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COMMENTS OF SUSAN VON STRUENSEE, JD, MPH

to the

Request for Information and Comment on Financial Institutions' Use of Artificial Intelligence, Including Machine Learning

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The financial crisis of 2008 has led to dramatic changes in the way that finance is regulated: the Dodd-Frank Act imposed broad and systemic regulation on the industry on a level not seen since the New Deal. But the financial regulatory reforms enacted since the crisis have been premised on an outdated idea of what financial services look like and how they are provided. Regulation has failed to take into account the rise of financial technology (or "fintech") firms and the fundamental changes they have ushered in on a variety of fronts, from the way that banking works, to the way that capital is raised, even to the very form of money itself. These changes call for a wide-ranging reconceptualization of financial regulation in an era of technology-enabled finance. In particular, this Article argues that regulators' focus on preventing the risks associated with "too big to fail" institutions overlooks the conceptually distinct risks associated with small, decentralized financial markets. In many ways, these risks can be greater than those presented by large institutions because decentralized fintech markets are more vulnerable to adverse economic shocks, are less transparent to regulators, and are more likely to encourage excessively risky behavior by market participants. The Article concludes by sketching out a variety of regulatory responses that better correspond to fintech's particular risks and rewards.

Magnuson, William J., Regulating Fintech (August 26, 2017). Vanderbilt Law Review, Forthcoming, Texas A&M University School of Law Legal Studies Research Paper No. 17-55, Available at SSRN: https://ssrn.com/abstract=3027525

There is broad consensus that accountability, liability, and the rule of law are basic requirements that must be upheld in the face of new technologies,

The arrival of robots, autonomous software agents and so-called "Internet-of-Things"-devices challenges existing liability systems. In fact, while the operation of legacy products was mostly in the hands of users, autonomous systems such as autonomous cars will be operated by an algorithm that is identical across a whole fleet of vehicles. Thus, products liability will gain in importance. At the same time, the concept of design defect, which is the current workhorse of products liability, becomes illusive.

Another set of problems arise once unbundling occurs, i.e. hard- and software components are marketed separately. Here, the allocation of responsibility between users and manufacturers will be difficult. Such difficulties could be overcome if the robot itself was awarded entity status. If robots were "ePersons", manufacturers and users would be shielded from liability, much like shareholders of corporations are today. The resulting externalization of risk may be avoided with the help of insurance mandates.[1]

Some of these problems were raised by the European Parliament's resolution on civil liability for damages caused by robotics, [2]and the European Commission Communication on "Building a European Data Economy". [3]

1Wagner, Gerhard, Robot Liability (June 19, 2018). Available at SSRN: https://ssrn.com/abstract=3198764 or http://dx.doi.org/10.2139/ssrn.3198764

2https://www.europarl.europa.eu/doceo/document/TA-8-2017-0051_EN.html

3https://digital-strategy.ec.europa.eu/en/library/communication-building-european-data-economy

With this article we will address some legal issues concerning the liability regime concerning conducts featured by AI elements. In particular we will address the issue related to liability and robots, being understood that certain relevant principles may apply in general to all AI systems, such as machine learning and deep learning.
Currently EU laws do not include any type of ad hoc provisions for robots and, more in general, for AI. According to the resolution of the EU Parliament dated February 16, 2017 (the Resolution), which sets out recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL), robots cannot be held liable per se for acts or omissions that cause damage to third parties. The existing rules on liability “cover cases where the cause of the robot’s act or omission can be traced back to a specific human agent such as the manufacturer, the operator, the owner or the user and where that agent could have foreseen and avoided the robot’s harmful behaviour.”
In this respect, the EU Commission Working Document on Liability (issued on April 25, 2018) for emerging digital technologies, such as robots operating through AI systems, underlines that we are facing a regulatory gap. Indeed:

- Where a robot takes autonomous decisions, according to the Resolution “the traditional rules will not suffice to give rise to legal liability for damage caused by a robot, since they would not make it possible to identify the party responsible for providing compensation and to require that party to make good the damage it has caused.” In fact, emerging digital technologies are featured by an inter-dependency among the different hardware, software and components/layers - such as “i) the tangible parts/devices (sensors, actuators, hardware), ii) the different software

components and applications, to iii) the data itself, iv) the data services (i.e. collection, processing, curating, analysing), and v) the connectivity features" -, which may impair the prediction of possible outcome/developments of a technology before its launch in the market.

- Furthermore, digital technologies generate and process a great amount of (big)data (see here our articles on the topic: **Artificial Intelligence vs Data Protection: the main concerns**; **Artificial Intelligence vs Data Protection: which safeguards?**; **AI Data Lakes: top five issues to consider**). In this regard, where a damage is caused by the supply of corrupted data, allocating liability may become unclear (and claims potentially difficult to enforce).
- Lastly, digital technologies change continuously, due to software extensions, updates and patches after their launch into the market / deployment in production. Any change to the software "may affect the behaviour of the entire system components or by third parties, in a way that can affect the safety of these technologies." Therefore, it is crucial to address responsibilities among the various actors of the AI value chain.

Responsibility may be identified upon robots' manufacturers pursuant to the provisions implementing the Product Liability Directive no. 85/374/EEC. Such Directive is based on strict liability (*responsabilità oggettiva*) of producers of defective products also in the event of personal injury or damage to property. According to some commentators, there are grounds to argue that the Product Liability Directive may apply to robots causing damages to individuals/goods: for instance, where the producer did not properly inform the customer of dangers associated with the autonomous robot or whether the robot's security systems were deficient.

Furthermore, we note that in various civil law countries the "strict liability" doctrine (*responsabilità oggettiva*) is the prevailing reference. The strict liability doctrine provides that it is necessary to prove that (a) damage occurred; and (b) such damage has been caused by conduct/omission of the damaging party, so that there is no need to prove the negligence / willful misconduct of the damaging party (generally requested for torts). In Italy, for instance, it has been suggested the application of the strict liability rules concerning the responsibility of a person carrying out a dangerous activity (Article 2050 of the Italian Civil Code), or the responsibility of parents/tutors/guardians/teachers for damages caused by a minor, pupil, student/apprentice or mentally impaired person (Articles 2047 and 2058 of the Italian Civil Code).

There are some open-ended questions that are yet to be addressed fully. Once the (legal) person responsible for the damage has been identified (the AI manufacturer, the programmer, the supplier or the user), his/her responsibility should be proportional to the "degree of autonomy" of the robot / AI system? How to properly address the degree of autonomy of the robot / AI system?

Lastly, some commentators prompt for the creation of a "quasi-legal" personality for robots (*e-Person*), which could protect manufacturers and users against liability (similarly to the autonomous liability of companies, which is distinct from the liability of company's shareholders). Such creation may only materialize in the medium/long term, since it would also imply a substantial and broader cultural shift towards technologies' and AI products.

That said, it is not possible to predict how the legislation on AI and liability will evolve, although most commentators rely upon the strict liability doctrine as the key driver to foster the ongoing legislative process.

Respectfully Submitted,

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Regulating Fintech

*William Magnuson**

The financial crisis of 2008 has led to dramatic changes in the way that finance is regulated: the Dodd-Frank Act imposed broad and systemic regulation on the industry on a level not seen since the New Deal. But the financial regulatory reforms enacted since the crisis have been premised on an outdated idea of what financial services look like and how they are provided. Regulation has failed to take into account the rise of financial technology (or "fintech") firms and the fundamental changes they have ushered in on a variety of fronts, from the way that banking works, to the way that capital is raised, even to the very form of money itself. These changes call for a wide-ranging reconceptualization of financial regulation in an era of technology-enabled finance. In particular, this Article argues that regulators' focus on preventing the risks associated with "too big to fail" institutions overlooks the conceptually distinct risks associated with small, decentralized financial markets. In many ways, these risks can be greater than those presented by large institutions because decentralized fintech markets are more vulnerable to adverse economic shocks, less transparent to regulators, and more likely to encourage excessively risky behavior by market participants. The Article concludes by sketching out a variety of regulatory responses that better correspond to fintech's particular risks and rewards.

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INTRODUCTION

The global financial crisis of 2008 ushered in the most sweeping reform of financial regulation in the United States since the New Deal. Alarmed by the systemic risk that financial institutions posed to the broader economy, as well as perceived abuses engendered by the "too big to fail" mindset among banking executives, legislators moved quickly to impose a slew of new requirements on the financial sector. These reforms, passed under the umbrella of the Dodd-Frank Act, drastically altered the regulatory landscape for financial institutions.[1] Wall Street firms found themselves subject to a bewildering array of new regulatory requirements, from restrictions on proprietary investing (the so-called Volcker Rule), to obligatory stress testing of banks' ability to withstand various crisis scenarios, to more stringent reporting requirements.

At the same time that Congress was focused on fixing Wall Street, dramatic changes were taking place in a less well-known and still emerging sector of the financial world: the fintech sector. This collection of start-ups and venture capital–backed companies were using developments in network technology and "big data" analysis to disrupt the way that financial services could be provided. From crowdfunding to robo-advisors to Bitcoin, financial technology firms have introduced innovations to a wide variety of areas and have allowed smaller, nimbler competitors to enter the financial marketplace. In

1. *See* John C. Coffee, Jr., *Systemic Risk After Dodd-Frank: Contingent Capital and the Need for Regulatory Strategies Beyond Oversight*, 111 COLUM. L. REV. 795 (2011) [hereinafter Coffee, *Systemic Risk*]; John C. Coffee, Jr., *The Political Economy of Dodd-Frank: Why Financial Reform Tends to Be Frustrated and Systemic Risk Perpetuated*, 97 CORNELL L. REV. 1019 (2012).

doing so, the fintech revolution promises to produce great benefits for the wider economy, including broader access to capital, fairer lending standards, better investment advice, and more secure transactions.[2] It is no wonder that Jamie Dimon, JPMorgan Chase's CEO, warned investors in 2015 that "Silicon Valley is coming."[3]

But the rise of fintech poses a challenge for current financial regulations. The Dodd-Frank reforms primarily aimed to prevent traditional banks from repeating the excesses of the precrisis era. They labeled certain financial institutions "systemically important" and imposed a variety of reporting and structural requirements on these actors. They created new regulators to police Wall Street and protect investors from their depredations. But they did not foresee the shift away from Wall Street that fintech firms had already started. The locus of financial services is becoming increasingly decentralized, with more and more areas of the financial sector being provided by small start-ups focused on narrow segments of the financial market.[4] The financial reforms of the postcrisis years are ill suited to handle the challenges presented by this new model of financial institution. Perhaps just as importantly, the substance of financial regulation today may well stifle beneficial innovation in the financial sector, precisely at a time when other nations are racing to attract fintech to their jurisdictions.[5] Because fintech is so new, and its ways of doing business so

2. *See The Fintech Revolution*, ECONOMIST (May 9, 2015), https://www.economist.com/news/leaders/21650546-wave-startups-changing-financefor-better-fintech-revolution [https://perma.cc/3FQW-UUZC] (discussing benefits).

3. Jamie Dimon, *Solid Strategy and Future Outlook*, JPMORGAN CHASE & CO. (Apr. 8, 2015), https://www.jpmorganchase.com/corporate/annual-report/2014/ar-solid-strategy.htm [https://perma.cc/GN9Z-LAS4] (included in letter from Chairman and CEO to shareholders).

4. *See* Corinne Abrams, *Fintech Startups Seek to Shake Up Money-Transfer Industry*, WALL ST. J. (Dec. 19, 2017), https://www.wsj.com/articles/fintech-startups-seek-to-shake-up-money-transfer-industry-1513679401 [https://perma.cc/W6ND-HTYA]; Andrew Ross Sorkin, *Fintech Firms Are Taking On the Big Banks, but Can They Win?*, N.Y. TIMES: DEALBOOK (Apr. 6, 2016), https://www.nytimes.com/2016/04/07/business/dealbook/fintech-firms-are-taking-on-the-big-banks-but-can-they-win.html [https://perma.cc/UY5Z-SKW2]; *The Fintech Revolution*, *supra* note 2.

5. Hong Kong regulators recently announced that they were creating a "supervisory sandbox" in which fintech companies could operate without needing to comply with otherwise applicable financial regulation. *See* Nathaniel Popper, *Where Finance and Technology Come Together*, N.Y. TIMES: DEALBOOK (Nov. 14, 2016), https://www.nytimes.com/2016/11/15/business/dealbook/where-finance-and-technology-come-together.html [https://perma.cc/8VKB-FLZK] (internal quotation marks omitted); *see also Singapore Tries to Become a Fintech Hub*, ECONOMIST (Jan. 12, 2017), https://www.economist.com/news/finance-and-economics/21714384-city-state-wants-fintech-bolsters-not-disrupts-mainstream [https://perma.cc/5G6K-25HZ]. Similarly, Britain's Financial Conduct Authority launched a new initiative, Project Innovate, to assist fintech start-ups. *See* Popper, *supra*.

unconventional, regulators are only beginning to come to terms with its implications for financial regulation.[6]

This Article argues that fintech poses a set of unique challenges to financial regulation, challenges that require us to question many of our fundamental understandings about the creation and propagation of systemic risk in the economy. In particular, the rise of fintech will undermine the widespread assumption that the primary source of systemic risk in the financial sector is the domination of large, "systemically important" banks and other financial institutions.[7] This

6. In 2016, the Bank of England announced that one of its priorities was creating a regulatory approach to fintech. Noting the difficulties involved with the endeavor, however, a Bank of England official stated that "[i]t's very difficult to decide how to regulate something you don't quite know what it is." *See* Huw Jones, *BoE Says Won't Stifle Innovation As Wrestles with Fintech*, REUTERS (Sept. 8, 2016), https://uk.reuters.com/article/uk-boe-tech/boe-says-wont-stifle-innovation-as-wrestles-with-fintech-idUKKCN11E1O7 [https://perma.cc/XWU6-H7RW]. On the other hand, the European Union's European Banking Authority has delayed a decision on whether fintech calls for new regulation. Its executive director has recently said that "[w]e should wait and see what uses the market is contemplating and whether that sort of use would imply the emergence of new risks." *See* Huw Jones & Michelle Price, *Blockchain Sends Banking Regulators Back to Basics*, REUTERS (May 20, 2016), https://www.reuters.com/article/finance-summit-blockchain/reuters-summit-blockchain-sends-banking-regulators-back-to-basics-idUSL5N18H23A [https://perma.cc/3GRG-3MHJ]. In Germany, the president of the national bank, Jens Weidmann, has stated that "[g]etting a clearer picture of fintechs' business activities is essential if we are to better understand whether and in what way they might pose a threat to financial stability." *See Fintech Sector Needs More Regulatory Oversight: Bundesbank*, REUTERS (Jan. 25, 2017), https://www.reuters.com/article/us-fintech-bundesbank/fintech-sector-needs-more-regulatory-oversight-bundesbank-idUSKBN1591LV [https://perma.cc/ZY7J-53B5].

7. For prominent examples of this overriding focus on large financial institutions as the source of systemic risk, see Kenneth Ayotte & David A. Skeel, Jr., *Bankruptcy or Bailouts?*, 35 J. CORP. L. 469, 476–77 (2010) (focusing its analysis of the proper response to financial distress on the failure of large financial institutions); Felix B. Chang, *The Systemic Risk Paradox: Banks and Clearinghouses Under Regulation*, 2014 COLUM. BUS. L. REV. 747, 747 (arguing that "[c]onsolidation in the financial industry threatens competition and increases systemic risk"); Jeffrey N. Gordon & Christopher Muller, *Confronting Financial Crisis: Dodd-Frank's Dangers and the Case for a Systemic Emergency Insurance Fund*, 28 YALE J. ON REG. 151, 154–55 (2011) (arguing that, in order to prevent future financial crises, large financial firms should be forced to self-insure against outbreaks of systemic distress); Prasad Krishnamurthy, *Regulating Capital*, 4 HARV. BUS. L. REV. 1, 1 (2014) (stating that "[m]ost observers agree that the excessive debt or leverage of systemically important financial institutions (SIFIs) was a central reason why the housing crash of 2007–2009 led to a recession"); Edward R. Morrison, *Is the Bankruptcy Code an Adequate Mechanism for Resolving the Distress of Systemically Important Institutions?*, 82 TEMP. L. REV. 449, 449 (2009) (viewing the problem of systemic risk as primarily an issue of the risk posed by large, systemically important institutions); Michael C. Munger & Richard M. Salsman, *Is "Too Big to Fail" Too Big?*, 11 GEO. J.L. & PUB. POL'Y 433 (2013) (testing the empirical effects of government bailout policies on the incentives for excessive risk and leverage in financial institutions); Andrew F. Tuch, *Financial Conglomerates and Information Barriers*, 39 J. CORP. L. 563 (2014) (analyzing the regulatory challenges posed by large financial conglomerates); Andrew F. Tuch, *The Fiduciary Dilemma in Large-Scale Organizations: A Comparative Analysis*, *in* RESEARCH HANDBOOK ON FIDUCIARY LAW (Andrew Gold & Gordon Smith eds., forthcoming 2018) (describing the dangerous conflicts of interest that arise in large financial institutions); Manuel A. Utset, *Complex Financial Institutions and Systemic Risk*, 45 GA. L. REV. 779, 781 (2011) (describing the systemic risk posed by "[m]odern financial institutions [that] are large, complex, highly interconnected, and—compared to nonfinancial firms—fragile"); Arthur E. Wilmarth, *The*

conventional view is based on a few simple observations. Large banks have grown to such gargantuan proportions, and have become so intricately connected with other sectors of the economy, that their failure would have drastic consequences on economic growth and activity. Governments, aware of this fact, thus have strong incentives to bail out struggling banks that are deemed "too big to fail." This fact alone, of course, might not be cause for concern—ex post, it is quite rational and, indeed, desirable for governments to act to protect their citizens from economic harm. But ex ante, the *knowledge* that governments will do so has important—and perverse—effects on decisionmaking. In particular, it incentivizes excessively risky behavior by banks and their counterparties, who recognize that the implicit government guarantee for large banks insulates them from any harmful repercussions of their risky behavior. This dynamic came to a head during the financial crisis of 2008, when risky bets on the subprime housing market, shoddy lending standards, and the widespread use of complex derivatives led to unprecedented losses in the financial sector. Ever since, the guiding principle of financial reform has been that systemic risk is a product of large, dominant financial institutions and the "too big to fail" phenomenon. This belief has led to significant shifts in both substantive regulation and regulatory priorities.[8]

But this conventional wisdom about the source of systemic risk in the financial sector underestimates the extent to which systemic risk can be generated—not just by large, concentrated actors, but by small, disaggregated ones as well. Markets characterized by atomized and decentralized actors present unique risks, ones that may be more worrisome than the risks presented by centralized markets. Perhaps just as importantly, regulations aimed at preventing the risks of centralization may lead to increases in the risks associated with decentralization.

Fintech presents a particularly acute problem from the perspective of systemic risk for three reasons. First, fintech firms,

Dodd-Frank Act: A Flawed and Inadequate Response to the Too-Big-To-Fail Problem, 89 OR. L. REV. 951, 954 (2011) (arguing that resolving the "too big to fail" subsidy for large financial firms should be the primary objective of regulatory reforms in the financial sector); David Zaring, *A Lack of Resolution*, 60 EMORY L.J. 97, 106, 126 (2010) (proposing that resolution authority should be revised to require the government to create a public list of large, "nationalizable institutions" and that such a reform would "ensure that the government's power to destroy is not overly broad").

8. On the other hand, President Donald Trump has taken a contrary position and promised to roll back Wall Street regulation. *See* Ben Protess & Julie Hirschfield Davis, *Trump Moves to Roll Back Obama-Era Financial Regulations*, N.Y. TIMES: DEALBOOK (Feb. 3, 2017), https://www.nytimes.com/2017/02/03/business/dealbook/trump-congress-financial-regulations.html [https://perma.cc/2TWN-3CX5]. At the time of the writing of this Article, the outcome of such efforts is uncertain.

because of their size and business model, are more vulnerable to adverse economic shocks than large financial institutions, and those shocks are more likely to spread to other firms in the industry. Second, fintech firms are more difficult to monitor and constrain than typical financial institutions because regulators lack reliable information about the structure and operations of fintech markets. Third, fintech markets suffer from collective action problems that inhibit cooperation among market actors.[9] All of these problems suggest that fintech presents a set of regulatory concerns that are different from—and in many cases more severe than—the concerns presented by more conventional financial institutions. Financial regulatory priorities must shift to reflect these changes.[10]

This Article will proceed in four parts. Part I will sketch out the contours of the fintech industry and describe how fintech is revolutionizing the ways in which financial services are provided. Part II will outline the key regulatory reforms of the postcrisis era and efforts to rein in systemic risk in the financial industry. Part III will identify the ways in which financial regulation is inapt to deal with the unique challenges and opportunities of fintech firms. Part IV will conclude by proposing a set of regulatory reforms aimed at promoting innovation in the financial industry while also ensuring stability and transparency.

9. As discussed below, *infra* Section III.C, an important contributing factor to this collective action problem is the lower reputational constraints faced by fintech firms. While large banks interact frequently with their largest stakeholders and regulators, fintech firms are smaller and more decentralized, and thus may care less about their reputations. *See* Matthew D. Cain, Antonio J. Macias & Steven Davidoff Solomon, *Broken Promises: The Role of Reputation in Private Equity Contracting and Strategic Default*, 40 J. CORP. L. 565 (2015); Kevin T. Jackson, *Global Corporate Governance: Soft Law and Reputational Accountability*, 35 BROOK. J. INT'L L. 41 (2010); William Magnuson, *The Public Cost of Private Equity*, 102 MINN. L. REV. (forthcoming 2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2955175 [https://perma.cc/VHN5-3FXD]; Jean Tirole, *A Theory of Collective Reputations (with Applications to the Persistence of Corruption and to Firm Quality)*, 62 REV. ECON. STUD. 1 (1996). In addition, in markets with small, decentralized actors, information diffusion is more problematic. *See* Enrico Perotti & Ernst-Ludwig von Thadden, *Investor Dominance and Strategic Transparency: On the Role of Corporate Governance for Product and Capital Market Competition*, *in* CORPORATE GOVERNANCE REGIMES: CONVERGENCE AND DIVERSITY 363 (Joseph A. McCahery et al. eds., 2002). For a good overview of the risk implications of fintech in the consumer finance area, see Rory Van Loo, *Making Innovation More Competitive: The Case of Fintech*, 65 UCLA L. REV. 232 (2018).

10. It should be noted at the outset that fintech firms are not the only firms that possess the risk-creating features identified here. Conceivably, other decentralized players in the financial industry might also warrant regulation on similar grounds, as identified further below. But fintech is unique because the very nature of the industry contributes to its distinctive risk. Its dependence on technology as its primary innovation facilitates the kinds of features that make systemic risk prevalent—it allows small actors to connect, it accelerates and magnifies problematic behaviors, and it obscures the dissemination of transactional information.

I. WHAT IS FINTECH?

The fintech industry has undergone tremendous growth over the past few years. In 2015, investors poured over $19 billion into the industry, an increase of 106% over the amount invested in 2014.[11] Venture capital–backed fintech companies received $13.8 billion in investments in 2015, six times the amount from 2011. There are now twenty-seven fintech "unicorns," or private companies worth more than $1 billion.[12] In 2016, Nasdaq even launched a financial technology index to track the performance of companies specializing in financial technology.[13] It is increasingly clear that fintech is now an essential feature of the financial landscape.

Despite this explosion in the size and importance of fintech, the industry itself is surprisingly ill defined. The term is sometimes used broadly to refer to any use of technology in finance. This has led some commentators to dismiss fintech as merely a fancy term for an old concept: banks, after all, have always used technology of one sort or another, and the mere fact that *new* technologies have emerged does not suggest that these technologies have any unique effect on the industry.[14] Others have suggested that fintech is an unhelpful term

11. *The Pulse of Fintech, 2015 in Review*, KPMG & CB INSIGHTS 11 (Mar. 9, 2016), https://assets.kpmg.com/content/dam/kpmg/pdf/2016/03/the-pulse-of-fintech.pdf [https://perma.cc/634A-NC2F].

12. Ciara Linnane, *China's Dominance in Fintech Extends to Its "Unicorns,"* MARKETWATCH (Sept. 10, 2016), https://www.marketwatch.com/story/chinas-dominance-in-fintech-extends-to-its-unicorns-2016-09-09 [https://perma.cc/NK5B-9MKB]. *See generally* Jennifer S. Fan, *Regulating Unicorns: Disclosure and the New Private Economy*, 57 B.C. L. REV. 583 (2016) (discussing "unicorns" and the regulations applied to them).

13. *See* Telis Demos, *What's Fintech? Nasdaq and KBW Offer an Answer with a New Index*, WALL ST. J. (July 19, 2016), https://www.wsj.com/articles/whats-fintech-nasdaq-and-kbw-offer-an-answer-with-a-new-index-1468950444 [https://perma.cc/LW73-HV48] ("[E]xchange operator Nasdaq Inc. a day ago unveiled the KBW Nasdaq Financial Technology Index, or KFTX.").

14. *See* Tom C.W. Lin, *Infinite Financial Intermediation*, 50 WAKE FOREST L. REV. 643, 655–56 (2015) (arguing that "[t]his type of substitutive disintermediation is more superficial than substantive in nature" because "while [fintech] companies like Wealthfront have replaced human money managers with algorithmic programs, they have simply substituted a human intermediary with a computerized one"); Leslie Picker, *"Fintech" Loses Some of Its Attraction for Investors*, N.Y. TIMES: DEALBOOK (Apr. 6, 2016), https://www.nytimes.com/2016/04/07/business/dealbook/fintech-loses-some-of-its-attraction-for-investors.html [https://perma.cc/A4P7-L3NC] (noting that "[e]ven industry leaders are divided over what separates a fintech company from a plain old financial services company that uses technology"). *But see* Chris Brummer & Yesha Yadav, *Fintech and the Innovation Trilemma*, 106 GEO. L.J. (forthcoming 2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3054770## [https://perma.cc/8RTH-T73W] (arguing that fintech's financial innovations are different in a number of significant ways from previous iterations of financial innovation).

that agglomerates a number of distinct phenomena into one catchy, but underspecified, term.[15]

In order to avoid these difficulties, this Article will use the term "fintech" to refer to the new breed of companies that specialize in providing financial services primarily through technologically enabled mobile and online platforms.[16] Importantly, this definition distinguishes the current fintech revolution from previous technological innovations in finance. Unlike earlier generations of finance-related technology, which typically focused on providing services to already-established financial firms, today's fintech companies are increasingly providing services directly to consumers.[17] As this Part will demonstrate, fintech is changing finance in fundamental ways, from investment management to capital raising to the very form of currency itself. In each of these areas, fintech innovation has lowered the barriers to entry, expanded access to financial services, and challenged traditional understandings about how finance works.[18]

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15. *See* Nick Ismail, *Is FinTech Really a Game Changer?*, INFO. AGE (Sept. 7, 2016), http://www.information-age.com/fintech-really-game-changer-123461993/ [https://perma.cc/MM7A-WU5G] (characterizing the term "FinTech" as a "largely unhelpful buzzword").

16. For a sampling of alternative definitions of fintech, see Nat'l Econ. Council, *A Framework for FinTech*, WHITE HOUSE 2 (Jan. 2017), https://obamawhitehouse.archives.gov/sites/obamawhitehouse.archives.gov/files/documents/A%20Framework%20for%20FinTech%20_FINAL.pdf [https://perma.cc/6MF8-XWXP] (defining fintech as a "wide spectrum of technological innovations which impact a broad range of financial activities, including payments, investment management, capital raising, deposits and lending, insurance, regulatory compliance, and other activities in the financial services space"); *Supporting Responsible Innovation in the Federal Banking System: An OCC Perspective*, OFF. COMPTROLLER CURRENCY (Mar. 2016), https://www.occ.gov/publications/publications-by-type/other-publications-reports/pub-responsible-innovation-banking-system-occ-perspective.pdf [https://perma.cc/V6AT-F9PD] (defining "fintech" as simply "financial technology"); and THE ECONOMIST INTELLIGENCE UNIT, ECONOMIST, THE DISRUPTION OF BANKING 2 n.2 (2015), https://www.eiuperspectives.economist.com/sites/default/files/EIU-The%20disruption%20of%20banking_PDF_0.pdf [https://perma.cc/P63L-EBAL] (defining fintech as "new entrants that use Internet-based and mobile technologies to create new or superior banking products"). While most fintech companies focus on a particular slice of the fintech industry, some have attempted to expand into offering broader financial services. *See* Selina Wang & Julie Verhage, *SoFi Buys Teams from Mortgage Startup Clara to Boost Offerings*, BLOOMBERG (Jan. 26, 2018), https://www.bloomberg.com/news/articles/2018-01-26/sofi-buys-teams-from-mortgage-startup-clara-to-boost-offerings [https://perma.cc/C7RH-FU2V].

17. *See* Liz Moyer, *From Wall Street Banking, a New Wave of Fintech Investors*, N.Y. TIMES: DEALBOOK (Apr. 6, 2016), https://www.nytimes.com/2016/04/07/business/dealbook/from-wall-street-banking-a-new-wave-of-fintech-investors.html [https://perma.cc/FRM3-GR8S].

18. In response to these challengers, some traditional banks have attempted to acquire fintech companies or develop them in-house. In 2016, for example, Goldman Sachs acquired Honest Dollar, an online retirement savings start-up, while JPMorgan created a program to "adopt" fintech start-ups, allowing them access to JPMorgan's facilities and expertise. *See* Melissa Mittelman, *JPMorgan to Adopt Fintech Startups with In-House Incubator*, BLOOMBERG (June 30, 2016), https://www.bloomberg.com/news/articles/2016-06-30/jpmorgan-to-adopt-fintech-startups-with-in-house-incubator [https://perma.cc/24N4-HVET] (explaining JPMorgan's "adoption" plan); Anne Tergesen & Peter Rudegeair, *Goldman Sachs Buys Online Retirement Benefits Business*,

A. Asset Management

One area of finance in which fintech has made substantial headway is asset management.[19] The process of advising investors and managing investments has long been a lucrative one: profit margins in the asset management industry were 39% in 2014.[20] But it has also been a problematic one.[21] In recent years, the asset management industry has been sharply criticized for its endemic conflicts of interest,[22] opaque fee structure,[23] and poor performance.[24] Indeed, after the financial crisis, the Securities and Exchange Commission set up a separate asset management unit to increase monitoring of the industry's practices, a sign of the perceived magnitude of the problems

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WALL ST. J. (Mar. 14, 2016), https://www.wsj.com/articles/goldman-sachs-buys-online-retirement-benefits-business-1457975369 [https://perma.cc/GP79-R5Z8] (discussing Goldman Sachs' acquisition of Honest Dollar). For an analysis of the reasons for these developments and the efforts by established institutions to commandeer fintech companies, see Robert C. Hockett & Saule T. Omarova, *The Finance Franchise*, 102 CORNELL L. REV. 1143 (2017).

19. *See* Tom C.W. Lin, *The New Financial Industry*, 65 ALA. L. REV. 567, 573–74 (2014) (describing the use of artificial intelligence and computerization in the asset management industry).

20. *See The Tide Turns – Asset Managers*, ECONOMIST (Mar. 26, 2016), https://www.economist.com/news/finance-and-economics/21695552-consumers-are-finally-revolting-against-outdated-industry-tide-turns [https://perma.cc/N2GJ-BNM2] (detailing asset manager profit margins).

21. *See* Harvey Bines & Steve Thel, *The Varieties of Investment Management Law*, 21 FORDHAM J. CORP. & FIN. L. 71, 77 (2016) (discussing the problems created by institutional trusts); Ryan Sklar, Note, *Hedges or Thickets: Protecting Investors from Hedge Fund Mangers' Conflicts of Interest*, 77 FORDHAM L. REV. 3251 (2009) (detailing the negative effects that conflicts of interest in the hedge fund industry can have on investors).

22. *See* Roberta S. Karmel, *The Challenge of Fiduciary Regulation: The Investment Advisers Act After Seventy-Five Years*, 10 BROOK. J. CORP. FIN. & COM. L. 405, 417 (2016) (discussing the difficulties created by conflicts of interest); Arthur B. Laby, *Fiduciary Obligations of Broker-Dealers and Investment Advisers*, 55 VILL. L. REV. 701 (2010) (explaining the restrictions placed on investment advisors aimed at preventing conflicts of interest); Edward B. Rock, *Foxes and Hen Houses?: Personal Trading by Mutual Fund Managers*, 73 WASH. U. L.Q. 1601, 1615–16 (1995) (detailing conflicts of interest facing fund managers).

23. In recent years, the SEC has fined a number of large asset managers for improper fee practices. The wrongdoers include such prominent firms as Apollo, Blackstone, and KKR. *See* Lisa Beilfuss & Aruna Viswanatha, *Blackstone in $39 Million SEC Settlement*, WALL ST. J. (Oct. 7, 2015), https://www.wsj.com/articles/blackstone-settles-with-sec-over-certain-fee-practices-1444238653 [https://perma.cc/LJZ4-E4DG]; Mark Maremont, *KKR Agrees to $30 Million SEC Settlement*, WALL ST. J. (June 29, 2015), https://www.wsj.com/articles/kkr-settles-with-sec-for-nearly-30-million-1435592880 [https://perma.cc/CT97-DMGK]; Ben Protess, *Apollo Global Settles Securities Case as S.E.C. Issues $53 Million Fine*, N.Y. TIMES: DEALBOOK (Aug. 23, 2016), https://www.nytimes.com/2016/08/24/business/dealbook/apollo-global-settles-securities-case-as-sec-issues-53-million-fine.html [https://perma.cc/BH2C-9YVH].

24. *See* Madison Marriage, *86% of Active Equity Funds Underperform*, FIN. TIMES (Mar. 20, 2016), https://www.ft.com/content/e555d83a-ed28-11e5-888e-2eadd5fbc4a4 [https://perma.cc/4FKY-9T9G]; Chris Newlands & Madison Marriage, *99% of Actively Managed US Equity Funds Underperform*, FIN. TIMES (Oct. 23, 2016), https://www.ft.com/content/e139d940-977d-11e6-a1dc-bdf38d484582 [https://perma.cc/JSL7-U3DW].

plaguing the sector.[25] The Financial Stability Oversight Council has recently stated that it is concerned about potential systemic risks mounting in the asset management industry.[26]

In the face of these problems, a number of start-up fintech companies have entered into the field with technology-based solutions to compete with traditional asset managers.[27] These robo-advisor companies provide a set of wealth management services entirely online and largely based on data-driven, algorithmic approaches to investment.[28] Companies such as Betterment, Wealthfront, and Folio, for example, promise to improve portfolio returns for regular investors saving for retirement, college, or other major events through a variety of automated investment strategies. The strategies are derived from inputs received from users about their sensitivity to risk, investment horizon, and current investments. These companies generally have no brick-and-mortar locations and instead funnel all interactions through their online sites.[29] They often have well-developed and fully integrated mobile applications to deliver services and advice.[30] They communicate

25. *See* Amy B.R. Lancellotta, Paulita A. Pike & Paul Schott Stevens, *Fund Governance: A Successful, Evolving Model*, 10 VA. L. & BUS. REV. 455, 485 (2016) (discussing the SEC's Asset Management Unit); Landon Thomas Jr., *A New Focus on Liquidity After a Fund's Collapse*, N.Y. TIMES: DEALBOOK (Jan. 11, 2016), https://www.nytimes.com/2016/01/12/business/dealbook/a-new-focus-on-liquidity-after-a-funds-collapse.html [https://perma.cc/4CHJ-R3F6] ("In 2010, the S.E.C., the main regulator for mutual funds, set up an asset management unit with the aim of increasing surveillance of fund companies.").

26. *See* FIN. STABILITY OVERSIGHT COUNCIL, 2016 ANNUAL REPORT 4 (2016), https://www.treasury.gov/initiatives/fsoc/studies-reports/Documents/FSOC%202016%20Annual%20Report.pdf [https://perma.cc/6JJ7-M38G] ("The asset management industry's increasing significance to financial markets and to the broader economy underscores the need for the Council's consideration of potential risks to U.S. financial stability from products and activities in this sector.").

27. *See* Lin, *supra* note 14, at 653–54 ("Automated money management companies, like Wealthfront, have billions of dollars under management and are fundamentally changing the wealth management business once dominated by financial advisors.").

28. These services have recently been the subject of intense regulatory scrutiny. The Massachusetts securities regulator even announced that automated robo-advisors "may be inherently unable to carry out the fiduciary obligations of a state-registered investment adviser." Mass. Sec. Div., *Policy Statement: Robo-Advisers and State Investment Adviser Registration*, SECRETARY COMMONWEALTH MASS. 1 (Apr. 1, 2016), https://www.sec.state.ma.us/sct/sctpdf/policy-statement--robo-advisers-and-state-investment-adviser-registration.pdf [https://perma.cc/4KGW-64PW]. Thus, robo-advisors face a number of challenges in surmounting political opposition to their growth.

29. *See* Leena Rao, *Wealthfront's Leader on Investment Fees, Millenials, and the Competition*, FORTUNE (Aug. 6, 2016), http://fortune.com/2015/08/06/wealthfront-investing-qa/ [https://perma.cc/QH7M-P6QN] (explaining that Wealthfront has "focused on providing a completely automated investment service, eliminating the cost of retail locations and sales teams").

30. *See generally* Nizan Geslevich Packin & Yafit Lev-Aretz, *Big Data and Social Netbanks: Are You Ready to Replace Your Bank?*, 53 HOUS. L. REV. 1211 (2016) (discussing the use of digital platforms by fintech start-ups).

with customers through blogs and emails, rather than personal relationships.[31] The success of robo-advisors has led to an explosion of new entrants into the market, with hundreds of companies now active in the field, many of them start-ups.[32]

Robo-advisors have pioneered a number of digital innovations aimed at responding to legal incentives in the financial marketplace. One example is their aggressive use of "tax loss harvesting" techniques.[33] Tax loss harvesting refers to the practice of lowering a taxpayer's taxable income by selectively selling investments that have suffered capital losses, while holding onto investments that have seen capital gains.[34] The technique is not without controversy, as several commentators have pointed out that it allows individuals to "cherry pick" the timing of sales to make a winning portfolio look like a losing one in the eyes of the IRS.[35] Despite the controversy, tax loss harvesting is widely viewed as legal under current regulations, and fintech firms have taken great advantage of the practice.[36] Fintech has a comparative advantage over human advisors in this area, as optimal tax loss harvesting requires an advisor to closely and continuously monitor the performance of investments, something that only computer software can realistically achieve in today's market.[37] One fintech firm estimates that the advantage of performing tax loss harvesting on a daily basis, rather than an annual one (as is more common in traditional firms), generates tax benefits that are twice as large.[38]

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31. *See* Michael Blanding, *Why Millenials Flock to Fintech for Personal Investing*, FORBES (Dec. 7, 2016), https://www.forbes.com/sites/hbsworkingknowledge/2016/12/07/why-millennials-flock-to-fintech-for-personal-investing/ [https://perma.cc/JAT3-64VF].

32. *See* Robert McGarvey, *Robo-Advisors Are on the Rise*, STREET (Apr. 3, 2016), https://www.thestreet.com/story/13515631/1/robo-advisors-are-on-the-rise.html [https://perma.cc/EZ78-QC56].

33. *See* PAOLO SIRONI, FINTECH INNOVATION: FROM ROBO-ADVISORS TO GOAL BASED INVESTING AND GAMIFICATION 33–36 (2016) (discussing the principles of "tax-loss harvesting").

34. *See* Eric D. Chason, *Taxing Losers*, 18 FLA. TAX REV. 541, 543–45 (2016).

35. *See id.* at 543 ("Taxpayers should not be able to 'cherry pick' loss elements out of an overall winning portfolio."); Yoseph M. Edrey, *What Are Capital Gains and Losses Anyway?*, 24 VA. TAX REV. 141, 171 (2004) ("This creates what is called the 'cherry-picking' problem: the taxpayer will be able to choose a convenient date to dispose of the asset and realize a loss that will offset regular taxable income."); Robert H. Scarborough, *Risk, Diversification and the Design of Loss Limitations Under a Realization-Based Income Tax*, 48 TAX L. REV. 677, 680–81 (1993) ("It is widely agreed that the principal justification for limiting capital losses is to prevent selective realization, or 'cherrypicking,' of losses by taxpayers who have unrealized gains.").

36. *See* Blanding, *supra* note 31.

37. *See Wealthfront Tax-Loss Harvesting White Paper*, WEALTHFRONT, https://research.wealthfront.com/whitepapers/tax-loss-harvesting/ (last visited Mar. 17, 2018) [https://perma.cc/GW35-SNC7] (explaining that daily tax loss harvesting "could result in significantly greater benefit than what could be achieved from the manual end-of-year approach typically taken").

38. *Id.*

Through their use of robo-advising, fintech firms have been able to dramatically lower costs in the industry. While traditional wealth management firms charge clients a fee of 1% or more of the assets being managed, robo-advisors can charge between .15% and .35%.[39] Given the close correlation between lower fees and higher returns, investors have started to shift toward these sorts of low-fee financial services.[40] Increased competition in the industry has put pressure on traditional investment managers to lower their fees as well.[41]

In addition to lowering costs, fintech firms have greatly expanded consumer access to sophisticated wealth management services. Many large banks that offer wealth management services require potential clients to invest $1 million or more in assets before they will consider taking them on as clients.[42] Fintech start-ups, on the other hand, require significantly less from their clients, with some firms eliminating minimum investment requirements entirely.[43] This distinction has allowed fintech firms to reach a set of consumers that have traditionally been overlooked by the investment management industry.[44]

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39. Andrea Coombes, *How to Get Investment Advice for Less Online*, WALL ST. J. (Sept. 4, 2013), https://www.wsj.com/articles/how-to-get-investment-advice-for-less-online-1378324912 [https://perma.cc/GM88-LY7J].

40. *See Index We Trust – Asset Management*, ECONOMIST (June 11, 2016), https://www.economist.com/news/finance-and-economics/21700401-vanguard-has-radically-changed-money-management-being-boring-and-cheap-index-we [https://perma.cc/ZW8Z-SHK8].

41. *See* Irving Wladawsky-Berger, *Is FinTech Forcing Banking to a Tipping Point?*, WALL ST. J. (Apr. 15, 2016), https://blogs.wsj.com/cio/2016/04/15/is-fintech-forcing-banking-to-a-tipping-point/ [https://perma.cc/F6EC-GUH8] ("[I]ncreased competition from FinTech startups [is] putting huge pressure on banks . . . to embrace many of the FinTech innovations introduced by startups . . . ."). In addition, some firms have decided to adopt the strategies of robo-advisor firms. BlackRock, for example, recently laid out plans to fold a number of its actively managed funds into funds based on algorithmic trading. *See* Landon Thomas Jr., *At BlackRock, Machines Are Rising over Managers to Pick Stocks*, N.Y. TIMES: DEALBOOK (Mar. 28, 2017), https://www.nytimes.com/2017/03/28/business/dealbook/blackrock-actively-managed-funds-computer-models.html [https://perma.cc/2GUY-354Q] (detailing BlackRock's "plan to consolidate a large number of actively managed mutual funds with peers that rely more on algorithms and models to pick stocks").

42. *See Robo-Advisory in Wealth Management*, DELOITTE 1 (Oct. 2016), https://www2.deloitte.com/content/dam/Deloitte/de/Documents/financial-services/Robo_No_2.pdf [https://perma.cc/CK48-GZ3K] ("On average, a potential client needs to have somewhere between one and five million euros in liquid assets to be within the scope of a Wealth Manager's target client group.").

43. *See* John Divine, *How Will Robo Advisors Impact the Future of Investing?*, U.S. NEWS & WORLD REP. (Sept. 29, 2016, 9:21 AM), https://money.usnews.com/investing/articles/2016-09-29/how-will-robo-advisors-impact-the-future-of-investing [https://perma.cc/FRR3-AUCR] ("Some robo advisors, by contrast, don't even have minimum buy-ins. . . . Just hand over your money, tell the robots a little bit about your risk tolerance and goals and leave the rest to the algorithm.").

44. *See* Barbara Novick et. al., *Digital Investment Advice: Robo Advisors Come of Age*, BLACKROCK 6 (Sept. 2016), https://www.blackrock.com/corporate/en-at/literature/whitepaper/viewpoint-digital-investment-advice-september-2016.pdf [https://perma.cc/DNP5-DW3S] ("Digital

B. Crowdfunding

Fintech is also working tremendous change in another of finance's essential roles: raising capital. Deciding which companies and individuals receive loans and investments to help them grow and prosper has always been a core function of the financial industry. Efficient allocation of capital ensures that markets function properly, directing money and resources to the businesses and entrepreneurs that are most deserving.[45] For this reason, the power to control the allocation process itself has fundamental consequences for the wider economy.[46] The process has traditionally been dominated by large banks; they are the only ones with the financial capacity and the market knowledge to adequately handle large debt issuances, initial public offerings, and the like.[47] This is what led Lloyd Blankfein, the former head of Goldman Sachs, to conclude, in the period just months after the global financial crisis, that investment banks were "doing God's work."[48]

Fintech, however, has started to disrupt the business of raising capital. It has broken the monopoly that banks have had over both debt and equity financing and pioneered new ways for consumers and businesses to access capital. In doing so, fintech companies have made

advisors may provide an effective way to engage consumers who have not considered using traditional investment management services or who have been discouraged by the costs associated with obtaining personalized investment advice.").

45. *See, e.g.*, Bernard S. Black, *The Legal and Institutional Preconditions for Strong Securities Markets*, 48 UCLA L. REV. 781 (2001); Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 VA. L. REV. 549 (1984); Jack Hirshleifer, *Efficient Allocation of Capital in an Uncertain World*, 54 AM. ECON. REV. 77 (1964).

46. *See* Franklin Allen, *Stock Markets and Resource Allocation*, *in* CAPITAL MARKETS AND FINANCIAL INTERMEDIATION 81, 95–97 (Colin Mayer & Xavier Vives eds., 1993) (explaining the relationship between market valuation and resource allocation); *see also* Jeffrey Wurgler, *Financial Markets and the Allocation of Capital*, 58 J. FIN. ECON. 187 (2000) (exploring international differences in the efficiency of capital allocation).

47. *See* Kathryn Judge, *Fee Effects*, 98 IOWA L. REV. 1517, 1543–47 (2013) (analyzing the effects of concentration in commercial and investment banking); Randall S. Thomas, Stewart J. Schwab & Robert G. Hansen, *Megafirms*, 80 N.C. L. REV. 115, 180–86 (2001) (describing the increasing market power in debt offerings and initial public offerings of a few investment banks); Arthur E. Wilmarth, Jr., *The Transformation of the U.S. Financial Services Industry, 1975–2000: Competition, Consolidation, and Increased Risks*, 2002 U. ILL. L. REV. 215, 251–54 (describing the relentless process of consolidation in the banking industry in recent decades). The domination of investment banks in this field was reduced, though not eliminated, in 1999 when the Glass-Steagall Act was repealed and commercial banks were allowed to enter the underwriting markets. *See* Charles K. Whitehead, *Size Matters: Commercial Banks and the Capital Markets*, 76 OHIO ST. L.J. 765, 800–03 (2015).

48. *Blankfein Says He's Just Doing 'God's Work,'* N.Y. TIMES: DEALBOOK (Nov. 9, 2009, 5:27 AM), https://dealbook.nytimes.com/2009/11/09/goldman-chief-says-he-is-just-doing-gods-work?mtrref=undefined&gwh=F0697C8FCADBE1F2F4A58C6732661259&gwt=pay [https://perma.cc/FW25-QTX6].

fundamental changes in the way that capital is allocated in the market, simultaneously lowering costs and broadening access to new constituencies.

The primary innovation that fintech has engineered in capital raising is the pioneering of crowdfunding.[49] Crowdfunding generally refers to the phenomenon of early-stage companies raising money from large groups of people through the internet, often aided by social networks and viral media campaigns.[50] Crowdfunding companies have broken new ground in equity raising, debt financing, and other areas. As a result, the sector has seen tremendous growth in recent years. Crowdfunding companies raised $16.2 billion in 2014,[51] and the World Bank predicts that the industry could grow to $96 billion by 2025.[52]

In equity, the traditional route for start-up companies to raise large amounts of capital from investors was through initial public offerings or venture capital firms.[53] Both of these routes were expensive and generally tended to limit the field of initial investors to large institutional investors or very wealthy individuals.[54] But a number of fintech companies have started to change the way that start-up companies seeking capital connect with people seeking investments. Through the proliferation of online crowdfunding companies such as

49. *See* C. Steven Bradford, *Crowdfunding and the Federal Securities Laws*, 2012 COLUM. BUS. L. REV. 1, 10–29 (explaining what crowdfunding is, the types of crowdfunding, and the merging of crowdsourcing and microfinance); Joan MacLeod Heminway, *Crowdfunding and the Public/Private Divide in U.S. Securities Regulation*, 83 U. CIN. L. REV. 477, 477–81 (2014) (outlining the origination and expansion of crowdfunding and the resulting application of U.S. securities law); Joan MacLeod Heminway & Shelden Ryan Hoffman, *Proceed at Your Peril: Crowdfunding and the Securities Act of 1933*, 78 TENN. L. REV. 879, 880–85 (2011) (introducing the history of crowdfunding as it relates to federal securities regulation); Joan MacLeod Heminway, *What is a Security in the Crowdfunding Era?*, 7 OHIO ST. ENTREPRENEURIAL BUS. L.J. 335, 356–61 (2012) (explaining the models of crowdfunding and crowdfunded business interests at the margin); Donald C. Langevoort & Robert B. Thompson, *"Publicness" in Contemporary Securities Regulation After the JOBS Act*, 101 GEO. L.J. 337, 339 (2013) (" '[C]rowd-funding' and other kinds of small business capital raising, gained political traction in Congress as well as in the White House.").

50. Heminway & Hoffman, *supra* note 49, at 881.

51. *Global Crowdfunding*, ECONOMIST (Apr. 4, 2015), https://www.economist.com/news/economic-and-financial-indicators/21647603-global-crowdfunding [https://perma.cc/RDJ3-WM3P].

52. JASON BEST, SHERWOOD NEISS & RICHARD SWART, WORLD BANK, CROWDFUNDING'S POTENTIAL FOR THE DEVELOPING WORLD 43 (2013), https://www.infodev.org/infodev-files/wb_crowdfundingreport-v12.pdf [https://perma.cc/276T-4SF5].

53. *See* JOSEPH W. BARTLETT, EQUITY FINANCE: VENTURE CAPITAL, BUYOUTS, RESTRUCTURINGS AND REORGANIZATIONS § 1.1 (2d ed. 2018).

54. *See* Christine Hurt, *Pricing Disintermediation: Crowdfunding and Online Auction IPOs*, 2015 U. ILL. L. REV. 217, 221 (noting that "[t]he most optimistic commentators hope that crowdfunding eases access to capital markets for promising for-profit ventures, creating a new step in the life cycle of a startup: friends and family funding, *crowdfunding*, angel investing, venture capital . . ., and then IPO").

AngelList and FundersClub, early stage companies can reach significantly broader audiences. FundersClub, for example, facilitates the pooling of capital from large groups of investors through its website, thus allowing smaller investors to purchase equity stakes in start-ups without the large minimum investments typically required by venture capital funds.[55] Equity crowdfunding sites facilitate transactions that are entirely online, and the fintech companies merely serve as intermediaries in the exchange. The industry has been buoyed by the passage of new regulations designed to encourage crowdfunding.[56] The proliferation of these sorts of equity crowdfunding sites suggests an enduring expansion of potential sources of funds for start-ups.[57]

Fintech has also made significant headway in debt financing, both for businesses and for individuals. Loans to small businesses have always been an uncertain and costly sector of the market, and many banks have cut back on them after the financial crisis.[58] But fintech has stepped into the void with a number of innovations, perhaps most importantly in peer-to-peer lending.[59] Firms such as Prosper and

55. Most venture capital funds require minimum investments of between $50,000 and $250,000 to participate in their offerings, while FundersClub investors can make investments as small as $3,000. Ryan Westwood, *Startup Investing Could Get a Lot More Angels*, FORBES 2 (Oct. 28, 2015, 3:11 PM), https://www.forbes.com/sites/ryanwestwood/2015/10/28/startup-investing-could-get-a-lot-more-angels/2/#538cbb486de1 [https://perma.cc/V6AM-UCBN]. AngelList has an even lower minimum investment of $1,000. *Investing on AngelList*, ANGELLIST, https://angel.co/invest/start (last visited Mar. 17, 2018) [https://perma.cc/22JX-TK5V].

56. The JOBS Act of 2012 included new exemptions for certain crowdfunding transactions. Jumpstart Our Business Startups (JOBS) Act, Pub. L. No. 112-106, § 302, 126 Stat. 306, 315 (2012). The Act has come under some criticism, however, for not going far enough to allow greater access to crowdfunding. *See* Joan MacLeod Heminway, *How Congress Killed Investment Crowdfunding: A Tale of Political Pressure, Hasty Decisions, and Inexpert Judgments That Begs for a Happy Ending*, 102 KY. L.J. 865, 880–85 (2014) (arguing that the Act imposed significant costs on crowdfunding in excess of the expected benefits); Jason W. Parsont, *Crowdfunding: The Real and the Illusory Exemption*, 4 HARV. BUS. L. REV. 281, 284 (2014) (arguing that retail crowdfunding is "not viable" under the JOBS Act).

57. One large crowdfunding site, Indiegogo, entered the equity crowdfunding space in November 2016 and, by December, had already raised $575,000 in equity funds. Tess Murphy, *Equity Crowdfunding: 4 Weeks In, $575k+ Raised*, INDIEGOGO (Dec. 14, 2016), https://go.indiegogo.com/blog/2016/12/equity-crowdfunding-success.html [https://perma.cc/HHN8-3JBK]. And crowdfunding is expanding the pool of potential investors; a 2015 study by the UK's Financial Conduct Authority found that 62% of investors in crowdfunding sites had no prior investment experience. *A Review of the Regulatory Regime for Crowdfunding and the Promotion of Non-readily Realisable Securities by Other Media*, FIN. CONDUCT AUTHORITY 5 (Feb. 2015), https://www.fca.org.uk/publication/thematic-reviews/crowdfunding-review.pdf [https://perma.cc/2CLY-C7SH].

58. *See Crowdfunding: Cool, Man*, ECONOMIST (May 9, 2015), https://www.economist.com/news/special-report/21650291-where-small-businesses-can-borrow-if-banks-turn-them-down-cool-man [https://perma.cc/VGU6-RAEE] ("But what bankers would surely have disdained, the public seized with gusto . . . .").

59. For an analysis of the regulatory status of peer-to-peer lending, see Andrew Verstein, *The Misregulation of Person-to-Person Lending*, 45 U.C. DAVIS L. REV. 445 (2011).

Lending Club, instead of providing loans themselves, connect companies and individuals who need money to regular individuals, rather than traditional financial institutions, who are willing to loan them that money.[60] Funding Circle, another firm active in this market, calls itself "the bond market for small companies."[61] Debt crowdfunding companies have introduced a number of innovations to support the industry, including such practices as using big data to more accurately assess the risk of loans, mobile applications and online platforms to streamline and clarify loan management and terms, and automated investing platforms to allow investors to automatically purchase loans within certain risk ratios.[62]

Peer-to-peer lending companies have also helped drive down the cost of borrowing for consumers. Just to name a few examples, fintech companies have entered the student loan market,[63] the auto loan market,[64] and the home mortgage market,[65] in each case lowering costs by reducing the difficulty of connecting investors with borrowers. In the student loan market, one major player, SoFi, has focused on connecting alumni from particular schools with current students at those schools, under the belief that the alumni have a better sense of the potential risks and rewards of the investment.[66] While the strategies in each of these markets differ, all of these consumer-facing fintech companies promise lower interest rates for borrowers, and better returns for individual investors, by utilizing technology and online networks to cut out costs.

Finally, beyond equity and debt crowdfunding, fintech companies have also demonstrated that companies can raise capital in other, more creative ways. At a number of fintech sites, companies seeking to raise capital can reward early investors, not with shares or

60. Moyer, *supra* note 17.

61. *Crowdfunding: Cool, Man*, *supra* note 58.

62. *See Frequently Asked Questions*, FUNDING CIRCLE, https://www.fundingcircle.com/us/invest/faq/ (last visited Mar. 17, 2018) [https://perma.cc/KB22-7Z9D] (detailing such innovations as provided by online marketplace Funding Circle).

63. *See* Robert Farrington, *The Rise of Peer to Peer Student Loans*, FORBES 1 (Aug. 13, 2014, 8:48 AM), https://www.forbes.com/sites/robertfarrington/2014/08/13/the-rise-of-peer-to-peer-student-loans/#289557b34edb [https://perma.cc/F4JJ-7G52].

64. *See Car Loans: New Engine*, ECONOMIST (May 7, 2016), https://www.economist.com/news/finance-and-economics/21698276-fintech-firms-find-way-finance-purchases-secondhand-cars-new-engine [https://perma.cc/4268-UPJ2].

65. *See* Ben McLannahan, *Fintech Start-Ups Look to Build on US Mortgage Market Share*, FIN. TIMES (Nov. 24, 2016), https://www.ft.com/content/e83f9a78-b1bc-11e6-9c37-5787335499a0 [https://perma.cc/X8ZB-RSJL].

66. Peter Rudegeair & Telis Demos, *Slump Might Turn Anti-bank SoFi into a Bank*, WALL ST. J. (July 12, 2016, 11:56 AM), https://www.wsj.com/articles/slump-might-turn-anti-bank-sofi-into-a-bank-1468339004 [https://perma.cc/N7P2-DHWW].

bonds, but with products or services.[67] Companies such as Kickstarter and Indiegogo, for example, allow companies to raise money from the public for various projects, primarily in the technology and media sectors, and in return, their "backers" receive "rewards" such as early prototypes of the products or free t-shirts and tote bags.[68] Similarly, a number of new ventures have raised funds for research and development through "initial coin offerings," under which investors buy digital tokens that they hope will eventually entitle them to use the services generated by the venture.[69] The popularity of these sorts of crowdfunding sites has made it far easier and less expensive for early stage companies to raise funds for expansion and product development. These sites have also allowed small businesses that might not have received the support of traditional banks to access capital.

Thus, crowdfunding is revolutionizing the process of capital raising. Crowdfunding sites are reducing costs, tapping new markets, and utilizing technology and big data to compete with traditional players. Many are operating in areas that suffer from market failures, such as the auto loan market where moral hazard and lack of information inhibit efficient transactions. Fintech has sought out and identified these areas and has attempted to eliminate the market failures. In essence, fintech's aim is to reduce transaction costs in order to improve capital allocation in a wide range of markets. They have demonstrated that alternative sources of financing are not as difficult to find as they once were.

C. Virtual Currency

In addition to asset management and crowdfunding, fintech has also innovated in an even more fundamental facet of finance—that is, the structure of currency itself. It is hard to imagine a more essential

67. Perhaps the most infamous case is that of Oculus Rift. In 2012, Oculus raised $2.5 million from investors through the crowdfunding site Kickstarter. The money was used to develop the Oculus Rift virtual reality headset. In return, Oculus promised to give the headsets to the investors if and when they were produced. The investors, notably, did not receive equity interests in the company. Two years later, in 2014, Oculus was sold to Facebook for $2 billion. Christopher Mims, *Tech Startup Crowdfunding Isn't All It's Cracked Up to Be*, WALL ST. J. (Dec. 7, 2015), https://www.wsj.com/articles/tech-startup-crowdfunding-isnt-all-its-cracked-up-to-be-1449464460 [https://perma.cc/JC3S-8AUA].

68. Carol Benovic & Sid Orlando, *Need Some Reward Ideas? Here Are 96 of Them*, KICKSTARTER BLOG (Apr. 16, 2015), https://www.kickstarter.com/blog/need-some-reward-ideas-here-are-96-of-them [https://perma.cc/2GL2-BE5Z].

69. *See* Jonathan Rohr & Aaron Wright, *Blockchain-Based Token Sales, Initial Coin Offerings, and the Democratization of Public Capital Markets* (Univ. of Tenn. Legal Studies Research, Working Paper No. 338, 2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3048104 [https://perma.cc/X5WY-W2F7].

underpinning of the modern economy than money. As Niall Ferguson has put it, "the ascent of money has been essential to the ascent of man."[70] Until now, the process of creating and distributing currency has been the province of governments.[71] Fintech is starting to challenge that system, primarily through the invention of "virtual currencies."[72]

Virtual currency refers generally to digital money that is electronically created and stored but that lacks the status of legal tender backed by government authority.[73] The rise of virtual currency is in a sense the culmination of a larger and longer process of the steady decentralization of control over money supplies.[74] When money could only change hands through coins minted by the government, the government had exclusive control over the means and value of exchanges. Money served a primarily public function: if governments wished to mint more coins or to debase their currencies, they had the power to do so.[75] But once banks allowed people to deposit money into their reserves and simultaneously loaned that money out to borrowers, money could be "created" by the private sector.[76] With the proliferation of credit and debit cards, money can be exchanged without ever using the hard currency that governments print and mint.[77] So, in a sense, money has been virtual and digital for some time.

The primary innovation of fintech in recent years, however, has been to remove government currencies from the process entirely. It has done so by utilizing decentralized, peer-to-peer networks enabled

70. NIALL FERGUSON, THE ASCENT OF MONEY: A FINANCIAL HISTORY OF THE WORLD 2 (2008).

71. *Id.* at 23–24. An important exception can be found in the private bank notes issued during the so-called Free Banking Era in the United States from 1837 to 1863, during which individual banks would print notes that entitled holders to payment from the bank in gold or silver. *See* HUGH ROCKOFF, THE FREE BANKING ERA: A REEXAMINATION (1975).

72. *See* Carla L. Reyes, *Moving Beyond Bitcoin to an Endogenous Theory of Decentralized Ledger Technology Regulation: An Initial Proposal*, 61 VILL. L. REV. 191, 199–202 (2016) (explaining the potentially broad applications of decentralized ledger technology, including Bitcoin); Kevin V. Tu & Michael W. Meredith, *Rethinking Virtual Currency Regulation in the Bitcoin Age*, 90 WASH. L. REV. 271, 277–96 (2015) (detailing Bitcoin and other virtual currencies and their rise to prominence).

73. Tu & Meredith, *supra* note 72, at 278; *see Virtual Currency Schemes*, EUR. CENT. BANK 13–19 (Oct. 2012), http://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemes201210en.pdf [https://perma.cc/Z2XN-XEV4] (defining and categorizing virtual currency schemes).

74. CHRISTINE DESAN, MAKING MONEY: COIN, CURRENCY, AND THE COMING OF CAPITALISM 25 (2014); Adam J. Levitin, *Safe Banking: Finance and Democracy*, 83 U. CHI. L. REV. 357, 376–79 (2016); *Virtual Currency Schemes*, *supra* note 73, at 41–52.

75. Levitin, *supra* note 74, at 376–77.

76. *Id.* at 377.

77. *See* Julia Gladstone, *Survey of the Law of Cyberspace: Introduction*, 53 BUS. LAW. 217, 221 (1997) ("Secure Electronic Transactions . . . [have] made credit card transactions on the Internet secure and, as a result, cashless and credit sales on the Internet are burgeoning.").

through a public ledger known as the "blockchain."[78] While a comprehensive analysis of the technology underlying virtual currency is beyond the scope of this Article,[79] a few key features should be highlighted.

First, transactions in virtual currency are recorded on a publicly available ledger, or blockchain, rather than routed through financial institutions.[80] This ledger, which amounts to a log of all previous transactions, is continuously downloaded by users, thereby authenticating and confirming each transaction as it happens.[81] The distributed and consensual nature of the networks gives users greater confidence that fraudulent transactions will be identified and prevented. The network itself is used to monitor and verify currency creation and transfer.[82]

Second, new currency is created through a process called "mining."[83] Users that provide computer power to process virtual currency transactions are rewarded with virtual currency for their services to the network.[84] This creates an incentive for users to contribute to the proper functioning of the currency.

Third, virtual currency exchanges have sprung up to allow parties to buy and sell virtual currencies.[85] These exchanges contribute to establishing the value of the currencies by providing a readily available way to exchange virtual currency for other currencies, such as

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78. The importance of blockchain extends beyond just virtual currencies. The technology is being used in a variety of different contexts, from bank trading to real estate government services. *See, e.g.*, Telis Demos, *J.P. Morgan Has a New Twist on Blockchain*, WALL ST. J. (Oct. 3, 2016, 8:51 PM), https://www.wsj.com/articles/j-p-morgan-has-a-new-twist-on-blockchain-1475537138 [https://perma.cc/B7VQ-GSKA]; Nikhil Lohade, *Dubai Aims to Be a City Built on Blockchain*, WALL ST. J. (Apr. 24, 2017, 10:08 PM), https://www.wsj.com/articles/dubai-aims-to-be-a-city-built-on-blockchain-1493086080 [https://perma.cc/26A6-KNFY]; *Governments May Be Big Backers of the Blockchain*, ECONOMIST (June 1, 2017), https://www.economist.com/news/business/21722869-anti-establishment-technology-faces-ironic-turn-fortune-governments-may-be-big-backers [https://perma.cc/47RK-QWU6].

79. For a survey of the technology underlying blockchain and virtual currencies, see Jesse Yli-Huumo, Deokyoon Ko, Sujin Choi, Sooyong Park & Kari Smolander, *Where Is Current Research on Blockchain Technology?—A Systematic Review*, PLOS ONE (Oct. 3, 2016), http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0163477 [https://perma.cc/54PP-BVC2].

80. Reyes, *supra* note 72, at 197.

81. *Id.* at 197–99.

82. *The Economist Explains: How Does Bitcoin Work?*, ECONOMIST (Apr. 11, 2013), http://www.economist.com/bitcoinexplained [https://perma.cc/KK5R-9PEL].

83. Tu & Meredith, *supra* note 72, at 283.

84. PEDRO FRANCO, UNDERSTANDING BITCOIN: CRYPTOGRAPHY, ENGINEERING, AND ECONOMICS 106 (2015).

85. *See* Nikolei M. Kaplanov, *Nerdy Money: Bitcoin, the Private Digital Currency, and the Case Against Its Regulation*, 25 LOY. CONSUMER L. REV. 111, 121–23 (2012) (explaining Bitcoin exchanges).

dollars or euros.[86] As will be discussed further below, because of their centrality to the system, these exchanges have become the target of hackers, resulting in several high-profile attacks.[87]

Finally, virtual currencies provide varying degrees of confidentiality for the parties engaged in transactions. Bitcoin, for example, does not transmit personal information about the identity of owners, thereby providing a degree of privacy, but actual transactions in the currency are publicly available.[88] Other currencies obscure even more information, including information about past transactions.[89]

Several virtual currencies have now emerged, and it is becoming increasingly clear that these currencies will serve different purposes and different markets. Bitcoin is perhaps the most well-known virtual currency. Launched in 2009, it is now widely used in virtual transactions, with trading volumes currently reaching $30 million a day in the United States alone, and even greater volumes in China and Japan.[90] Although the Securities and Exchange Commission recently rejected a request to create an exchange-traded fund based on Bitcoin, other regulators have been more open to its development.[91] Another virtual currency, Ethereum, was created in 2015 and has already gained a significant following, at least partially due to its built-in tools for creating "smart contracts."[92] Smart contracts are contracts that

86. *See* Matthew Kien-Meng Ly, *Coining Bitcoin's "Legal-Bits": Examining the Regulatory Framework for Bitcoin and Virtual Currencies*, 27 HARV. J.L. & TECH. 587, 592 (2014) (explaining this concept as related to bitcoins).

87. *See e.g.*, Yuji Nakamura, *The Wretched, Endless Cycle of Bitcoin Hacks*, BLOOMBERG (Aug. 17, 2016), https://www.bloomberg.com/news/articles/2016-08-17/the-wretched-endless-cycle-of-bitcoin-hacks [https://perma.cc/327G-6TAA].

88. *Known Unknown*, ECONOMIST (Oct. 27, 2016), https://www.economist.com/news/finance-and-economics/21709329-another-crypto-currency-born-known-unknown [https://perma.cc/Y7D4-DWDD].

89. *See id.* (describing how Zcash, a virtual currency, uses a cryptographic technique known as "zero-knowledge proofs" to prevent any information about a transaction other than its validity from being available).

90. *See* Rob Curran, *As Bitcoin ETF Nears, Analysts Warn of Trading Frenzy*, WALL ST. J. (Feb. 5, 2017, 10:10 PM), https://www.wsj.com/articles/irrational-exuberance-for-bitcoin-etfs-1486350601 [https://perma.cc/F8TL-SP9J] (discussing the financial implications of the virtual currency).

91. *See* Alexander Osipovich, *The Future of Bitcoin Could Be Bitcoin Futures*, WALL ST. J.: MONEYBEAT (Mar. 28, 2017, 3:26 PM), https://blogs.wsj.com/moneybeat/2017/03/28/the-future-of-bitcoin-could-be-bitcoin-futures/ [https://perma.cc/7VKV-SWYH] (stating that the Commodity Futures Trading Commission, among others, is open to the introduction of Bitcoin futures); Nathaniel Popper, *S.E.C. Rejects Winklevoss Brothers' Bid to Create Bitcoin E.T.F.*, N.Y. TIMES: DEALBOOK (Mar. 10, 2017), https://www.nytimes.com/2017/03/10/business/dealbook/winkelvoss-brothers-bid-to-create-a-bitcoin-etf-is-rejected.html [https://perma.cc/P99H-9C9H] (noting the unregulated nature of Bitcoin markets).

92. *See* Paul Vigna, *Bitcoin Rival Ethereum Gains Traction*, WALL ST. J. (June 20, 2016, 11:28 PM), https://www.wsj.com/articles/bitcoin-rival-ether-gains-traction-1466461279 [https://perma.cc/WW55-DB2B] (noting that Ethereum "has become the next hot thing in cryptocurrencies").

automatically enforce their provisions through computer algorithms, rather than relying on unpredictable courts.[93] So, for example, a smart bond contract could provide that, on certain dates, interest and principal payments would automatically be sent to the creditor, triggered solely by the functioning of the algorithm. A network of such smart contracts could potentially replicate many of the features of a corporation, and indeed, some programmers have attempted to do so.[94] Yet another virtual currency, Zcash, promises complete confidentiality, specifically guaranteeing that no information about the parties or even the transaction itself will leak to third parties.[95]

The explosion of virtual currencies in recent years has drawn attention from regulators, who have concerns about the systemic implications of virtual currencies on the wider economy. But regardless of the eventual response of regulators to virtual currency, fintech has already demonstrated the feasibility of decentralized, peer-to-peer online networks to disrupt fundamental features of the financial system, in this case currency itself. It suggests that fintech will continue to challenge many of the assumptions about the respective roles of banks, governments, and individuals in finance.

II. FINANCIAL REGULATION AND SYSTEMIC RISK

Fintech has ushered in a wave of innovation and change in the financial industry. These changes have affected nearly every sector of finance, from asset management to capital raising to the form of money itself. By increasing competition and lowering prices, fintech promises to provide great benefits to society at large. But the changes also call for a broad reassessment of the adequacy of current financial regulation. In particular, fintech raises questions about one unique feature of financial regulation—its focus on systemic risk. In order to understand the potential implications of fintech for systemic risk, we must first analyze the structure and rationale of current regulations aimed at reducing the likelihood that shocks in the financial industry will lead to broader and deeper collapses in the economy as a whole.

93. *See* Reyes, *supra* note 72, at 201 ("Smart contracts can be thought of as self-executing transactions, or as 'automated programs that transfer digital assets within the block-chain upon certain triggering conditions . . . .' "(alteration in original) (quoting Joshua A.T. Fairfield, *Smart Contracts, Bitcoin Bots, and Consumer Protection*, 71 WASH. & LEE L. REV. ONLINE 35, 38 (2014))).

94. *See Not-So-Clever Contracts*, ECONOMIST (July 28, 2016), https://www.economist.com/news/business/21702758-time-being-least-human-judgment-still-better-bet-cold-hearted [https://perma.cc/9SSR-2GLP].

95. *See Known Unknown*, *supra* note 88.

A. Systemic Risk

While the financial system has grown in size and complexity over the years, its core purpose has always been a simple one: to mediate between suppliers of capital and users of capital.[96] The efficient allocation of capital is central to the functioning of modern-day economies, and the health of the financial system is closely correlated with economic growth more generally.[97] But like all markets, the financial system does not always function properly. Individual financial institutions pursuing their own private interests sometimes impose costs on the public, perhaps as a result of the underproduction of public goods or the lack of relevant information or the development of monopolies. In these instances, governments have an interest in intervening to correct the inefficient behavior.[98] Financial regulation, thus, aims to improve the functioning of the financial system by, among other things, correcting market failures, limiting externalities, and protecting vulnerable parties.[99]

Given the centrality of the financial sector to economic growth, it is perhaps unsurprising that financial regulation has long been distinguished by its particular focus on systemic risk.[100] Many of the country's economic crises, after all, have been precipitated by crises in the financial sector.[101] When banks struggle, their problems ripple out to the broader economy. This type of externality is a classic rationale for government regulation, and, as a result, financial regulation has been structured so as to minimize systemic risk.[102]

96. *See* JOHN ARMOUR, DAN AWREY, PAUL DAVIES, LUCA ENRIQUES, JEFFREY GORDON, COLIN MAYER & JENNIFER PAYNE, PRINCIPLES OF FINANCIAL REGULATION 22–51 (2016) (discussing the underlying policies and principles of financial regulation).

97. *Id.* at 26 (analyzing the relationship between financial markets and overall economic health).

98. *See* Alan S. Binder, *It's Broke, Let's Fix It: Rethinking Financial Regulation*, 6 INT'L J. CENT. BANKING 277, 279–80 (2010) (discussing the four main reasons for financial regulations).

99. *Id.* at 51–80 (providing in-depth explanations of these rationales).

100. *See* Iman Anabtawi & Steven L. Schwarcz, *Regulating* Ex Post*: How Law Can Address the Inevitability of Financial Failure*, 92 TEX. L. REV. 75 (2013) (analyzing the implications of ex ante and ex post approaches to reducing financial systemic risk); Robert Charles Clark, *The Soundness of Financial Intermediaries*, 86 YALE L.J. 1 (1976) (describing the rationales underlying the regulation of risk at financial companies); Charles K. Whitehead, *Reframing Financial Regulation*, 90 B.U. L. REV. 1 (2010) (arguing that the principal issues that financial regulation is intended to address are market stability and risk-taking).

101. *See* CHARLES P. KINDLEBERGER & ROBERT ALIBER, MANIAS, PANICS AND CRASHES: A HISTORY OF FINANCIAL CRISES 1–20 (5th ed. 2005) (discussing how wealth mismanagement and misuse of credit often led to financial crises).

102. *See* ARMOUR ET AL., *supra* note 96, at 51–52 (noting the reactionary structuring of financial regulation).

The term "systemic risk" is a widely used but poorly understood concept. Systemic risk generally refers to the probability that economic shocks in one part of a financial system can lead to shocks in other parts of that system.[103] Thus, an institution presents a high degree of systemic risk when adverse shocks to the institution are likely to be transmitted to other institutions in a domino-like fashion. For example, large banks are considered to present systemic risks because, if they fail, their failure has a high probability of causing adverse effects on other banks and financial institutions. Those institutions will then experience their own economic shocks, and so on and so forth, ending with a diminution of activity in the broader economy and potentially a reduction in growth or even recession in the macroeconomy.[104]

There has been a significant amount of economic literature on the stability of various market structures and their relative levels of systemic risk.[105] While there is by no means consensus in the field, four factors stand out as primary contributors: (1) the extent to which individual actors are vulnerable to rapid, adverse shocks;[106] (2) the existence of multiple pathways for adverse shocks to spread from a single institution to others;[107] (3) the level of asymmetric information in

103. *See* Adam J. Levitin, *In Defense of Bailouts*, 99 GEO. L.J. 435, 444–45 (2011) (noting that "[t]he existing literature has generally identified systemic risk as the risk of a single firm's failure having substantial negative effects on the broader economy"); Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193, 197 (2008) (describing systemic risk as involving "a trigger event, such as an economic shock or institutional failure, [that] causes a chain of bad economic consequences—sometimes referred to as a domino effect").

104. *See* Franklin Allen & Douglas Gale, *Financial Contagion*, 108 J. POL. ECON. 1, 1–2 (2000) ("One theory is that small shocks, which initially affect only a few institutions or a particular region of the economy, spread by contagion to the rest of the financial sector and then infect the larger economy.").

105. *See, e.g.*, George G. Kaufman, *Bank Contagion: A Review of the Theory and Evidence*, 8 J. FIN. SERVS. RES. 123 (1994) (discussing the abundance of literature on failure contagion); Marina Brogi, Valentina Lagasio & Luca Riccetti, Systemic Risk Measurement: Bucketing G-SIBs Between Literature and Supervisory View (Feb. 10, 2017) (unpublished working paper), https://ssrn.com/abstract=2915172 [https://perma.cc/WY36-22EB]) (noting previous works on financial systems and systemic risks).

106. *See* JOSEPH FIKSEL, RESILIENT BY DESIGN: CREATING BUSINESSES THAT ADAPT AND FLOURISH IN A CHANGING WORLD 4–6 (2015) (discussing the susceptibility of business enterprises to disruption); NASSIM NICHOLAS TALEB, ANTIFRAGILE: THINGS THAT GAIN FROM DISORDER 20–21 (2012) (noting the effects of shock on institutions); Lawrence H. White, *Antifragile Banking and Monetary Systems*, 33 CATO J. 471, 474–79 (2013) (discussing how legal restrictions may have contributed to the fragility of banking systems).

107. *See* Fabio Caccioli, Munik Shrestha, Christopher Moore & J. Doyne Farmer, *Stability Analysis of Financial Contagion Due to Overlapping Portfolios*, 46 J. BANKING & FIN. 233, 233 (2014) ("Financial contagion comes through different channels, including (i) counterparty risk, (ii) roll-over risk, and (iii) common asset holdings, i.e. overlapping portfolios."); Graciela Kaminsky, Carmen Reinhardt & Carlos Végh, *The Unholy Trinity of Financial Contagion*, 17 J. ECON. PERSP. 51 (2003) (discussing the spread of financial contagion); Olivier de Bandt & Philipp Hartmann, *Systemic Risk: A Survey* 10–18 (Eur. Cent. Bank, Working Paper No. 35, 2000),

the market;[108] and (4) the overall size of the market.[109] While the presence of any one of these features in a market may not be sufficient to conclude that a market poses a systemic risk to the economy, the presence of all four should be considered a red flag.

With respect to the first factor, systemic risk generally increases where individual actors in a system are vulnerable to rapid, adverse shocks. In other words, where particular firms are highly dependent on volatile resources or products or customers, the likelihood that any single adverse change will cause significant harm to the firm increases. Indeed, in recent years, a number of scholars have focused on ways to make firms and markets "antifragile."[110] The idea here is that certain traits make individuals and institutions resilient, or even help them to thrive, in the face of stress. In particular, an institution is antifragile when it is flexible and responsive to change, rather than rigid and unbending. One classic way to increase the resiliency of an institution is through diversification.[111] If firms are widely invested in a number of uncorrelated areas, the likelihood that a change in circumstances will affect all of their interests decreases. An alternative way to increase resiliency, and thus reduce vulnerability, is to establish asset buffers to withstand stresses.[112] This has been one of the primary approaches

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=258430 [https://perma.cc/MM3Z-VVSX] (noting the propagation mechanisms for systemic shock).

108. *See* Bandt & Hartmann, *supra* note 107, at 6 ("Some financial crises might just eliminate inefficient players in the system, in particular when asymmetric information has prevented the market mechanism from doing its job ex ante."); Markus K. Brunnermeier & Martin Oehmke, *Bubbles, Financial Crises, and Systemic Risk*, *in* 2B HANDBOOK OF THE ECONOMICS OF FINANCE 1221, 1233–38 (George M. Constantinides, Milton Harris & René M. Stulz eds., 2013) (discussing the lack of common knowledge inherent to asymmetrical information).

109. *See* Timothy Geithner, *Are We Safe Yet? How to Manage Financial Crises*, FOREIGN AFF., Jan./Feb. 2017, at 54 (discussing the impacts of a large market system on the ability of governments to limit the effects of shock).

110. The term was coined by Nassim Nicholas Taleb in his 2012 book, *Antifragile*, to refer to systems that can resist catastrophic failure. TALEB, *supra* note 106. It has since been used to examine regulatory frameworks in a number of areas, from mortgages to intellectual property to the law school market. *See* Ian Ayres & Joshua Mitts, *Anti-Herding Regulation*, 5 HARV. BUS. L. REV. 1, 17 (2015) ("The importance of the distribution of variation is stated in terms of probability theory by risk-management scholar Nassim Nicholas Taleb in his writings on uncertainty and fragility."); Jennifer Gerardo Brown, *Sustaining the Canary in Toxic Times: Parables About Survival for Legal Education*, 66 SYRACUSE L. REV. 531, 536 (2016) (using the term "antifragile" in reference to law school markets); Michal Shur-Ofry & Ofer Tur-Sinai, *Constructive Ambiguity: IP Licenses As a Case Study*, 48 U. MICH. J.L. REFORM 391, 405 n.54 (2015) (citing Taleb's book, *Antifragile*).

111. *See* White, *supra* note 106, at 476 ("We will not have achieved robustness, much less antifragility, until no single financial firm is considered systemically critical or too important to close.").

112. *See* Stijn Claessens, *Capital and Liquidity Requirements: A Review of the Issues and Literature*, 31 YALE J. ON REG. 735, 742 (2014) ("It is clear that both asset and liability structures are crucial for a bank's sound and efficient operations at reasonable ('prudent') levels of risk.").

used by domestic and international regulators to increase the stability of financial institutions—specifically, regulators require banks and other firms to establish minimum capital-to-asset ratios to ensure that they will have sufficient reserves to draw on in times of difficulty.[113]

The second factor that increases the likelihood of systemic risk is the existence of multiple pathways for the propagation of economic shocks. One particularly powerful form of propagation mechanism is interconnectedness.[114] If firms in a market are highly dependent on each other by, for example, relying on other participants for essential parts of their business or having contracts and agreements that require the cooperation (and solvency) of the other firms, then it will be more likely for shocks in one institution to spread to other institutions. A recent example of this phenomenon was the widespread use of credit default swaps before the financial crisis. Credit default swaps are complex financial derivatives that are effectively contracts requiring one party to pay another party in the event of the default or bankruptcy of a third party.[115] While they were initially designed as a way to protect a party from the risk that another party would not comply with the terms of its agreements, they eventually morphed into a giant market (which at its height was worth $58 trillion) for bets on the financial insolvency of certain institutions.[116] But when Lehman Brothers, a large investment bank, failed in 2007, and other firms failed or threatened to fail in the coming months, the failure had far-reaching repercussions throughout the industry, as the credit default swaps effectively magnified and transmitted these losses to other actors.[117] Propagation mechanisms take a number of less obvious forms as well, such as closely coordinated business strategies, shared risks, and

113. *See* Robert F. Weber, *Post-Crisis Reform of the Supervisory System and High Reliability Theory*, 50 GA. L. REV. 249, 255 (2015) (noting that minimum capital ratios are the "most loss-absorbent capital").

114. *See* Zachary Gubler, *Regulating in the Shadows: Systemic Moral Hazard and the Problem of the Twenty-First Century Bank Run*, 63 ALA. L. REV. 221, 252–53 (2012) ("The systematic moral hazard problem is likely to lead to increased failure risk at both the securitized bank and at other entities that are 'too interconnected to fail.' ").

115. For a fuller description of the nature and growth of the credit default market, see Douglas B. Levene, *Credit Default Swaps and Insider Trading*, 7 VA. L. & BUS. REV. 231 (2012).

116. *See* Sean Campbell & Josh Gallin, *Risk Transfer Across Economic Sectors Using Credit Default Swaps*, BOARD GOVERNORS FED. RES. SYS. (Sept. 3, 2014), https://www.federalreserve.gov/econresdata/notes/feds-notes/2014/risk-transfer-across-economic-sectors-using-credit-default-swaps-20140903.html [https://perma.cc/5SEB-27JU].

117. *See* Jeremy C. Kress, *Credit Default Swaps, Clearinghouses, and Systemic Risk: Why Centralized Counterparties Must Have Access to Central Bank Liquidity*, 48 HARV. J. ON LEGIS. 49, 59–61 (2011) (noting that the crisis would likely have been exacerbated without governmental intervention).

consumer behavioral patterns, all of which can serve to spread economic shocks from one actor to another.[118]

The third factor that increases systemic risk in an industry is the presence of significant information asymmetries in the market.[119] If parties cannot accurately assess the status or solvency of other actors in a market in times of economic shock, they may well assume the worst and take retrenching actions, such as terminating contracts, withdrawing deposits, or pursuing litigation.[120] This can lead to cascading effects, as the lack of information requires parties to act as if the information is bad.[121] Information asymmetries were at the root of the bank runs of the Great Depression: unsure about the reserves and future actions of rural banks where they had deposited their savings, depositories assumed that banks were likely to fail and thus hurried to withdraw their assets.[122] Information asymmetries also contribute to systemic risk by reducing market efficiency.[123] When information is unavailable or prohibitively expensive to gather, beneficial transactions are disincentivized, resulting in inefficient markets that are more susceptible to collapse.[124]

Finally, systemic risk increases as the overall size of a market increases. The concept here is simple: the more central a market is to the broader economy, the more likely it is that cascading failures or adverse changes in the market will have a substantial effect on

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118. *See* Stijn Claessens, Rudiger Dornbusch & Yung Chul Park, *Contagion: Why Crises Spread and How This Can Be Stopped*, *in* INTERNATIONAL FINANCIAL CONTAGION 36 (Stijn Claessens & Kristin J. Forbes eds., 2001) (discussing less prominent propagation mechanisms); Kristin Forbes & Roberto Rigobon, *Measuring Contagion: Conceptual and Empirical Issues*, *in* INTERNATIONAL FINANCIAL CONTAGION, *supra*, at 43–66 (defining "contagion" and detailing its spread).

119. Some scholars have even argued that information asymmetry is the *primary* cause of systemic risk. *See, e.g.*, Gary Gorton & Lixin Huang, *Bank Panics and the Endogeneity of Central Banking*, 53 J. MONETARY ECON. 1613, 1618 (2006) (stating that information asymmetry significantly contributes to widespread panic and fund withdrawals).

120. *See* Utset, *supra* note 7, at 803–09 (noting that parties may not always have all available information, and this lack of information plays into business decisions).

121. *See* Kathryn Judge, *Fragmentation Nodes: A Study in Financial Innovation, Complexity, and Systemic Risk*, 64 STAN. L. REV. 657, 696–97 (2012) (stating that information loss leads to uncertainty and fear of the future).

122. *See* Charles W. Calomiris & Gary Gorton, *The Origins of Banking Panics: Models, Facts, and Bank Regulation*, *in* FINANCIAL MARKETS AND FINANCIAL CRISES 109 (R. Glenn Hubbard ed., 1991) (defining bank runs and discussing their resulting inefficiencies).

123. *Id.*

124. *Id.* Information asymmetries increase uncertainty for the party at an informational disadvantage. This uncertainty can generate inefficiencies in one of two ways: first, it may lead parties to enter into value-destroying transactions that they would have avoided if they had sufficient information; and, second, it may lead parties to refrain from entering into value-creating transactions that they would have agreed on if they had sufficient information. *Id.*

economic growth.[125] One of the reasons why the subprime mortgage crisis triggered the financial crisis was the sheer size of the industry: U.S. home mortgage debt relative to GDP rose from 46% in the 1990s to 73% in 2008, reaching a total of $10.5 trillion.[126] If the market had been smaller, its collapse might not have had the far-reaching implications that it did.[127]

Financial regulation has attempted to reduce systemic risk in the financial industry by targeting these potential vulnerabilities (although, for obvious reasons, they have generally refrained from limiting the overall size of the financial industry). Capital adequacy requirements reduce the vulnerability of individual institutions to external shocks, deposit guarantees reduce the propensity for failures at one institution to spread to other institutions, and disclosure requirements reduce information asymmetries.[128] While the relative importance of these various factors in the financial regulatory scheme has varied over time, the basic focus on systemic risk has remained a constant.

B. Dodd-Frank and Too Big to Fail

Following the financial crisis, the focus on systemic risk reached a fever pitch.[129] The underlying causes of the crisis are still the matter of substantial debate, but most observers agree that the financial industry played an essential role in creating unacceptably high levels of systemic risk.[130] In an interesting twist, however, systemic risk

125. *See* Geithner, *supra* note 109, at 56 (describing how "[w]hen expected losses to the value of assets appear very large, there will be uncertainty about which party will bear those losses," leading to a "general reduction in funding for a broad range of financial institutions"). Conversely, small markets are less likely to pose systemic risks. *See* Roger Ferguson & David Laster, *Hedge Funds and Systemic Risk*, *in* BANQUE DE FRANCE, NO. 10, FINANCIAL STABILITY REVIEW 45, 51 (2007) (noting that losses in small, isolated markets have "little systemic risk").

126. Colin Barr, *The $4 Trillion Housing Headache*, FORTUNE (May 27, 2009, 4:05 PM), http://archive.fortune.com/2009/05/27/news/mortgage.overhang.fortune/index.htm [https://perma.cc/J6PQ-25HB].

127. On the other hand, the rise of mortgage-backed securities amplified the effects of the mortgage crisis. By allowing individual parties to buy and sell contracts based on the price of mortgages, mortgage-backed securities created a situation in which much more than the value of the mortgage was at stake in any individual home loan.

128. *See* ARMOUR ET AL., *supra* note 96, at 51–80 (discussing methods for reducing risks).

129. *See* Schwarcz, *supra* note 103, at 193 (describing the increasing attention to systemic risks and offering a conceptual framework for identifying them); Hal S. Scott, *The Reduction of Systemic Risk in the United States Financial System*, 33 HARV. J.L. & PUB. POL'Y 671, 673 (2010) ("Going forward, the central problem for financial regulation (defined as the prescription of rules, as distinct from supervision or risk assessment) is to reduce systemic risk.").

130. For a sampling of the divergent views, see ALAN S. BLINDER, AFTER THE MUSIC STOPPED: THE FINANCIAL CRISIS, THE RESPONSE, AND THE WORK AHEAD (2013); ROSS GARNAUT & DAVID LLEWELLYN-SMITH, THE GREAT CRASH OF 2008 (2009); CARMEN M. REINHART & KENNETH S.

became widely connected with a similar, though slightly different, concept—"too big to fail."[131]

Generally speaking, the "too big to fail" concept refers to the idea that once institutions (primarily banks) reach a certain size and become sufficiently integrated into financial networks such that their failure would impose significant costs on other sectors of the economy, the government cannot plausibly allow them to fail and, instead, in cases of crisis, will always intervene to bail them out.[132] Understanding this dynamic, large banks have incentives to engage in excessively risky behavior (such as large bets on complex derivatives or investments in subprime mortgages) because they will not bear the full costs of their actions. This is the classic problem of moral hazard.[133] Knowing that gains will be internalized while losses are externalized, large banks (and bankers working at those banks) do not feel the normal constraints of market discipline and instead can act with a reckless disregard for catastrophic loss.[134] "Too big to fail" institutions, thus, can become the engines of systemic risk in the economy.

In the years after the financial crisis, "too big to fail" became a focus of both public outrage and legislative action. The belief that the root causes of the financial crisis lay in the increasing concentration of

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ROGOFF, THIS TIME IS DIFFERENT: EIGHT CENTURIES OF FINANCIAL FOLLY (2009); NOURIEL ROUBINI & STEPHEN MIHM, CRISIS ECONOMICS: A CRASH COURSE IN THE FUTURE OF FINANCE (2010); JOSEPH E. STIGLITZ, FREEFALL: AMERICA, FREE MARKETS, AND THE SINKING OF THE WORLD ECONOMY (2010).

131. *See* ANDREW ROSS SORKIN, TOO BIG TO FAIL: THE INSIDE STORY OF HOW WALL STREET AND WASHINGTON FOUGHT TO SAVE THE FINANCIAL SYSTEM—AND THEMSELVES (2010) (detailing the financial crisis on Wall Street and the concept of "too big to fail"); John Crawford, *Predicting Failure*, 7 VA. L. & BUS. REV. 171, 173 (2012) (describing the problems of "hidden risk and bureaucratic inertia in the regulation of systemically important financial institutions").

132. There is some debate about whether the root problem of "too big to fail" is the size of the institution or the interconnectedness of the institution. *See* Gubler, *supra* note 114, at 253 (arguing that financial markets have created institutions that must be rescued from failure, not because they are too large, but because they are "too interconnected with other institutions in the capital markets"); *see also* Marcelo Dabós, *Too Big to Fail in the Banking Industry: A Survey*, *in* TOO BIG TO FAIL: POLICIES AND PRACTICE IN GOVERNMENT BAILOUTS 141, 141 (Benton E. Gup ed., 2004) ("The too big to fail (TBTF) doctrine states that governments will intervene in order to prevent failures of large institutions, mainly banks.").

133. *See* John Crawford, *The Moral Hazard Paradox of Financial Safety Nets*, 25 CORNELL J.L. & PUB. POL'Y 95, 95 (2015) ("Moral hazard plays a central role in almost every narrative of the recent financial crisis . . . ."). For descriptions of the application of moral hazard in other industries, see Lucian A. Bebchuk & Holger Spamann, *Regulating Bankers' Pay*, 98 GEO. L.J. 247, 255–57 (2010); Ronald J. Gilson & Alan Schwartz, *Understanding MACs: Moral Hazard in Acquisitions*, 21 J.L. ECON. & ORG. 330 (2005); Albert C. Lin, *Does Geoengineering Present a Moral Hazard?*, 40 ECOLOGY L.Q. 673 (2013); and Steven Shavell, *On Moral Hazard and Insurance*, 93 Q.J. ECON. 541, 541 (1979).

134. *See generally* Viral V. Acharya, Deniz Anginer & A. Joseph Warburton, The End of Market Discipline? Investor Expectations of Implicit Government Guarantees (May 1, 2016) (unpublished working paper), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1961656 [https://perma.cc/LRM3-CF8Q].

power—and therefore systemic risk—into a few super-large Wall Street banks drove financial reform efforts in the postcrisis years, the most important result of which was the enactment in 2010 of the Dodd-Frank Wall Street Reform and Consumer Protection Act.[135] Dodd-Frank was the most far-reaching reform of financial regulation enacted since the Great Depression. And while the Act addressed nearly every conceivable aspect of modern finance—from the creation of new regulators, to greater consumer protections, to new laws on the behavior of credit rating agencies—many of the reforms, and many of the related resources, were devoted to resolving the "too big to fail" problem.

The Dodd-Frank Act takes three general approaches to resolving the "too big to fail" problem. The first set of approaches aims to prevent such institutions from being created in the first place by prohibiting certain concentrations of assets and liabilities within any one corporation. The second set of approaches aims to regulate the behavior of "too big to fail" institutions when they do arise to reduce the risks and costs associated with them by, for example, monitoring their behavior more closely and constraining their risky behavior. The third set of approaches aims to prevent the perverse incentives created by the perception of an institution being considered "too big to fail" by ex ante binding the hands of government to prevent it from bailing out failing financial firms.

First, the Act contains a number of provisions intended to prevent systemically important, "too big to fail" institutions from being created in the first place. For example, the Act imposes flat-out prohibitions on certain concentrations of liabilities within financial institutions.[136] These include prohibitions of any mergers or consolidations that would lead to a firm having more than 10% of the total liabilities of certain groups of financial firms or, in the case of a bank, having more than 10% of the total amount of deposits of insured depository institutions.[137] The Act also grants the Federal Reserve the

135. *See* FIN. CRISIS INQUIRY COMM'N, THE FINANCIAL CRISIS INQUIRY REPORT 52 (2011), http://fcic-static.law.stanford.edu/cdn_media/fcic-reports/fcic_final_report_full.pdf [https://perma.cc/WZY6-ECJR]. For an alternative view of the root causes of the financial crisis, and the proper legislative response, see MORGAN RICKS, THE MONEY PROBLEM: RETHINKING FINANCIAL REGULATION, at x (2016) (arguing that "the fragility of the short-term funding markets was a central problem—perhaps *the* central problem—for financial stability policy").

136. 12 U.S.C. § 1852(b) (2012) (providing that "a financial company may not merge or consolidate with . . . another company, if the total consolidated liabilities of the acquiring financial company upon consummation of the transaction would exceed 10 percent of the aggregate consolidated liabilities of all financial companies").

137. *See Proposed Dodd-Frank Concentration Limit on Financial Institution M&A Transactions*, DAVIS POLK 3 (May 27, 2014), https://www.davispolk.com/sites/default/files/

authority to require financial companies to terminate activities or sell assets if the firm has more than $50 billion in assets and poses a "grave threat to the financial stability of the United States."[138] The aim of these types of regulations is to prevent companies from acquiring, through mergers or acquisitions, sufficient size or interconnectedness to render them "too big to fail."

Second, with respect to reducing the risks associated with "too big to fail" institutions when they arise, a number of provisions of Dodd-Frank establish higher standards of conduct for large financial institutions. Perhaps the most important of these is Title I of the Act, which created a new governmental body, the Financial Stability Oversight Council ("FSOC"), to oversee financial institutions and identify emerging threats to financial stability.[139] The FSOC has authority to reinforce a comprehensive regulatory regime, also established by Title I of the Act, aimed specifically at large bank holding companies and other "systemically important" nonbank firms.[140] The FSOC is required to identify financial institutions that could pose a threat to the financial stability of the United States if they failed or otherwise engaged in risky activities. Once an institution is designated as a systemically important financial institution (or "SIFI"), a heightened regulatory regime is triggered, imposing a range of behavioral and disclosure-based obligations on the firm.[141] Systemically important financial institutions must hold additional capital in order to ensure that they can withstand losses.[142] They must undergo regular "stress tests," designed to determine what the effect of certain economic shocks (such as a recession) would have on the firms.[143] They must also

05.27.14.Dodd-Frank.Concentration.Limit_.on_.Financial.Institution.MA_.pdf [https://perma.cc/73UM-JVD2] (providing an overview of the Federal Reserve's concentration limit proposal).

138. 12 U.S.C. § 5331(a).

139. *See* Hilary J. Allen, *Putting the "Financial Stability" in Financial Stability Oversight Council*, 76 OHIO ST. L.J. 1087, 1113–20 (2015) (describing the structure and mandate of FSOC).

140. *See* Troy S. Brown, *Legal Political Moral Hazard: Does the Dodd-Frank Act End Too Big to Fail?*, 3 ALA. C.R. & C.L. L. REV. 1, 40–46 (2012) (describing the role of FSOC and the Office of Financial Research).

141. The process of labeling a company as "systemically important" has been a fraught one. When FSOC designated the insurer MetLife as "systemically important" in 2014, MetLife challenged the designation in court, and the district court subsequently struck down the designation. The decision is now on appeal to the U.S. Court of Appeals for the D.C. Circuit. *See* Ryan Tracy, *MetLife Asks Appeals Court to Uphold Removal of 'SIFI' Label*, WALL ST. J. (Aug. 16, 2016, 10:38 AM), https://www.wsj.com/articles/metlife-asks-appeals-court-to-uphold-removal-of-sifi-label-1471355267 [https://perma.cc/CTW2-97QH].

142. *See* Krishnamurthy, *supra* note 7, at 3 (noting that the enhanced capital requirements for SIFIs under the Dodd-Frank Act are consistent with broader international developments under the Basel Accords).

143. For an in-depth discussion of how stress tests work in practice, see Robert Weber, *A Theory for Deliberation-Oriented Stress Testing Regulation*, 98 MINN. L. REV. 2236, 2290–2301 (2014).

create "living wills," or plans for how to be liquidated in an orderly manner and without a taxpayer bailout in the event that they do fail.[144] The overriding concern animating this set of regulations is to increase the stringency of regulatory requirements for large financial institutions.

Third, in order to prevent the moral hazard associated with financial institutions that are "too big to fail," the Act contains a commitment mechanism: it prohibits the federal government from intervening to bail out financial firms at all. During the financial crisis, the Treasury intervened in the market to purchase the troubled assets of failing firms such as Citigroup and Bank of America.[145] By doing so, the government in effect prevented banks and their creditors from taking losses that they would otherwise have suffered.[146] Of course, if parties believe that they will be bailed out if losses are too high, then they will be incentivized to engage in excessively risky behavior. Dodd-Frank aims to prevent this dynamic by prohibiting the Federal Reserve from making emergency loans to specific firms.[147] It also terminates the Federal Deposit Insurance Company's ("FDIC") emergency loan guarantee authority.[148] Finally, Dodd-Frank restricts the ability of the Treasury Department to create anything resembling the Troubled Asset Relief Program that in effect prevented banks and creditors from bearing the full costs of their behavior.[149] Instead, the Act provides for an FDIC-run receivership for the orderly liquidation of failing financial firms.[150] In other words, the government has bound its hands in order to credibly commit to nonintervention in the event of widespread financial losses.

C. Systemic Risk and Too Big to Fail

The close relationship between systemic risk and the "too big to fail" phenomenon has been echoed in academic commentary on

144. *See* Nisan Geslevich Packin, *The Case Against the Dodd-Frank Act's Living Wills: Contingency Planning Following the Financial Crisis*, 9 BERKELEY BUS. L.J. 29, 39 (2012) (describing living wills under the Dodd-Frank Act).

145. *See* Jonathan G. Katz, *Who Benefited From the Bailout?*, 95 MINN. L. REV. 1568, 1581–82 (2011) (describing how Citibank and Bank of America benefited from the Troubled Asset Relief Program ("TARP")).

146. *See* Gordon & Muller, *supra* note 7, at 190–93 (describing the FDIC's role).

147. *Id.* at 152–53.

148. For a discussion of the problematic incentives of emergency loan authority, see Anthony J. Casey & Eric A. Posner, *A Framework for Bailout Regulation*, 91 NOTRE DAME L. REV. 479, 534 (2015).

149. For a discussion of the "constitutional monstrosity" that was TARP, see Gary Lawson, *Burying the Constitution Under a TARP*, 33 HARV. J.L. & PUB. POL'Y 55, 58 (2010).

150. *See id.* at 190–93 (describing the FDIC's receivership process under Dodd-Frank).

financial regulation. Much recent scholarship on how to reform the financial industry has focused on reducing the risks posed by large institutions to the broader economy.[151] This literature has had the effect of cementing the identification of systemic risk as primarily a problem of institutional size.

This line of scholarship argues that large financial institutions are the primary threat to financial stability for a number of interrelated reasons. First, because of their size, large financial institutions necessarily create larger costs when they fail or experience adverse conditions: the failure of a bank with $1 billion in deposits will impose greater costs than the failure of a bank with $1 million, all else equal.[152] Second, because large financial institutions have connections to more parties, when they fail or suffer severe losses, these events reverberate and affect a greater number of parties.[153] So, both from a size and an interconnectedness standpoint, large financial institutions have the potential to impose greater costs on the wider economy than small financial institutions. Third, and finally, large financial institutions are more likely to engage in regulatory capture, ensuring that regulators will turn a blind eye to—or worse, fully legalize—risky behavior by banks.[154] Through lobbying or the revolving door phenomenon, large banks have an outsized influence in government and thus have a greater ability to affect the content of regulations as they develop and are enforced. Indeed, regulatory capture by big banks has become a stock explanation for the financial crisis.[155]

For all these reasons, existing literature has closely identified systemic risk with the "too big to fail" phenomenon. According to this conventional wisdom, large financial institutions are both more likely to engage in risky behavior and more likely to create negative externalities when they do so. Thus, it should come as no surprise that systemically important financial institutions have become the focus of legislative and regulatory attention in recent years.

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151. *See* sources cited *supra* note 7.

152. *See* Krishnamurthy, *supra* note 7, at 14 (noting that "the presence of large, interconnected, systemically important banks ensures that the externalities from their failure will be large").

153. *See* Gordon & Muller, *supra* note 7, at 154 ("The failure of a large financial firm may threaten others both because financial firms are interlinked and because firms following similar business strategies are likely to sink together.").

154. *See* Adam J. Levitin, *The Politics of Financial Regulation and the Regulation of Financial Politics: A Review Essay*, 127 HARV. L. REV. 1991, 1995–2037 (2014) (describing regulatory capture during the financial crisis).

155. *Id.*

III. FINTECH'S REGULATORY CHALLENGES

The assumption underlying financial regulation in the postcrisis era has been that large, "too big to fail" financial institutions are the primary source of systemic risk in the financial industry. This assumption animates many of the key provisions of the Dodd-Frank Act. It has also driven much of the academic scholarship on financial regulation in recent years. But this Part will argue that the focus on large financial institutions as the primary engines of systemic risk has obscured the extent to which small, decentralized actors can present systemic risk problems as well. These lesser financial actors can create negative externalities for the wider economy in much the same way that large ones can. In fact, in many ways, small actors may have greater incentives, and abilities, to engage in excessively risky behavior than large, more established ones. Given the dramatic shift toward fintech companies, which have revolutionized finance by decentralizing and automating financial services, it is essential that regulators and scholars start to look more seriously at the costs and benefits of the shift from concentrated markets to dispersed ones. [156]

In particular, this Part will argue that fintech poses three unique challenges for financial regulation. First, fintech has led to the proliferation of small, disaggregated actors that may be more susceptible to external shocks than traditional financial institutions. Second, the operations of fintech firms are significantly more opaque than those of traditional, large financial institutions, rendering it difficult if not impossible for regulators to effectively monitor their behavior. Third, fintech firms, because of their small size and dispersed nature, are less restricted by reputational constraints than large financial institutions. All of these challenges suggest that fintech poses unique and potentially more worrisome concerns than the "too big to fail" firms that have been the focus of regulatory attention in recent years.

A. The Systemic Risk of Decentralization

The rise of fintech raises a number of concerns about fintech's effect on the stability of the financial system as a whole. These concerns

156. This is not to say that particular fintech services are completely unregulated. Crowdfunding platforms may be regulated under the securities laws. Virtual currency platforms may fall under banking regulations. Investment advice may be regulated under the Investment Advisors Act. To the extent that fintech firms are offering services that fall under existing regulatory schemes, they will face regulatory scrutiny much as traditional financial firms do. But current regulations, by focusing on particular substantive areas rather than overall structures, overlook the broader implications of fintech for systemic stability.

are closely connected with the structure of the fintech industry and the ways that fintech firms operate, as well as the particular innovations that fintech is introducing to the market. In important ways, fintech's systemic risk concerns are the mirror image of those presented by traditional Wall Street banks: while large institutions have a number of pathologies and misincentives, so too do small, disaggregated ones.

To return to the systemic risk factors identified above, systemic risk is highest when individual actors are fragile, shocks are easily propagated, information asymmetries are widespread, and the overall market is large.[157] A close analysis of the factors suggests that concentrated markets are not necessarily more susceptible to systemic risk than dispersed or disaggregated ones. While the failure of a large institution may well have a greater magnitude of effect than the failure of a small one, large firms may also be less likely to fail given their economics of scale, diversification, and capitalization.[158] The ultimate level of systemic risk in an industry will depend on the interaction of these factors, and the single-minded focus on institutional size can obscure the extent to which other factors can elevate risk.

How, then, does fintech fit into this picture? The assumption underlying much of financial regulation in the postcrisis era has been that "too big to fail" institutions present the greatest systemic risk to the broader economy. But the absolute size—measured as assets or revenues or some similar metric—of individual institutions in a market is not fully correlated with the systemic risk of the market as a whole. Instead, the small size and dispersed nature of the fintech industry raises its own systemic risk concerns.

First, as mentioned above, systemic risk increases in situations where actors are vulnerable to rapid, adverse shocks. Fintech firms are more susceptible to these types of shocks than traditional players in a number of ways. The typical fintech firm is small, leanly staffed, and narrowly focused on one type of service. For instance, the prominent robo-advisor Betterment has fewer than 200 employees and focuses solely on investment advice, eschewing other means for generating revenue;[159] the small business lending company Prosper has just 150

157. *See supra* Section II.A.

158. *See Small Is Not Beautiful*, ECONOMIST (Mar. 3, 2012), http://www.economist.com/node/21548945 [https://perma.cc/2YH7-B2DZ].

159. Telis Demos, *Betterment Valued at Nearly $500 Million in New Round*, WALL ST. J.: MONEYBEAT (Feb. 19, 2015, 2:38 PM), https://blogs.wsj.com/moneybeat/2015/02/19/betterment-valued-at-nearly-500-million-in-new-round/ [https://perma.cc/9Q85-4NRH]. This situation may change, though, as one prominent robo-advisor, Wealthfront, recently announced that it will enter the loan market. *See* Julie Verhage, *Robo-Adviser Wants to Lend You Money, Not Just Manage It*, BLOOMBERG (Apr. 19, 2017, 11:45 AM), https://www.bloomberg.com/news/articles/2017-04-19/this-

employees in its San Francisco headquarters and, despite being a leader in the industry, has yet to turn a profit;[160] and virtual currency companies are even smaller, with an average of only twelve employees per company in North America.[161] This feature of fintech—its low overhead and efficient business model—has been responsible for much of fintech's success, but it also renders it vulnerable to swift changes in fortune. When it was discovered that a hacker had made off with $50 million in Ethereum currency that was owned by a joint venture fund called the Decentralized Autonomous Organization (or "DAO"), the fund swiftly shut down and the value of Ethereum prices dropped 38% in an hour.[162] A few months later, in a separate crash, the value of Ethereum dropped from $335 to $0.10 in a matter of minutes.[163] Without the diversification and size of large banks, fintech firms have a high degree of variability in results and thus are susceptible to rapid and dramatic changes in fortune.[164]

Second, the fintech industry contains a variety of features that, in times of economic stress, can serve as propagation mechanisms for shocks. Perhaps the most obvious mechanism, and one that has long been a concern in the fintech world, is shared susceptibility to hacking.[165] While hacking can come in many forms—from merely gathering information to theft to outright system failure—the

robo-adviser-wants-to-lend-you-money-not-just-manage-it (last updated Apr. 19, 2017, 2:11 PM) [https://perma.cc/4UP2-AHXR].

160. *See* Oscar Williams-Grut, *Funding Circle CEO Says It's a "Golden Age" for Marketplace Lending as Revenue Jumps 144%*, BUS. INSIDER (Oct. 1, 2016), http://www.businessinsider.com/funding-circle-ceo-samir-desai-on-lending-club-2015-accounts-and-us-business-2016-9 [https://perma.cc/42L4-28QQ].

161. GARRICK HILEMAN & MICHEL RAUCHS, CAMBRIDGE CTR. FOR ALT. FIN., GLOBAL CRYPTOCURRENCY BENCHMARKING STUDY 25 (2017), https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2017-global-cryptocurrency-benchmarking-study.pdf [https://perma.cc/A3W6-7HWB].

162. *See* Klint Finley, *A $50 Million Hack Just Showed That the DAO Was All Too Human*, WIRED (June 18, 2016, 4:30 AM), https://www.wired.com/2016/06/50-million-hack-just-showed-dao-human/ [https://perma.cc/JE53-LKHF]; Paul Vigna, *Fund Based on Digital Currency Ethereum to Wind Down After Alleged Hack*, WALL ST. J., https://www.wsj.com/articles/investment-fund-based-on-digital-currency-to-wind-down-after-alleged-hack-1466175033 (last updated June 17, 2016, 7:27 PM) [https://perma.cc/22EZ-EEHG].

163. *See* Paul Vigna, *Volatile Digital Currency Suffers 'Flash Crash,'* WALL ST. J., https://www.wsj.com/articles/volatile-digital-currency-suffers-flash-crash-1498260100 (last updated June 23, 2017, 8:12 PM) [https://perma.cc/EQ29-HHFQ].

164. And, at least in the currency realm, they do not benefit from the backing of a central bank that can reassure jittery markets. *See* Hilary J. Allen, *$ = € = Bitcoin?* (Suffolk Univ. Law Sch., Working Paper No. 15-33, 2017), https://ssrn.com/abstract=2645001 [https://perma.cc/9SNF-6EUE].

165. Hacking, of course, is also a major concern for traditional financial institutions, forcing them to spend significant amounts of money on cybersecurity efforts. But the magnitude of fintech's exposure to hacking is far greater than that of traditional players, given that many fintech firms' entire models are based on coding and other forms of automated decisionmaking.

possibility that the programming that underlies an industry might contain vulnerabilities is a clear pathway for adverse shocks to spread.[166] Another related propagation mechanism is automated decisionmaking that may lead to excessively correlated actions. Take, for example, the asset management industry. One potential systemic concern in the asset management sector is that if firms face large-scale redemptions from their funds in a time of stress, they may need to unwind their positions in the market on unfavorable terms.[167] If the terms become more unfavorable as the crisis deepens, then first-movers will have an advantage in the market. This can create the kind of systemic risk that underlay the last financial crisis, with firms engaging in "fire sales" of troubled assets in order to reduce the risk of facing even greater losses if they waited to see how markets recovered.[168] Now, of course, if the decisions of asset managers are merely reflecting the primary decisions by investors, then perhaps the asset management firms should not properly be considered as *creators* of the risk. Instead, they are merely executing the decisions of others. But in fintech, much investment advice, and in some cases investment decisions themselves, are made by computer algorithms.[169] These algorithms have not yet been tested in times of market turmoil. And at least in other areas of trading, it is widely believed that algorithmic high-speed trading has contributed to instability in markets.[170] Perhaps more importantly, if fintech asset management algorithms as a class exhibit "herd behavior"—that is, they tend to make similar decisions based on the decisions of others—then systemic risk is amplified.[171]

166. *See* Iris H-Y Chiu, *Fintech and Disruptive Business Models in Financial Products, Intermediation and Markets*, 21 J. TECH. L. & POL'Y 55, 106–07 (2016) (outlining challenges faced by private money–based economies).

167. *See* Douglas J. Elliott, *Systemic Risk and the Asset Management Industry*, BROOKINGS INST. 4 (May 2014), https://www.brookings.edu/wp-content/uploads/2016/06/systemic_risk_asset_management_elliott.pdf [https://perma.cc/V57V-PS57].

168. *See* OFFICE OF FIN. RESEARCH, U.S. DEP'T OF TREASURY, ASSET MANAGEMENT AND FINANCIAL STABILITY 9–20 (2013), http://financialresearch.gov/reports/files/ofr_asset_management_and_financial_stability.pdf [https://perma.cc/S7U5-HNSA].

169. *See* Robin Wigglesworth, *Fintech: Search for a Super-Algo*, FIN. TIMES (Jan. 20, 2016), https://www.ft.com/content/5eb91614-bee5-11e5-846f-79b0e3d20eaf [https://perma.cc/FY2K-QHL6].

170. *See* Pankaj K. Jain, Pawan Jain & Thomas H. McInish, *Does High-Frequency Trading Increase Systemic Risk?*, 31 J. FIN. MKTS. 1, 1 (2016) (studying the Tokyo Stock Exchange and finding that high-frequency trading could lead to risks like flash crashes).

171. *See* Marcel Kahan & Michael Klausner, *Path Dependence in Corporate Contracting: Increasing Returns, Herd Behavior and Cognitive Biases*, 74 WASH. U. L.Q. 347, 356 (1996) (further describing herd behavior); David Scharfstein & Jeremy Stein, *Herd Behavior and Investment*, 80 AM. ECON. REV. 465, 465 (1990) (describing the forces that lead to "herd behavior"). In the crowdfunding arena, recent developments with respect to the securitization of peer-to-peer unsecured loans also raise systemic risk concerns. *See* Werner Bijkerk, *Risks and Benefits of Crowd-Funding*, INT'L ORG. SEC. COMMISSIONS 28 (Apr. 10, 2014),

Third, information asymmetries in the fintech industry are high.[172] Most fintech firms are not subject to the extensive disclosure obligations that large, public financial institutions are, and thus there is significantly less information about them available.[173] This lack of information can become an important, and dangerous, channel for propagating systemic risk in times of adversity. Bursts of financial creativity create markets ripe for speculation and, potentially, bubbles.[174] Consider the crowdfunding industry's practice of offloading risk. Many peer-to-peer lending platforms provide ways for individuals and companies to transact with one another, with the platforms themselves not bearing any of the risks associated with the resulting transactions.[175] This offloading of risk to third parties raises the possibility that crowdfunding firms will encourage excessively risky behavior. After all, if a fintech mortgage company benefits from each mortgage that it generates but bears none of the cost of loans that go bad, it has few short-term incentives to discourage risky mortgages from being created and sold.[176] In these scenarios, fintech firms benefit from creating and perpetuating positions of asymmetric information.

Finally, the overall size of the fintech industry, while smaller than the portion of the market controlled by traditional institutional players, is growing quickly. A recent survey of the fintech industry found that fintech companies had raised $105 billion in total funding and that the overall size of the industry by value is now $870 billion.[177]

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https://www.iosco.org/research/pdf/20140410-Risks-and-Benefits-of-Crowdfunding.pdf [https://perma.cc/J77C-HD34].

172. *See* Brown, *supra* note 140, at 37–46 (discussing three-dimensional information asymmetry); Donald C. Langevoort, *Toward More Effective Risk Disclosure for Technology-Enhanced Investing*, 75 WASH. U. L.Q. 753, 755 (1997) (discussing the impact of technology on information).

173. *See* Mary Jo White, Chair, Sec. & Exch. Comm'n, Opening Remarks at the Fintech Forum (Nov. 14, 2016), https://www.sec.gov/news/statement/white-opening-remarks-fintech-forum.html [https://perma.cc/8X7W-ZGJF].

174. *See* KINDLEBERGER & ALIBER, *supra* note 101, at 48–52.

175. *See From the People, for the People*, ECONOMIST (May 9, 2015), https://www.economist.com/news/special-report/21650289-will-financial-democracy-work-downturn-people-people [https://perma.cc/S9CL-6AZJ] (describing peer-to-peer lending companies, such as Lending Club).

176. Of course, it may have long-term incentives to maintain a reputation for providing high-quality, reliable loans and investment opportunities. But where the long-term interests of the company and the short-term interests of the managers of the company diverge, it is far from clear that the long-term interests will win out. *See* Magnuson, *supra* note 9 (discussing the balance of long-term and short-term interests).

177. Jean Baptiste Su, *The Global Fintech Landscape Reaches over 1000 Companies, $105B in Funding, $867B in Value: Report*, FORBES (Sept. 28, 2016, 4:13 PM), https://www.forbes.com/sites/jeanbaptiste/2016/09/28/the-global-fintech-landscape-reaches-over-1000-companies-105b-in-funding-867b-in-value-report/#3d103e4b26f3 [https://perma.cc/E4L4-HE7F]. In comparison, the largest U.S. bank, JPMorgan Chase, had a market capitalization of $240 billion in 2016. Ben Eisen, *J.P. Morgan Leapfrogs over Wells Fargo in Market Capitalization*, WALL ST. J.,

Investment in fintech doubled between 2014 and 2015.[178] Large banks are expecting that this trend will continue and are already foreseeing significant impacts on their own profitability.[179] Additionally, fintech is not just a Silicon Valley phenomenon: London, China, and Singapore all are home to significant fintech activity.[180] As a proportion of total market size, fintech firms are also quickly expanding.[181] As the size of the fintech industry grows, so too will the systemic risks associated with it.

B. Regulatory Opacity

As the previous Section demonstrated, fintech raises a number of red flags related to systemic risk: fintech firms are particularly vulnerable to adverse shocks, they have multiple pathways for those shocks to spread to other actors, they present significant informational asymmetries, and their market is growing. All of these elements indicate that fintech could potentially serve as a catalyst for wider losses in cases of extreme events, some of which may be predictable and others of which may not. The possibility of such externalities, and related market failures, suggest that government regulation to contain the risks of inefficient and harmful behavior in fintech is essential. But fintech presents a unique set of regulatory difficulties that are less prevalent in more traditional forms of finance.

It is well recognized that effective regulatory regimes require effective monitoring regimes.[182] A regulator cannot constrain the

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https://www.wsj.com/articles/j-p-morgan-leapfrogs-over-wells-fargo-in-market-capitalization-1473782816 (last updated Sept. 13, 2016, 5:16 PM) [https://perma.cc/F5K2-TPVU].

178. SPARKLABS GLOB. VENTURES, FINTECH INDUSTRY OVERVIEW 21 (2016), https://www.slideshare.net/bernardmoon/fintech-industry-report-2016 [https://perma.cc/RN6Z-DF6T].

179. Laura Noonan, *Growth of Fintech Forecast to Spur Almost 2m Banking Job Cuts*, FIN. TIMES (Mar. 30, 2016), https://www.ft.com/content/e00f8884-f65c-11e5-96db-fc683b5e52db [https://perma.cc/AEE5-QDZ2].

180. Jamie Lee, *Singapore, London in Race to Be Top Global Fintech Hub*, BUS. TIMES (Sept. 30, 2016), http://www.businesstimes.com.sg/banking-finance/singapore-london-in-race-to-be-top-global-fintech-hub [https://perma.cc/BME2-QNLA].

181. One study concluded that 10% of total investable wealth will be in robo-advising funds by 2025. MyPrivateBanking, *Robo Advisors vs. Human Financial Advisors: Why Not Both?*, BUS. INSIDER (Nov. 21, 2017, 11:03 AM), http://www.businessinsider.com/hybrid-robo-advisors-will-manage-10-of-all-investable-assets-by-2025-2017-11-21 [https://perma.cc/M34G-BSMT]. The World Economic Forum has estimated that 10% of global gross domestic product will be stored on the blockchain by 2027. GLOB. AGENDA COUNCIL ON THE FUTURE OF SOFTWARE & SOC'Y, WORLD ECON. FORUM, DEEP SHIFT: TECHNOLOGY TIPPING POINTS AND SOCIETAL IMPACT (2015), http://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf [https://perma.cc/7GGV-6TTK].

182. *See, e.g.*, Gary S. Becker, *Crime and Punishment: An Economic Approach*, 76 J. POL. ECON. 169, 172–73 (1968); Robert J. Jackson, Jr. & David Rosenberg, *A New Model of*

behavior of relevant actors if it cannot observe their behavior, or even identify the relevant actors in the first place.[183] One of the criticisms of financial regulators after the crisis, after all, was that the regulators had not properly monitored the complex derivatives and other financial instruments that banks were creating in large numbers. These instruments ultimately caused widespread losses for banks and threatened the stability of the financial system.[184] In the wake of this monitoring failure, legislation was passed to improve the monitoring capabilities of regulators. As mentioned above in Section II.B, these efforts included additional disclosure requirements for large banks, periodic stress tests to assess the riskiness of bank behavior, and new monitors tasked with identifying systemic risks posed by large banks as they emerged.[185] These reforms have contributed to a significant drop in the overall risk metrics of systemically important financial institutions.[186] But regardless of what we may think about the success of financial regulators in reining in the behavior of large financial institutions since the financial crisis, regulators at least benefit from the fact that the relevant players are readily identifiable and their behaviors are subject to extensive disclosure requirements. Both of these assumptions are highly questionable in the fintech arena.

First, fintech's structure renders it more difficult for regulators to identify the relevant actors for regulation. As discussed above, fintech is in many ways defined by its decentralized nature, relying on dispersed networks of small actors and, sometimes, algorithms for decisionmaking. This decentralization serves as a barrier to effective monitoring. The virtual currency Bitcoin provides a good example of the magnitude of the problem. If a regulator desires to increase its monitoring of Bitcoin, where does it start? The currency is a product of a decentralized network of computers with no central control and

Administrative Enforcement, 93 VA. L. REV. 1983 (2007); A. Mitchell Polinsky & Steven Shavell, *Enforcement Costs and the Optimal Magnitude and Probability of Fines*, 35 J.L. & ECON. 133, 135–39 (1992) (discussing several monitoring regimes and the associated pros and cons); George J. Stigler, *The Optimum Enforcement of Laws*, 78 J. POL. ECON. 526 (1970) (discussing enforcement mechanisms for effective regulatory regimes).

183. *See* Matthew T. Wansley, *Regulation of Emerging Risks*, 69 VAND. L. REV. 401, 442–43 (2016) ("If the expected risk were not observed, agencies would be hard pressed to justify continued regulation.").

184. *See* Schwarcz, *supra* note 103, at 118–19 (discussing the sometimes-perverse effects certain types of regulation can have on financial stability).

185. *See supra* Section II.B.

186. *See* FIN. STABILITY OVERSIGHT COUNCIL, 2016 ANNUAL REPORT 109 (2016), https://www.treasury.gov/initiatives/fsoc/studies-reports/Documents/FSOC%202016%20Annual%20Report.pdf [https://perma.cc/N3J4-PPG9] (observing that "[s]ince the financial crisis, the largest [bank holding companies] have reduced leverage and become better prepared to manage draws on liquidity, significantly improving their resilience").

operating through consensual group dynamics. It could, of course, focus on the creator of the system—but it turns out that the creator is a shadowy figure going by the name of Satoshi Nakamoto who is still the subject of much uncertainty, including whether he is a single person at all.[187] It could, instead, focus on the Bitcoin exchanges, where a portion (but not all) of bitcoin transfers (but not all transactions) occur. Or it could focus on the bitcoin miners, who are (in a sense) creating additional bitcoins, but the miners are often anonymous individuals located in such disparate locations as Iceland,[188] Mongolia,[189] and Tibet.[190] It could also focus on the individuals using Bitcoin to enter into transactions, but the process of identifying these actors is difficult as well, given Bitcoin's anonymity.[191] These are difficult questions, and perhaps the best approach would be to tackle all of the above. But regardless of the eventual approach adopted, the disaggregated nature of fintech makes this process difficult and costly. And all of these questions will need to be answered anew as new services and products arise.

Second, fintech's structure also makes it more difficult for regulators, once they have identified the relevant actors, to monitor the actors' behavior. Even setting aside the fact that many of the actors may not be located within a country's jurisdiction, and thus may escape the authority of regulators, the activities of many fintech firms are not subject to the substantial disclosure regimes that large banks are, and the complex workings of their algorithms are not always easily understood.[192] When asked about interactions with regulators, the head of one fintech start-up stated that "[m]ost of our interaction has largely

187. Adrian Chen, *We Need to Know Who Satoshi Nakamoto Is*, NEW YORKER (May 9, 2016), https://www.newyorker.com/business/currency/we-need-to-know-who-satoshi-nakamoto-is [https://perma.cc/5XLL-XAKE].

188. Nathaniel Popper, *Into the Bitcoin Mines*, N.Y. TIMES: DEALBOOK (Dec. 31, 2013), https://dealbook.nytimes.com/2013/12/21/into-the-bitcoin-mines/ [https://perma.cc/ZH5G-U6CC].

189. *Bitcoin: The Magic of Mining*, ECONOMIST (Jan. 8, 2015), https://www.economist.com/news/business/21638124-minting-digital-currency-has-become-big-ruthlessly-competitive-business-magic [https://perma.cc/TS2R-WRR3].

190. Simon Denyer, *The Bizarre World of Bitcoin "Mining" Finds a New Home in Tibet*, WASH. POST (Sept. 12, 2016), https://www.washingtonpost.com/world/asia_pacific/in-chinas-tibetan-highlands-the-bizarre-world-of-bitcoin-mining-finds-a-new-home/2016/09/12/7729cbea-657e-11e6-b4d8-33e931b5a26d_story.html?utm_term=.bef7286d503f [https://perma.cc/F3E2-ZXCT].

191. Tu & Meredith, *supra* note 72, at 297–99.

192. Yesha Yadav, *How Algorithmic Trading Undermines Efficiency in Capital Markets*, 68 VAND. L. REV. 1607, 1668–70 (2015). In an interesting twist, however, regulators have increasingly adopted the "big data" methods of fintech firms to further their own policies. *See* Rory Van Loo, *Rise of the Digital Regulator*, 66 DUKE L.J. 1267 (2017) (discussing the "big data" method).

been explaining what we do and how we work."[193] Indeed, a slew of recent white papers and research reports have lamented that regulators lack basic understandings about the workings and applications of fintech businesses.[194]

These two features (the protean nature of the actors, and the lack of information about their actions) contribute to a more general problem of regulatory opacity in the industry. When a market poses a systemic risk to the economy, regulators have a legitimate interest in monitoring the behavior of actors within the industry to constrain excessively risky behavior. But monitoring depends on transparency; without accurate and timely information about the creation of risk within an industry, regulators cannot take action to prevent or mitigate systemic risks as they arise. Where the number of actors is large and their behaviors are not subject to easy verification—that is, where the opacity of an industry from the perspective of regulators is high—monitoring can break down. It is precisely in these scenarios that regulation is least effective as a constraint on behavior.

In sum, by contributing to the fragmentation of finance, fintech may be obscuring risk. Its model bears many of the features of systemic risk, and the level of such risk is likely to increase as the industry grows. But recent regulation of the financial industry has focused on a different segment of the market and has largely ignored the unique problems associated with fintech. As a result, regulators have neither the tools nor the expertise necessary to properly guide and constrain the behavior of fintech firms.

C. Reputation and Cooperative Behavior

As demonstrated above, fintech presents many of the features of an industry that poses a systemic risk to the broader economy. Adding to this problem, regulators are ill equipped to monitor and constrain that risk. This is a worrisome situation. It might, however, be remedied through private sector mechanisms if fintech players were able and willing to cooperate in pursuit of longer-term interests. In the absence of legal constraints, fintech could potentially develop mutually value-

193. Katy Burne, *Fed Outlines Approach to Monitoring Fintech*, WALL ST. J., https://www.wsj.com/articles/fed-expected-to-outline-approach-to-monitoring-fintech-1480935601 (last updated Dec. 5, 2016, 2:33 PM) [https://perma.cc/8RTK-NWZF].

194. *See, e.g.*, David Mills et al., *Distributed Ledger Technology in Payments, Clearing, and Settlement* 34 (Fin. & Econ. Discussion Series, Working Paper No. 2016-095, 2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2881204 [https://perma.cc/SS2D-G2E3] (concluding that "the industry's understanding and application of [distributed ledger] technology is still in its infancy").

enhancing behaviors on a voluntary basis to fill the void and reduce risk.

The conditions under which private sector cooperation may develop are by now well established. Actors, for example, are often willing to cooperate in pursuit of the collective interest, even at the cost of their short-term interests, if they perceive a more durable interest in maintaining their reputation.[195] The classic demonstration of this dynamic in game theory is the iterated prisoner's dilemma.[196] In a prisoner's dilemma, the players can maximize their value by cooperating (for example, refusing to speak to the jailers), but each individual actor has an incentive to cheat (by ratting out his partner). If the game is only played once, the rational choice is to cheat. But of course, if each actor takes this choice, they will end up with the jointly minimizing outcome (both going to jail for long periods).[197] The game changes, however, if it is known that it will be repeated. In iterated prisoner's dilemmas, rational cooperation can develop, as each party knows that if he cheats in one round, he may earn a reputation for being a cheater, and thus be "punished" in future rounds.[198] "Tit-for-tat" strategies, in which one party punishes the other party for noncooperative behaviors, can encourage the establishment of stable and persistent forms of cooperation.[199] In other words, when parties know that they are repeat players and that they will interact with one another in the future, cooperation becomes, if not likely, at least more probable. Players become more willing to sacrifice short-term interests in pursuit of long-term gains.

The financial industry has seen this scenario play out in multiple instances during past financial crises. One famous example from the 2008 financial crisis was when the heads of the largest investment banks on Wall Street (including Goldman Sachs, Merrill

195. *See, e.g.*, JAMES MORROW, GAME THEORY FOR POLITICAL SCIENTISTS 241–44 (1994) (explaining the balance between collective interests and short-term individual interests); Rachel Brewster, *Unpacking the State's Reputation*, 50 HARV. INT'L L.J. 231, 244–49 (2009) (discussing the importance of cooperation for long-term collective interests); Magnuson, *supra* note 9 (discussing long-term and short-term interests); Ariel Porat & Robert E. Scott, *Can Restitution Save Fragile Spiderless Networks?*, 8 HARV. BUS. L. REV. (forthcoming 2018) (manuscript at 7–21), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2946404 [https://perma.cc/L2LM-9X8B] (exploring business networks and some externalities that accompany them); Reinhard Selten, *The Chain Store Paradox*, 9 THEORY & DECISION 127 (1978) (explaining the concept of collective interest versus individual interest); Tirole, *supra* note 9 (exploring how individual reputations form group reputation).

196. *See* MORROW, *supra* note 195, at 262–68 (discussing the prisoner's dilemma).

197. *Id.*

198. PETER ORDESHOOK, GAME THEORY AND POLITICAL THEORY 447–48 (1986).

199. Richard Axelrod, *The Evolution of Strategies in the Iterated Prisoner's Dilemma*, *in* GENETIC ALGORITHMS AND SIMULATED ANNEALING 32–41 (Lawrence Davis ed., 1987).

Lynch, Morgan Stanley, and JPMorgan) met to coordinate their actions in response to the impending failure of Lehman.[200] This action was made possible by the fact that the actors were readily identifiable and could all meet in a single room.

But there are several reasons to believe that cooperative behavior is less likely to evolve in the fintech sector than in traditional finance. First, because fintech is defined by its *disruption* of traditional forms of finance, norms of behavior are still nascent and ill formed. Fintech is pioneering new forms of finance, and the rules of the road are still being established. Reputation is most effective, however, when norms of behavior are clear and easily communicated.[201] When norms are unclear, actors are less likely to cooperate in pursuit of reputational gains because the costs from breaking any norms that are being developed are lower.[202] Indeed, without reliable expectations about what counts as cooperative behavior, reputation may have no normative force at all.[203] For example, let us assume that debt crowdfunding companies can reap short-term gains by allowing excessively risky loans to be placed on their platforms, increasing the total volume of loans from which they derive fees while simultaneously offloading the risk of those loans to third-party lenders. Overall, fintech companies might be better off if they implemented policies to identify excessively risky (or even fraudulent) loans before they were placed on their platforms, but any single fintech actor would benefit in the short term from not implementing these policies and capturing that slice of the market.[204] This is a classic problem in finance: banks often have incentives to increase risk so long as the risks are borne by third

200. William D. Cohen, *Three Days That Shook the World*, FORTUNE, http://archive.fortune.com/galleries/2008/fortune/0812/gallery.threedays.fortune/index.html (last updated Dec. 16, 2008, 4:23 PM) [https://perma.cc/C6QJ-V5B9].

201. *See* Robert Axelrod, *An Evolutionary Approach to Norms*, 80 AM. POL. SCI. REV. 1095, 1108 (1986) (discussing the importance of social norms for reputation to be effective); Robert D. Cooter, *Decentralized Law for a Complex Economy: The Structural Approach to Adjudicating the New Law Merchant*, 144 U. PA. L. REV. 1643, 1670 (1996) (discussing reputation as being tied to norms).

202. *See* Axelrod, *supra* note 201, at 1105.

203. *See* JACK L. GOLDSMITH & ERIC A. POSNER, THE LIMITS OF INTERNATIONAL LAW 31 (2005) (arguing that cooperation between countries is only possible when "the parties . . . know what counts as cooperation and what counts as cheating"); William Magnuson, *The Domestic Politics of International Extradition*, 52 VA. J. INT'L L. 839, 897–99 (2012) (describing the effects of compliance uncertainty).

204. On the other hand, some commentators argue that fintech should have no role in vetting the riskiness of loans on their peer-to-peer markets. Instead, borrowers and lenders should bear full responsibility for assessing the costs and benefits of loans. Bill Frezza, *Caveat Emptor Banking: Peer-to-Peer Lending Challenges Too-Big-To-Fail Status Quo*, FORBES (Aug. 13, 2013, 9:30 AM), https://www.forbes.com/sites/billfrezza/2013/08/13/caveat-emptor-banking-peer-to-peer-lending-challenges-too-big-to-fail-status-quo/#4b7db0743bdc [https://perma.cc/8QPH-GHMY].

parties.[205] Reputation might serve as a disciplining force to push fintech firms toward the cooperative action—in this case, implementing risk compliance procedures. But given the newness of the industry, the strength of the norms surrounding acceptable behavior will likely be low. As a result, the violation of the nascent norm would likely carry few reputational consequences.

Second, the diffusion of information about cooperative behavior within fintech is hindered by the sheer *number* of actors within the field. Reputation is most powerful when the number of actors is small. As economist Mancur Olson has described it, "unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, rational, self-interested individuals will not act to achieve their common or group interests."[206] This is so because reputation can only affect behavior to the extent information about past actions is reliably transmitted to other actors.[207] Parties, after all, have to observe the behaviors of other actors before they can change their actions based on the reputation of others. And if parties recognize that their reputations will not be affected by their actions, or indeed, if they lack any useful reputation at all, then their actions will not be skewed by reputational effects.[208] In the crowdfunding example above, the problem is immediately evident. A 2015 study found that there were more than 1,250 crowdfunding companies operating in the field already and that the number would likely grow in coming years.[209] The cost of monitoring the behavior of thousands of actors is prohibitively high for most companies. Perhaps companies could reach a mutual agreement on monitoring a subset of the actors or sharing information about the

205. *From the People, for the People*, *supra* note 175.

206. MANCUR OLSON, JR., THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS 1–2 (1965); *see also* Jack L. Goldsmith & Eric A. Posner, *A Theory of Customary International Law*, 66 U. CHI. L. REV. 1113, 1132–33 (1999) (discussing collective interest issues); Kenneth A. Oye, *Explaining Cooperation Under Anarchy: Hypotheses and Strategies*, *in* COOPERATION UNDER ANARCHY 1, 19–20 (Kenneth A. Oye ed., 1986) (discussing common interests).

207. *See* Zachary J. Gubler, *The Financial Innovation Process: Theory and Application*, 36 DEL. J. CORP. L. 55, 100–02 (2011) (discussing moral hazard and its reliance on information transmission); Edward B. Rock, *Saints and Sinners: How Does Delaware Corporate Law Work?*, 44 UCLA L. REV. 1009, 1012–13 (1997) (discussing "norm-based" incentives); Roy Shapira, *A Reputational Theory of Corporate Law*, 26 STAN. L. & POL'Y REV. 1 (2015) (suggesting that corporate law serves to produce information).

208. *See* Goldsmith & Posner, *supra* note 206, at 1130–31 (concluding that "n-state prisoner's dilemmas and coordination games tend to be solved, if at all, by treaty or other international agreement, and not by decentralized evolution").

209. *See* David Drake, *2,000 Global Crowdfunding Sites to Choose from by 2016: Top 5 Growth Indicators*, HUFFINGTON POST (Oct. 23, 2015), https://www.huffingtonpost.com/david-drake/2000-global-crowdfunding-_b_8365266.html [https://perma.cc/WMH5-NNPM].

practices of others in the industry, but such a result is unlikely given that it would require, again, agreement between a large number of actors. And even to the extent that they did agree to monitor the behavior of other actors in the field, it is far from clear that they could gather the information they would need to ensure cooperation. The vast majority of crowdfunding platforms are not public and thus do not disclose information widely. Given the dearth of information and the difficulties of diffusing that information within the industry, reputation is less likely to serve as a carrot or stick to encourage fintech companies to take cooperative actions.

Third, fintech firms are less likely to engage in cooperative behaviors because of the small *size* of the firms involved in the sector. It has long been recognized that collective goods are more likely to be provided when large actors dominate the landscape.[210] This is so because large actors have a greater stake in the game and thus capture a greater percentage of any gains from provision of the good in question.[211] Climate change provides a simple example of this point. The environment is a public good that provides benefits to all, but each individual state has an interest in allowing its own companies to fully exploit the environment without regard to global emissions. The fundamental problem that prevents states from adopting the mutually optimal level of regulation is that the benefits to individual states from a healthy environment are generally insufficient to outweigh the (short-term) costs from adopting stringent environmental regulations. The

210. *See* ROBERT KEOHANE, AFTER HEGEMONY: COOPERATION AND DISCORD IN THE WORLD POLITICAL ECONOMY (1984) (discussing size of firms and its effect on collective goods); CHARLES KINDLEBERGER, THE WORLD IN DEPRESSION, 1929–1939 (1974) (discussing collective interests and size of firms); Charles Kindleberger, *Systems of International Economic Organization*, *in* MONEY AND THE COMING WORLD ORDER (David Calleo ed., 1976) (discussing the effect of large firms on collective good); William Magnuson, *International Corporate Bribery and Unilateral Enforcement*, 51 COLUM. J. TRANSNAT'L L. 360, 376–79 (2013) (regarding size of financial firms and collective interests); Duncan Snidal, *The Limits of Hegemonic Stability Theory*, 39 INT'L ORG. 579 (1986) (explaining that large actors have more of an effect on collective interests).

211. Another form of this dynamic arises in the game-theoretical model of "contribution games." Contribution games are games in which the actors seek to produce a socially desirable public good of some sort—for example, systemic stability. The public good is only provided if the amount of contributions reaches a set level of *K*. Each actor must decide whether to make successive contributions to the production of the public good. Unless and until the total amount of contributions reaches *K*, then the public good will not be produced and the players will not receive the concomitant benefits, even if the efficient outcome is for the players to contribute sufficient amounts of resources to ensure that the public good is provided. The efficient outcome may, however, be produced if the project would be completed by one player if that player were the sole player. In other words, if the benefits to a single player from the production of the good are equal to or greater than *K*, then the public good will be produced. As the size of an actor increases (and therefore the portion of any benefits from the public good increases), the likelihood that this condition will prove true increases as well. Anat R. Admati & Motty Perry, *Joint Projects Without Commitment*, 58 REV. ECON. STUD. 259, 262–68 (1991).

likelihood of this calculus tipping in favor of mutually beneficial regulation, however, increases as the size of the actors increases. Larger states capture greater shares of aggregate benefits, and thus, assuming a set cost for adopting environmental regulation, larger states will be more likely to realize sufficient gains from the collective good so as to offset the costs of greater regulation. At the extreme, if there were only one state, that state would capture all of the gain from a healthy environment, and thus it would have an incentive to engage in the efficient level of regulation (whatever that level might be). The same dynamic applies in the financial sector. Large actors are more likely to engage in cooperative actions that benefit the system as a whole (for example, maintaining adequate capital ratios or refraining from excessively risky bets that impose externalities on others) because they capture a larger portion of system-wide benefits—in this case, systemic stability. Fintech actors, however, are generally much smaller than traditional players in finance, and thus are less likely to take cooperative actions that contribute to reducing systemic risk because they capture smaller portions of systemic benefits.[212] Instead, given their small share of any benefits from public goods they could contribute to providing, they are more likely to focus on short-term, self-interested behaviors that provide them with immediate benefits.

Finally, cooperative behaviors are less likely to develop in fintech because of the short *time horizons* of actors in the field. One important assumption that underlies game theoretical models of cooperative behavior is that players must reasonably believe that they will receive sufficient benefits from future periods to offset any short-term losses.[213] In other words, if the future benefits from being perceived as a "cooperative" player are sufficiently high, players will be willing to take actions that are costly in the short term. But the nature of the fintech industry undermines this assumption. Fintech is a winner-take-all market: the companies that can gain an early lead in the deployment of technology to the market, and thus attract a stable customer base, often end up continuing to succeed in the future.[214] Those that are slow to enter the market, or who do not grow quickly,

212. The question of how to determine "size" is a difficult one. But on most reasonable metrics—revenue, number of employees, market share—fintech firms are significantly smaller than Wall Street financial institutions. *See The Fintech Revolution*, *supra* note 2.

213. The point here is twofold. First, if actors have very high discount rates—that is, they care little about their future welfare and very much about their present welfare—then they will be less likely to cooperate in any given period. Second, if the costs of cooperating, or the benefits from not cooperating, are high, then they will also be less likely to cooperate. *See* Goldsmith & Posner, *supra* note 206, at 1126–27.

214. Joseph M. Green & John F. Coyle, *Crowdfunding and the Not-So-Safe SAFE*, 102 VA. L. REV. ONLINE 168, 172–73 (2016).

are often doomed to failure. Indeed, fintech firms fail at a surprisingly high rate; one study found that the median lifespan of a Bitcoin exchange was 381 days.[215] Thus, fintech firms are not playing an indefinite game. The game, instead, rewards those players that take an early lead. Adding to the problem is that many of the investors in fintech are venture capital firms.[216] It has long been recognized that venture capitalists encourage companies to expand as rapidly as possible.[217] This single-minded focus on growth encourages excessive risk-taking by companies, a dynamic that is not conducive to the development of cooperation.

For all of these reasons—the disruptive nature of the industry, the large number of actors, their small size, and the rewards for early-stage growth—fintech firms are less likely to develop cooperative behaviors in support of systemic stability. Unlike more established players in finance, who have large stakes in the orderly continuation of current structures, fintech firms are incentivized to focus on short-term gains at the expense of potentially value-creating, but long-term, activities.

IV. FINANCIAL REFORM IN THE FINTECH ERA

The financial crisis brought into sharp relief the dangers that large financial institutions pose to the broader economy: through excessive leverage and the placing of risky bets on complex financial instruments, banks created an environment in which economic shocks could ripple through the industry, creating wider and wider damage until the point when the economy as a whole faced paralysis. In the wake of the crisis, legislators acted to rein in systemic risk, imposing a slew of new requirements on banks and other "systemically important" financial institutions to resolve the "too big to fail" problem. But this legislation largely overlooked the systemic risk that can be created, not by large institutions, but by small ones. In fact, small financial institutions in many ways are *more* likely to pose systemic risk concerns than large ones, given the particular dynamics inherent in decentralized, disaggregated markets.

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215. Tyler Moore & Nicolas Christin, *Beware the Middleman: Empirical Analysis of Bitcoin-Exchange Risk*, *in* LECTURE NOTES IN COMPUTER SCIENCE VOL. 7859: FINANCIAL CRYPTOGRAPHY AND DATA SECURITY 25, 28 (Ahmad-Reza Sadeghi ed., 2013).

216. *See* Christine Parajon Skinner, *Whistleblowers and Financial Innovation*, 94 N.C. L. REV. 861, 874 (2016).

217. *See* Antonio Davlia et al., *Venture Capital Financing and the Growth of Startup Firms*, 18 J. BUS. VENTURING 689 (2003); David Kirsch et al., *Form or Substance: The Role of Business Plans in Venture Capital Decision Making*, 30 STRATEGIC MGMT. J. 487 (2009).

Fintech presents precisely this type of systemic risk. Fintech firms have exploded onto the scene in rapid fashion since the financial crisis, disrupting the financial industry on a number of fronts. While these innovations have provided great benefits to consumers, the fintech model presents a number of systemic risk concerns based on its disaggregated nature. Simultaneously, regulators have struggled to identify the relevant fintech actors and monitor their behaviors in order to mitigate these risks. And given the incentives in the fintech industry for fast growth at the earliest stage, it is unlikely that fintech players, at least initially, will voluntarily develop the kind of cooperative behaviors that support systemic stability.

Fintech raises the possibility of systemic risk, evades effectual monitoring, and disincentivizes cooperation. What, then, can be done about it? Ultimately, the goal of eliminating systemic risk is likely to prove futile. Systems naturally evolve and change over time, and no system is bulletproof. But the goal of any financial regulatory regime must be to limit the likelihood and magnitude of economic damage and to contain that damage to the participants that knowingly and voluntarily take part in the sector. This Section argues that four changes to current regulation would make significant progress toward accomplishing these goals. First, regulators should adopt a "regulation lite" model that incentivizes fintech firms to provide information to regulators about their businesses and seek guidance on the applicability of current law. Second, regulators should focus on limiting contagion in the event of unexpected economic shocks. Third, regulators should attempt to leverage the idiosyncratic knowledge of fintech firms to encourage self-policing. Finally, regulators should work closely with their counterparts in foreign countries to design regulations that work on the global level.

A. Producing Information

One of the essential features of the revolution that fintech has wrought in finance is that the problems presented by fintech are *different* than the problems presented by traditional financial institutions. Fintech operates in a fundamentally different way than other firms in the sector (although these other institutions are attempting to copy some of the strategies and techniques of fintech firms), and regulation must take these differences into account.[218] One

218. Traditional banks have even gone so far as to swallow up fintech firms in order to fully integrate fintech strategies into their own models. Indeed, large financial institutions have been actively acquiring fintech firms in recent months to bolster their competitive positions. Jon Marino, *Big Banks Shift Fintech Strategy*, CNBC (Apr. 11, 2016, 3:44 PM),

important corollary of this proposition is that the obligations imposed on fintech should not simply mirror those imposed on other financial institutions.[219]

Once we have accepted that financial regulation must contain different substantive standards in fintech in order to accommodate its essentially different business model and related risks, the focus shifts to devising what these new standards should look like. As a starting point, regulation must balance the desire to promote useful innovation in the field with appropriate limits on the creation of systemic risk. But as mentioned above, regulators currently struggle to understand and monitor fintech's behavior. In order to remedy this problem, regulation should be aimed at producing better quality information.[220] It can do so in a number of ways.

To begin with, given fintech's focus on disruption and innovation, regulation should promote observed experimentation.[221] In other words, regulators should create incentives for fintech firms to provide information about their business and voluntarily seek guidance on the applicability of current regulations. One way to do this would be

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https://www.cnbc.com/2016/04/11/big-banks-shift-fintech-strategy.html [https://perma.cc/RCM3-4KVX].

219. While this point would appear relatively unobjectionable on its face, adoption of the principle would in fact represent a departure from the viewpoints of several financial regulations today. Just to cite a few of the more recent and prominent examples of what can be called the "mirror image" rule, the Office of the Comptroller of the Currency stated in its recent report on fintech that fintech banks "will be held to the same high standards of safety and soundness, fair access, and fair treatment of customers that all federally chartered institutions must meet." OFFICE OF THE COMPTROLLER OF THE CURRENCY, EXPLORING SPECIAL PURPOSE NATIONAL BANK CHARTERS FOR FINTECH COMPANIES 1 (2016), https://www.occ.gov/topics/responsible-innovation/comments/special-purpose-national-bank-charters-for-fintech.pdf [https://perma.cc/2G9B-KTF2]. In a similar vein, the head of the Consumer Financial Protection Bureau ("CFPB") has stated that it is an overarching principle of the CFPB that fintech firms "must be held to the same standards of compliance with the law" as large banks. Richard Cordray, *Prepared Remarks of CFPB Director Richard Cordray at the LendIt USA Conference*, CFPB NEWSROOM (Mar. 6, 2017), https://www.consumerfinance.gov/about-us/newsroom/prepared-remarks-cfpb-director-richard-cordray-lendit-usa-conference/ [https://perma.cc/9JA3-89DK]. One might interpret these statements as meaning simply that regulators will pursue the same general goals in regulating fintech as they do in regulating more traditional institutions. But a plain reading of these statements suggests that regulators are starting with the position that fintech must abide by the *same* rules.

220. A similar approach was adopted in response to concerns about the private equity and hedge fund industries. Dodd-Frank introduced a number of revisions to the Investment Advisor Act in order to remedy the dearth of information about these companies. Even if the changes did not lead to substantive regulation, it put regulators on notice about the industries' landscape. *See*, *Dodd-Frank Act Advisory: Advisers to Private Investment Funds*, COVINGTON & BURLING LLP (July 21, 2010), https://www.cov.com/-/media/files/corporate/publications/2010/07/dodd-frank-act---advisers-to-private-investment-funds.pdf [https://perma.cc/3DW6-HF9J] (detailing the Dodd-Frank Act).

221. *See, e.g.*, Bradley C. Karkkainen, *Information-Forcing Environmental Regulation*, 33 FLA. ST. U. L. REV. 861 (2006) (describing methods by which regulation induces regulated entities to disclose relevant information about public regulatory objectives more effectively).

to create a kind of "regulatory sandbox," an approach adopted by the United Kingdom. The UK's Financial Conduct Authority has created a regulatory project that allows fintech start-ups to launch new financial products on an accelerated basis and with minimal regulatory barriers.[222] The advantages of such an approach are clear, as it promotes greater transparency in the industry while simultaneously encouraging innovation.

Importantly, given the small size of fintech firms and the already sizeable barriers to entry in finance generally, regulation must aim to impose minimal administrative burdens on firms.[223] While regulatory transaction costs should presumably be taken into account in *all* well-designed regulations, they do not appear to have been a driving principle in recent financial regulation, which has focused more heavily on imposing substantive restrictions and reporting requirements than on reducing administrative burdens. Indeed, the Dodd-Frank Act spans some twenty-two thousand pages of new rules and regulations, imposing significant compliance costs on financial institutions.[224] The potential deterrent effect of these heavy burdens on fintech is substantial due to fintech's dependence on maintaining low overhead and providing services at low cost. Administrative burdens, thus, can be expected to have a disproportionately adverse effect on fintech firms, and regulation must take this effect into account.

For these reasons, fintech regulation should be aimed at producing higher-quality information in the most cost-effective manner possible. While creating a "regulatory sandbox," as the Financial Conduct Authority has done in the UK, would be one example of such an approach, it is by no means the only method for achieving these goals. Other ideas that have been floated include the centralization of

222. Max Colchester & Rachel Witkowski, *U.K. Takes Novel Approach on Fintech*, WALL ST. J. (Apr. 11, 2016, 6:30 AM), https://www.wsj.com/articles/u-k-takes-novel-approach-on-fintech-1460370600 [https://perma.cc/7J2X-YVLE].

223. *See* Howell E. Jackson, *Variation in the Intensity of Financial Regulation: Preliminary Evidence and Potential Implications*, 24 YALE J. ON REG. 253 (2007) (quantifying the substantial regulatory costs imposed on financial institutions in the United States); John C. Coates IV, *Cost-Benefit Analysis of Financial Regulation: Case Studies and Implications*, 124 YALE L.J. 882 (2015) (describing the difficulties of measuring compliance and other regulatory costs ex ante).

224. Marshall Lux & Robert Greene, *Dodd-Frank Is Hurting Community Banks*, N.Y. TIMES (Apr. 14, 2016), https://www.nytimes.com/roomfordebate/2016/04/14/has-dodd-frank-eliminated-the-dangers-in-the-banking-system/dodd-frank-is-hurting-community-banks [https://perma.cc/76SQ-HURN].

regulatory authority,[225] the creation of targeted fintech regulation,[226] and simplified registration procedures.[227]

Information, however, is not a panacea. Merely increasing public disclosure regarding the risks of fintech will not address the fundamental sources of those risks themselves. A growing number of studies demonstrate the limitations of disclosure as a method for reducing systemic risk.[228] Individuals are often unable to process the significant amounts of information available to them, and even when they are, they often fail to change their behaviors to appropriately reflect this information.[229] Thus, additional disclosure will likely be insufficient to address the systemic risk concerns of fintech.

B. Limiting Contagion

Instead, fintech regulation must also impose substantive regulations on risk. These substantive restrictions will necessarily depend on the nature of the innovation. Restrictions on robo-advisor platforms will likely differ from those placed on virtual currencies, as well as from those placed on crowdfunding ventures. They will necessarily involve difficult trade-offs between increasing stability and enabling innovation.

But even if the substantive restrictions on fintech will vary depending on the particular innovation or product being provided, one common principle should underlie substantive fintech restrictions: limiting contagion. It is likely impossible to eliminate the susceptibility of individual fintech firms to adverse economic shocks; it is in the nature of disruptive industries to experience high variations in results. But while it is difficult to prevent economic shocks for particular firms,

225. *See* Tu & Meredith, *supra* note 72, at 300–13 (arguing that the regulation of virtual currency in general, and Bitcoin in particular, has been stymied by the fragmentation of regulatory authority among various government bodies).

226. *See* Dale A. Oesterle, *Intermediaries in Internet Offerings: The Future Is Here*, 50 WAKE FOREST L. REV. 533, 547–49 (2015).

227. *See* Gregory Scopino, *Preparing Financial Regulation for the Second Machine Age: The Need for Oversight of Digital Intermediaries in the Futures Markets*, 2015 COLUM. BUS. L. REV. 439, 505–06.

228. *See, e.g.*, OMRI BEN-SHAHAR & CARL E. SCHNEIDER, MORE THAN YOU WANTED TO KNOW: THE FAILURE OF MANDATED DISCLOSURE (2014); Steven L. Schwarcz, *Disclosure's Failure in the Subprime Mortgage Crisis*, 2008 UTAH L. REV. 1109, 1110 ("Most, if not all, of the risks giving rise to the collapse of the market for securities backed by subprime mortgages were disclosed, yet the disclosure was insufficient, in part because complexity made the risks very difficult to understand."); Steven Davidoff Solomon & Claire A. Hill, *Limits of Disclosure*, 36 SEATTLE U. L. REV. 599, 603 (2013) (arguing that "improvements in disclosure will not do much to prevent or minimize the effects of future crises").

229. *See* Solomon & Hill, *supra* note 228, at 603.

it is decidedly easier to limit the mechanisms by which these shocks spread to other firms.[230]

What sorts of regulations might limit the paths of contagion? In general, regulation will fall into two buckets: ex ante and ex post. First, regulators should be supplied with the authority to limit propagation mechanisms ex ante in order to prevent potential adverse correlations. Second, regulators should be provided the authority to take concrete and direct action to dampen shocks ex post in order to stabilize fintech markets.[231]

Ex ante substantive restrictions on fintech could take a variety of forms. As a preliminary matter, regulators could limit interconnectedness in fintech markets.[232] For example, they could require robo-advisors to include in their algorithms "circuit-breaker" type features that reduce market volatility and prevent domino effects as parties rush to limit their losses.[233] Some firms have already included such features in their algorithms.[234] In virtual currency, ex ante regulations might focus on ensuring the trustworthiness of settlement mechanisms and the accuracy of distributed ledgers in order to prevent breakdowns in the system and curtail herd behavior by consumers.

Ex post regulatory actions, on the other hand, would focus on dampening contagion once it has started. The traditional method for doing so is to provide liquidity to struggling institutions in order to reassure counterparties that losses at one institution will not spread to others.[235] Of course, the problem with such an approach is that the very

230. *See* John Crawford, *Wargaming Financial Crises: The Problem of (In)Experience and Regulator Expertise*, 34 REV. BANKING & FIN. L. 111, 131–41 (2014) (describing how regulators can limit financial crises).

231. Ex ante and ex post regulations can potentially be at odds with one another. In other words, the existence of ex post authority for regulators to dampen contagion once it has started may *increase* the risk that contagion will begin in the first place, as actors, knowing that there is a safety net in the case of failure, will be more willing to take risks. This tension is inevitable in any regulatory regime, and thus regulators must not consider regulatory mechanisms in a vacuum. Rather, they must consider the full range of behavioral effects that the mechanisms will have.

232. *See, e.g.*, Steven L. Schwarcz, *Controlling Financial Chaos: The Power and Limits of Law*, 2012 WIS. L. REV. 815, 827–29.

233. Circuit breakers are systems that slow or pause trading when markets become excessively volatile. For example, the New York Stock Exchange halts trading for a period of time if the market drops by more than a specified percentage. Hayden C. Holliman, *The Consolidated Audit Trail: An Overreaction to the Danger of Flash Crashes from High Frequency Trading*, 19 N.C. BANKING INST. 135, 144–47 (2015).

234. *See* Tom Anderson, *Robo-Advisors May Have Too Much Control over Your Portfolio*, CNBC (July 26, 2016, 8:30 AM), https://www.cnbc.com/2016/07/25/robo-advisors-may-have-too-much-control-over-your-portfolio.html [https://perma.cc/H8MQ-5ANP] (noting that after the results of the Brexit referendum were announced and stock markets plunged, Betterment halted trading for several hours).

235. *See* Crawford, *supra* note 230, at 133–34.

existence of such an authority for regulators to bail out troubled institutions can encourage excessive risk in the industry. This was precisely the problem that Dodd-Frank and other financial regulations were aimed to prevent.[236] But the scenario in fintech is slightly different. Unlike "too big to fail" firms, fintech firms fail regularly and with minimal disruption to the broader financial system, let alone the economy generally.[237] Thus, counterparties will not have the same incentives to encourage excessively risky behaviors, as they will know that failure is a very real possibility. Instead, ex post regulatory actions would focus on preventing domino effects—that is, the adverse consequences that the failure of one institution has on another. The willingness to allow any particular fintech firm to fail should reduce the moral hazard problems in the industry. More importantly, focusing on injecting capital to struggling peer-to-peer lending firms or insuring consumers from losses would be a cost-effective way of restricting the pathways by which contagion is spread.

C. Enabling Self-Policing

Financial regulation must be tailored to address the unique risks of its regulated actors. Fintech, however, presents different risks than those involved with more traditional financial services, and thus fintech regulation must take those different risks into account. Fintech markets are typically small and decentralized, and thus a regulatory model aimed at producing high-quality information about fintech firms and their businesses, while limiting administrative burdens on small firms, is appropriate. Similarly, fintech regulation should aim to minimize risk propagation mechanisms in fintech markets, reducing the likelihood that adverse economic shocks to one actor will spread to other actors. But both of these approaches to fintech regulation will not solve another salient feature of fintech—the difficulty of identifying and monitoring the relevant actors. In order to address this problem, regulators should embrace the principle of self-policing.[238]

It is an inherent tension in the financial industry that regulated actors often (and perhaps always) know more about their business than regulators do. This situation leads regulators to depend in important

236. *See* Coffee, *Systemic Risk*, *supra* note 1, at 799–801.

237. *See* Moore & Christin, *supra* note 215, at 28.

238. Self-regulation has been a focus in financial regulation for some time, as banks have long argued that they are more capable of devising effective rules for themselves than detached regulators are. For a discussion of the history of financial self-policing, see Saule T. Omarova, *Wall Street As Community of Fate: Toward Financial Industry Self-Regulation*, 159 U. PA. L. REV. 411, 421–27 (2011).

ways on financial institutions themselves for guidance on how and where to regulate. This dependence, of course, can create opportunities for regulatory capture, as financial institutions shape the rules and regulations to benefit their interests.[239] It is now a commonplace belief that regulatory capture contributed to the creation and propagation of the 2008 financial crisis, at least in part by causing regulators to look the other way as financial institutions engaged in risky behaviors.[240] Despite these concerns about self-policing, it is likely that any effective regulatory regime for fintech will involve a substantial amount of voluntary self-monitoring.[241]

It is important to note at the outset that self-policing does not, in this context, mean that each individual firm will be solely responsible for monitoring and reporting its compliance with regulatory obligations. Certainly this is an essential element of any regulatory regime, as no regulator can observe the activities of all actors at all times. But well-designed self-policing regimes encourage actors to monitor *each other*.[242] Rather than relying on a centralized regulator to observe and enforce the laws, self-policing leverages the knowledge and expertise of multiple, dispersed actors to increase compliance.[243]

Fintech is a prime candidate for self-policing for a number of reasons. Fintech firms are in possession of idiosyncratic information that is poorly understood by outsiders. Robo-advisors know their businesses and investment algorithms better than anyone else. Crowdfunding sites understand their models and related vulnerabilities better than anyone else. Virtual currency platforms

239. Daniel Carpenter & David A. Moss, *Introduction* to PREVENTING REGULATORY CAPTURE: SPECIAL INTEREST INFLUENCE IN REGULATION AND HOW TO LIMIT IT (Daniel Carpenter & David A. Moss eds., 2014). For a general discussion of capture theory, see George J. Stigler, *The Theory of Economic Regulation*, 2 BELL J. ECON. & MGMT. SCI. 3 (1971).

240. *See* Levitin, *supra* note 154, at 2041–49 (summarizing the "regulatory capture narrative"); Saule T. Omarova, *Bankers, Bureaucrats, and Guardians: Toward Tripartism in Financial Services Regulation*, 37 J. CORP. L. 621, 623 (2012) (identifying "pervasive regulatory capture and lack of consistent representation of the public interest in long-term financial stability" as a critical flaw in existing financial regulation).

241. Indeed, regulatory capture may actually provide another reason why regulators should take a light hand in imposing broad, obligatory compliance procedures on the fintech industry. Some observers have noted that one rationale behind newly proposed OCC regulations of fintech companies is to protect incumbent banks. Pete Schroeder, *New Banking Regulator Defends Agency Effort to Regulate Fintech*, REUTERS (July 19, 2017, 12:11 PM), https://www.reuters.com/article/us-usa-banks-fintech-idUSKBN1A41ZP?il=0 [https://perma.cc/7GX2-HNSK]. To the extent that large banks have already captured financial regulators, they may well encourage regulators to impose excessively burdensome requirements on new fintech competitors in order to prevent fintech from making inroads into their businesses.

242. For a discussion of the benefits of banks monitoring risk-taking at other banks, see Kathryn Judge, *Interbank Discipline*, 60 UCLA L. REV. 1262 (2013).

243. *See id.* at 1281–96 (describing the methods that financial institutions use to impose discipline on other financial institutions).

understand the way that their currencies work better than anyone else. All of these actors are better placed than regulators to identify material risks in their industries, such as the introduction of new players or the discovery of unexpected features. Thus, they have the ability to identify relevant players and monitor their behavior much more effectively than outside regulators. Fintech firms are also closely attuned to the activities of their competitors. Fintech firms are constantly reviewing the competitive landscape to identify ways to improve their business, and, at least in virtual currency, much of the technology is "open source," allowing fintech firms greater visibility into the functioning of alternative firms. Thus, self-policing is likely to be particularly effective in the fintech sector.

The more difficult question, of course, is whether fintech will be *willing* to regulate itself. Monitoring is costly, and thus companies may not be willing to expend the resources necessary to do it, or they may not monitor at the optimal level. Even if they do discover risks in their industry that could potentially create negative externalities for third parties, they may have incentives to refrain from changing their behaviors to curtail these risks if the suspect behaviors are profitable. Thus, regulators will need to find ways to incentivize fintech to engage in an efficient level of self-policing.

One particularly powerful way to do this is to leverage collective sanctions, imposing costs on the group when an actor misbehaves. Collective sanctions are an effective way to utilize the superior information held by individual actors in a group and motivate them to use that information advantage to advance regulatory interests.[244] By allowing regulators to impose costs on an industry as a whole, rather than requiring them to identify individual bad actors, collective sanctions can incentivize individual companies to monitor the potentially risky behaviors of other members of their group. For example, regulators might signal to debt crowdfunding platforms that if a high number of loans in the industry default, the regulators will ratchet up the regulatory burdens on the industry as a whole. An alternative way to do this would be to impose the collective sanctions prematurely in the form of insurance—for instance, all debt crowdfunding companies could be required to contribute to an insurance fund to pay for bad debts in the event of systemic shock. Such a scenario, while marking a radical departure from current regulatory approaches, would encourage fintech companies to police themselves.[245]

244. *See* Daryl J. Levinson, *Collective Sanctions*, 56 STAN. L. REV. 345 (2003).

245. One important component of this process would, of course, be to identify the relevant "group" for sanctions. This would not be a simple or uncontroversial process, given the diversity of

The benefits of self-policing are evident: it requires little intrusion from government regulators, it imposes fewer administrative burdens on firms, and it leverages the superior knowledge of industry actors. In an industry that is disruptive and innovative, it mitigates the problem that any laws passed today will swiftly become outdated and stale. If individual actors in the sector can be incentivized to engage in self-policing at appropriate levels, regulators may be able to significantly reduce systemic risk with minimal intrusion.

D. International Cooperation

Finally, financial regulation must take into account the international dimensions of fintech. It is by now a commonplace notion that business is more international than ever. But too often, regulation is drafted without close scrutiny of the long-term international consequences of particular regulatory approaches. A more internationally minded regulatory regime would take into account three fundamental principles: first, fintech activity is not solely domestic, but rather crosses national borders and often raises complex jurisdictional issues; second, regulatory actions in one country will have effects on other countries; and third, regulators in other countries will have useful information about the effects of particular types of fintech regulation. All of these factors suggest that international cooperation will be essential in designing effective fintech regulation.[246]

Fintech activity is not neatly located in a single jurisdiction. Robo-advisors can provide financial advice to consumers around the world through their online platforms. Crowdfunding sites can connect companies seeking capital with investors around the world. Virtual currencies are created and maintained by dispersed sets of computers

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fintech actors and the constantly evolving nature of the industry. But regulators constantly go through similar exercises in identifying their relevant "regulated groups," and, as long as this process is done transparently and in good faith, it could lead to measured improvement in the industry.

246. There is a voluminous literature on international financial regulation and the proper role of coordination and cooperation between national regulatory bodies. For an excellent analysis of the SEC's efforts to address international regulatory coordination, see Howell E. Jackson, *Substituted Compliance: The Emergence, Challenges, and Evolution of a New Regulatory Paradigm*, 1 J. FIN. REG. 169 (2015). For more general analyses of the international implications of financial regulation, see Chris Brummer, *How International Financial Law Works (and How It Doesn't)*, 99 GEO. L.J. 257 (2011) (arguing that international financial rules are more coercive and powerful than traditional theories of international law predict); Stavros Gadinis, *The Politics of Competition in International Financial Regulation*, 49 HARV. INT'L L.J. 447, 447–53 (2008) (describing the importance of policy coordination in financial regulatory regimes); and Beth Simmons, *The International Politics of Harmonization: The Case of Capital Market Regulation*, 55 INT'L ORG. 589 (2001) (providing a model for how and why financial regulation converges on certain regulatory structures provided by a dominant nation).

located in many different countries. Fintech firms are actively searching for friendly jurisdictions in which to locate their headquarters, and they are uniquely capable of picking up their stakes and moving elsewhere.[247] As a result of the cross-border aspects of many fintech services, multiple regulators will have legitimate interests in regulating the activities of fintech actors. This means that fintech regulation will need to contain a substantial extraterritorial dimension in order for its dictates to be effective. It also means that overly burdensome fintech regulation in a single jurisdiction will have particularly consequential effects on the country's fintech industry. Unlike with traditional finance, where it is highly unlikely that any large bank of a sufficient size would attempt to completely abandon a significant market, with fintech, regulatory costs will likely play an important role in deciding where fintech locates itself in the first place.

As a consequence, regulators must recognize that their own regulations will have effects on other countries. In other words, there will be important distributional effects of adopting one particular regulatory regime over another. For example, if regulators impose particularly burdensome fintech regulations on actors in their own jurisdiction, this may cause fintech activity (and the tax and employment benefits thereof) to shift away from their own jurisdictions and into others. Or, conversely, if regulators adopt fintech-friendly regulations, they will be able to attract fintech companies to their countries. In some cases, this dynamic may lead to a "race to the bottom," in which countries compete to constantly lower the regulatory burdens in their own jurisdictions, with the ultimate result being excessively lax regulation that leads to abusive practices.[248] But of course, the "race to the bottom" is not the only potential dynamic; in some circumstances, we may witness a "race to the top," in which regulators compete to adopt better designed, more efficient regulations.[249] A third dynamic, and potentially the most worrisome one, would be overlapping and conflicting regulations, where regulators, concerned with domestic priorities, fail to take into account other countries' rules, and thus fintech firms find themselves having to navigate a maze of legal rules and restrictions that inhibit their ability

247. For a discussion of the increasing ability of firms to restructure and relocate in order to avoid burdensome regulation, see William Magnuson, *Unilateral Corporate Regulation*, 17 CHI. J. INT'L L. 521 (2016).

248. *See* Lucian Arye Bebchuk & Allen Ferrell, *A New Approach to Takeover Law and Regulatory Competition*, 87 VA. L. REV. 111, 132–35 (2001).

249. *See* Peter Dodd & Richard Leftwich, *The Market for Corporate Charters: "Unhealthy Competition" Versus Federal Regulation*, 53 J. BUS. 259, 260–61 (1980); Frank H. Easterbrook, *Managers' Discretion and Investors' Welfare: Theories and Evidence*, 9 DEL. J. CORP. L. 540, 549–50 (1984).

to operate efficiently. Whether regulatory competition in fintech will lead to the "Delaware effect," the "California effect," or the more insidious "anarchy effect" remains to be seen, but regulators must carefully consider the effects of their rules on other countries, and how those rules will interact with each other.

Finally, fintech regulators must recognize, and take advantage of, the useful information that foreign regulators will have with respect to their own experiences with fintech. Even if regulatory competition is inevitable, such competition does not necessarily need to foreclose the possibility of regulatory cooperation. Systemic risk, after all, does not respect national borders. The financial crisis started in the United States but quickly spread to other countries, in some cases causing even more disruption abroad than it did in the United States.[250] Governments, thus, have an interest in cooperating to prevent systemic risk from materializing in the fintech sector. They also have a broader interest in ensuring that fintech is not used to evade national regulations. These important governmental interests provide an opportunity for regulators to cooperate to create responsible and appropriate measures to respond to and limit systemic risk factors in the fintech sector.

This does not mean that fintech regulation must be uniform. In fact, uniformity is both unlikely and undesirable at this stage of fintech's development. Much as the federal system in the United States is valued for its ability to allow state governments to serve as "laboratories of democracy,"[251] national regulators must be free to experiment with their own types of fintech regulation based on their own unique interests and concerns. Already, national governments have adopted a plethora of different approaches to fintech. Hong Kong has adopted a regulatory sandbox that allows fintech firms to launch new financial products without complying with the usual regulatory

250. Just to take one example, Iceland suffered a particularly severe banking crisis. Within the course of a single week, Icelandic banks with assets worth fourteen times the country's GDP failed, and the country's currency dropped 70%. *Iceland Lifts Capital Controls*, ECONOMIST (Mar. 18, 2017), https://www.economist.com/news/finance-and-economics/21718889-last-country-marks-symbolic-recovery-its-financial-meltdown-iceland [https://perma.cc/7RCT-XRUE].

251. Justice Louis Brandeis is credited with the creation of the "laboratory of democracy" model of federalism. In *New State Ice Co. v. Liebmann*, he wrote in dissent that "[i]t is one of the happy incidents of the federal system that a single courageous state may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country." 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting). Whether states actually do innovate at efficient levels is, however, a matter of some controversy. *See* Brian Galle & Joseph Leahy, *Laboratories of Democracy? Policy Innovation in Decentralized Governments*, 58 EMORY L.J. 1333 (2009); Susan Rose-Ackerman, *Risk Taking and Reelection: Does Federalism Promote Innovation?*, 9 J. LEGAL STUD. 593 (1980).

requirements.[252] Britain has done the same, and even more recently, announced a "fintech salon," that aims to bring together the Bank of England, fintech companies, investors, and the Financial Conduct Authority to have open conversations about developments in the sector.[253] U.S. regulators are still in the early stages of developing their own response to fintech, with several bodies issuing white papers and other proposals.[254] Thus, fintech regulation is already emergent and diverse, and it will likely develop in unexpected ways. But it also presents a great opportunity, as regulators are just beginning to grapple with the difficult questions presented by the vast array of fintech innovations on the market. Regulators are adopting different mechanisms to promote innovation while constraining undesirable behavior. Some mechanisms will prove effective, while others will fall by the wayside. Regardless of the results of these various experiments, regulators will learn much from the process of experimentation itself, and it is important for these lessons to be shared between regulators. Regulators would be well advised to establish networks for formal and informal exchanges of information on a regular basis. These networks will likely prove essential in improving and revising financial regulation in light of fintech innovation.

Thus, well-designed fintech regulation will necessarily have an international dimension to it. It will require a careful consideration, not just of its effects on domestic actors, but also on foreign ones. It will require regulators to establish ties with regulators in other jurisdictions in order to share information and prevent harmful clashes. The aim is not so much to impose a single regulatory framework on all jurisdictions, but rather to ensure that regulatory competition and experimentation occurs in a way that produces useful and usable information for governments.

CONCLUSION

After the financial crisis of 2008, it was widely recognized that "too big to fail" financial institutions posed serious risks to the health of the wider economy. As a result, financial regulation pivoted toward reducing the risks posed by such large institutions, with Dodd-Frank

252. Michelle Chen & Michelle Price, *Hong Kong to Launch Banking Fintech "Sandbox" As Rivals Pull Ahead*, REUTERS (Sept. 6, 2016, 12:15 AM), https://www.reuters.com/article/us-hongkong-banks-regulator/hong-kong-to-launch-banking-fintech-sandbox-as-rivals-pull-ahead-idUSKCN11C0EV [https://perma.cc/PP4L-NF48].

253. Clare Dickinson, *Bank of England Gathers Minds for Fintech Salon*, FIN. NEWS (Mar. 17, 2017), https://www.fnlondon.com/articles/bank-of-england-gathers-minds-for-fintech-salon-20170317 (last updated Mar. 17, 2017, 4:14 PM) [https://perma.cc/YG6Z-WPV7].

254. *See supra* note 219.

enacting an array of reforms aimed to prevent "too big to fail" financial institutions from coming into being in the first place, and closely monitoring and constraining those that already existed. But this focus on "too big to fail" financial institutions overlooks an important and disruptive force in finance today: the rise of fintech. Fintech firms are innovating the way that financial services are provided in an enormous variety of areas, from asset management to capital raising to virtual currency. Fintech promises to provide great benefits to society, as it lowers costs and broadens access. But it also presents new and different concerns than those presented by conventional financial institutions. Small, disaggregated actors create their own systemic risks, risks that are potentially more worrisome than the risks presented by more traditional financial actors. Financial regulation must adapt to confront these risks head on. This Article has set forth a variety of potential regulatory responses that better address the unique risks and vulnerabilities of fintech, but it by no means proposes to serve as the final word on these difficult matters. Ultimately, fintech regulation will need to be as flexible and adaptable as the fintech industry itself. No simple task, to be sure. But if regulators are able to fashion smart and efficient rules to guide the industry, they will play a part in enabling one of the great innovations of our time.