BANKING & FIN. 255, 267 (1994), reprinted in Bernard Shull, *Banking and Commerce in the United States*, 27 J. REPRINTS ANTITRUST L. & ECON. 359, 371 (1997) (reviewing the historical relationship between banking and commerce and the policies underlying their separation).

engaging in business activities other than banking or managing banks.²²⁸

Investment regulation provides for similar separation and unbundling. For instance, the role of an investment advisor is to be separated from that of, first, the investment company holding legal title to fund assets; second, the custodian, which in most cases has custody of the fund's assets; and third, the broker-dealers and financial planners who assist investors in selecting funds. These unbundling requirements reflect that fund management, safekeeping, and investor roles together represent the traditional interest spheres of collective or pooled investments.²²⁹ In principle, whoever acts on the side of the investor, such as broker-dealers, wealth managers, estate planners or investment advisers (together referred to as "client intermediaries"), is by law bound to serve the investor's individual interest, while the fund manager and custodian/depositary should be committed to the "fund" rather than individual investors.

In particular, the Investment Company Act requires mutual funds to maintain strict custody of fund assets separate from the assets of the fund manager.²³⁰ In principle, all investments by registered investment companies "shall be deposited in the safekeeping of, or in a vault or other depository maintained by, a bank or other company whose functions and physical facilities are supervised by Federal or State authority."²³¹ Third-party custody enables investment funds to control both their own assets and assets (particularly collateral) held by the custodian when the custodian experiences difficulties. The advantage of this approach was highlighted in the aftermath of the collapse of the investment bank Lehman Brothers in 2008.²³²

This approach reveals the insight that each core intermediary fulfils a

228. See Khan, *supra* note 153, at 794 (stressing the similarity of these rules with antitrust and competition policy objectives and stating that the main justifications for preserving the separation between banking and commerce include "the needs to preserve the safety and soundness of insured depository institutions, to ensure a fair and efficient flow of credit to productive [businesses], and to prevent excessive concentration of financial and economic power in the financial sector").

229. See Morley, *supra* note 126, at 1238–42 (introducing the idea of separating funds and managers).

230. 17 C.F.R. § 270.17f-2 (2019) (custody of investments by registered management investment company). For further custody requirements see 17 C.F.R. § 270.17f-1 (2019) (broker-dealer custody); 17 C.F.R. § 270.17f-2 (b) (self-custody); 17 C.F.R. § 270.17f-4 (2019) (securities depositories); 17 C.F.R. § 270.17f-5 (2019) (foreign banks); 17 C.F.R. § 270.17f-6 (2019) (futures commission merchants); and 17 C.F.R. § 270.17f-7 (2019) (foreign securities depositories).

231. 17 C.F.R. § 270.17f-2 (b) (2019).

232. See *Comprehensive Regulatory Regime for U.S. Mutual Funds*, INV. CO. INST. (2014), https://www.ici.org/pdf/14_ici_usfunds_regulation.pdf [<https://perma.cc/UQC5-JWWH>] (observing that mutual funds with third-party custody arrangements were able to take control of their collateral more easily than market participants without such arrangements).

controlling function vis-à-vis each other type of intermediary. As long as the core intermediary functions are separate, we can expect an equilibrium to exist in the relations between the different types of core intermediaries. If separation is ensured, then market forces may lead to undesirable results only within each core intermediary.

The necessity of having types of intermediaries separated prompts the question whether there ought to be limits to disruption. Law is static and, for financial law, enforced by supervisory authorities. As such, law may function as a barrier to disruption. Specifically, the law may limit the extent to which tech-based innovation streamlines the value chain and the services integrated into platforms. If disruption is limited to *innovations within* each of the core intermediary functions, for structural reasons, the law must clearly define those limits.

A closer look reveals, however, that these limits are blurred. Under rule 17f-2(c), the *Investment Company Act* allows for self-custody with regard to various securities collateralized, escrowed, or in transit, or *in other transactions necessary or appropriate in the ordinary course of business relating to the management of securities*.²³³ Insolvency risk does not vanish in the context of digital finance platforms. Rather, with greater market concentration, a provider's insolvency might have a more severe impact. Other jurisdictions have thus abolished self-custody and always require third-party custody of investment fund assets.²³⁴

A discussion of investor protections in custody arrangements is beyond the scope of this Article. We are interested only in the limits to platform building in U.S. custody law. To address platform-based concentration, it may be advisable to amend Rule 17f-2(c) so that the investment company and investment advisor may hold only insignificant amounts of assets of their own. The fact that “[n]early all mutual funds use a bank custodian for domestic securities, and the custody agreement is typically far more elaborate than the arrangements used for other bank clients”²³⁵ suggests that this policy recommendation is in line with client expectations and industry practice.

In a similar vein, a strict line between the client intermediary function

233. 17 C.F.R. § 270.17f-2 (b) (2019).

234. See Directive 2011/61/EU of the European Parliament and of the Council of 8 June 2011 on Alternative Investment Fund Managers and amending Directives 2003/41/EC and 2009/65/EC and Regulations (EC) No 1060/2009 and (EU) No 1095/2010, 2011 O.J. (L. 174) 28 Article 21; Sebastiaan Hooghiemstra, *Depositary Regulation*, in THE ALTERNATIVE INVESTMENT FUNDS DIRECTIVE 441, 460–66 (Zetzsche ed., 3rd ed., 2020); John Siena, *Depositaries: Still a Bit of a Mess*, in THE ALTERNATIVE INVESTMENT FUNDS DIRECTIVE 497, 526–33 (Zetzsche ed., 3rd ed., 2020); Dirk A. Zetzsche, *(Prime) Brokerage*, in THE ALTERNATIVE INVESTMENT FUNDS DIRECTIVE 545, 569 (Zetzsche ed., 3rd ed., 2020).

235. INV. CO. INST., *supra* note 232.

and the fund manager function prevents additional conflicts of interests from greater integration of service functions. If an investment adviser provides its own products, it has an incentive to offer those to clients rather than products possibly better suited to clients. If the investment adviser functions as a custodian, it may seek to enhance profits from its custodian function by channeling investors' assets into those funds rather than recommending the best investment to its clients. Demanding strict separation of investment advice, broker-dealers, and custodians is somewhat distant from current industry practice. Broker-dealer conglomerates like Charles Schwab not only provide brokerage and investment advice – as a client intermediary – but also offer ETFs, a part of their role as fund managers. This fact exposes a large possible flaw in existing securities regulation: all of these services could be provided through entities owned and controlled by one holding company. In particular, the U.S. Bank Holding Company Act allows a bank that qualifies as a “financial holding company” to conduct all activities that are “financial in nature,” including securities dealing and insurance underwriting.²³⁶ As we have shown, many incumbents rely on this exemption to present front-to-back comprehensive financial ecosystems, putting the very policy objective at risk.

A softer form of unbundling and separation would require segregation. For instance, an investment advisor might be prohibited from booking the fund's asset in its own accounts, though it might under certain circumstances hold the assets in an account earmarked as investors' assets. An even softer form would merely manage conflicts: two functions could be provided by one entity, but an information barrier would have to be erected and conflicts monitored – avoided where possible and managed where unavoidable.

Along these lines, regulation could require the unbundling and separation of these four functions not only legally – as the law currently does by requiring separate legal entities to perform these tasks – but also *technically*. A technical unbundling requirement would declare a platform illegal that simultaneously provides or facilitates fund manager, fund, custodian, and investor functions, and uses both data and liquidity access to secure control over the whole fund value chain.

V. CONCLUSION

This Article offers three main contributions to the law of finance. First, we conceptualize and provide a theoretical analysis of digital finance platforms. In the asset management industry, these platforms are developing on the front- and back-end and, over time, appear to be evolving into

236. Omarova, *supra* note 227, at 268 (citing 12 U.S.C. § 1843(k)(1)(A)).

comprehensive, front-to-back financial ecosystems.

Second, we show that as a result of technological evolution, asset management – and finance more generally – is an emerging, quickly growing, and unappreciated species of platform industry, with many of the attendant benefits and concerns. We argue that ever-more parts of the asset management value chain will be integrated in ever-fewer dominant platform ecosystems. It is this process that is central to understanding the evolution of passive investment platforms. This evolution could be partly beneficial, as disintermediation can drive costs down. While this happens, societies – and their financial regulations – must seek to remain open to innovation and to balance innovation against risk.

Third, we argue that law and regulation must respond to the emergence of digital finance platforms in asset management. More broadly, regulators should apply legal approaches commensurate with the scale, scope, and role of each platform. Those interventions range from fostering innovation by taking a wait-and-see approach, to a pro-competition approach by moderate regulatory interventions, and finally to strict regulation as public utilities.

The options regulators should take will depend on the stage of development of a given digital finance platform, particularly in terms of market share, dominance, and the significance of the functions the platform provides. Regulators must, however, be prepared to act to curtail the significant risks associated with digital finance platforms, as now appears to be happening in China.²³⁷ These platforms are already so central to the asset management industry that the biggest of them are too big to fail. We do not yet know whether the greatest threat from digital finance platforms will emerge from their domineering success or catastrophic failure, but in either event, now is the time for sober legislative and regulatory scrutiny.

²³⁷ See *Ant's Failed IPO Points to Wider Clash on FinTech*, FIN. TIMES (Nov. 9, 2020), <https://www.ft.com/content/f3cf30a2-bf5d-43a7-8a30-3fa10712e556> [<https://perma.cc/7HQL-EABZ>].