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Fintech and International Financial Regulation

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ABSTRACT

This Article shows that fintech exacerbates the difficulties of standard setting in international financial regulation. Earlier work introduced the "Innovation Trilemma" (the Trilemma). When seeking to balance the goals of achieving market integrity and innovation through clear and simple rulemaking, regulators can—at best—achieve only two out of these three objectives. Fintech's unique characteristics—a reliance on automation and artificial intelligence, novel types of big data, as well as the use of disintermediating financial supply chains comprising a mix of traditional firms as well as technology specialists and newcomers—complicates the application of the Trilemma. Rulemaking struggles to achieve needed clarity where innovative algorithms introduce informational uncertainties and complex risks for market integrity. Further, regulation's ability to impose compliance costs on firms in response to these risks is limited when a preference for innovation favors smaller upstarts and nontraditional players.

International financial regulation presents even steeper challenges when viewed through the lens of the Trilemma. First, rules clarity is harder to achieve owing to divergences in national legal systems, administrative processes, and market structures. Secondly, fintech increases negotiation costs in international standard setting owing to the emergence of a much more expansive cast of economies—like China and India—that dominate as fintech hubs alongside the traditional power players such as the United States or European Union (EU). With distinctive policy preferences, emerging economies constitute powerful voices that mean that negotiation must account for a wider range of distributive preferences. Finally, standard setting must bridge the particularities of domestic market structures that are experiencing varying degrees of disintermediation and transformations in financial supply chains. Rules that impose high compliance costs may be acceptable to economies dominated by traditional intermediaries but

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may lack buy-in from those where nonbank firms hold sway. In concluding, this Article briefly surveys strategies for fostering greater global cooperation in standard setting for fintech.

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I. INTRODUCTION

In the summer of 2019, Facebook revealed its ambition to become a global monetary superpower by proposing to launch its own digital currency—Libra.[1] Boasting almost three billion users worldwide—offering a ready-made network for the future launch of such a project—the social media behemoth offered prospective customers the prospect of a new payment system that, if fully realized, could rival the most dominant national currency systems anywhere within the global order.[2]

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1. *An Introduction to Libra*, LIBRA 1 (June 2019), https://libra.org/en-US/wp-content/uploads/sites/23/2019/06/LibraWhitePaper_en_US.pdf [https://perma.cc/ST3Z-5QUY] (archived Feb. 7, 2020); Hannah Murphy, *Facebook Unveils Global Digital Coin called Libra*, FIN. TIMES (June 18, 2019), https://www.ft.com/content/af6b1d48-90cc-11e9-aea1-2b1d33ac3271 [https://perma.cc/U2PR-V2HX] (archived Feb. 7, 2020).

2. Brendan Greeley, *Facebook's Libra Currency is Wake-up Call for Central Banks*, FIN. TIMES (Oct. 21, 2019), https://www.ft.com/content/6960c7a4-f313-11e9-b018-

The white paper outlining Libra was more aspirational than real, touting its future potential to reach a global population of users and transform how they move their money. Yet in setting out its intent to reshape global financial markets, Facebook quickly attracted regulatory scrutiny, popular distrust, and political ire.[3] Yet amid this firestorm, policymakers began to appreciate the full power of digital financial technologies to revolutionize market structure and to set a series of questions that national regulators would have to tackle jointly: Could a tech company successfully manage a currency? What kinds of risks would Libra's institutional arrangements create for Libra's users? Did regulators possess the resources to oversee a project of this scale and significance? Perhaps most fundamentally, did Facebook's idea threaten the future of domestic fiat currencies, and by extension, the monetary sovereignty of countries animating the global community?[4]

Yet despite the attention garnered by Libra, Facebook's entry into financial services ultimately comprised the tip of a much larger iceberg.[5] Over the last few years, markets have witnessed a slate of

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3ef8794b17c6 [https://perma.cc/LV58-2EX3] (archived Feb. 18, 2020); Dirk Zetzsche et al., *Regulating LIBRA: The Transformative Potential of Facebook's Cryptocurrency and Possible Regulatory Responses* 1 (Univ. of Hong Kong Faculty of Law Research, Working Paper No. 042, 2020).

3. *See* Eric Posner, *The Trouble Starts If Facebook's New Currency Succeeds*, ATLANTIC (June 25, 2019), https://www.theatlantic.com/ideas/archive/2019/06/dont-trust-libra-facebooks-new-cryptocurrency/592450/ [https://perma.cc/F82M-2HXM] (archived Apr. 6, 2020); Ben Walsh, *Facebook's New Libra Currency Runs Into Distrust in the Senate*, BARRON'S (July 16, 2019), https://www.barrons.com/articles/facebooks-libra-cryptocurrency-encounters-distrust-in-the-senate-51563300923 [https://perma.cc/2GQJ-JP9U] (archived Apr. 6, 2020).

4. *99 Problems – Examining Facebook's Proposed Cryptocurrency and Its Impact on Consumers, Investors, and the American Financial System: Hearing Before the H. Comm. on Fin. Servs.*, 115th Cong. 1–2 (2018) (statement of Chris Brummer, Professor of Law, Georgetown Univ. Law Ctr.), https://financialservices.house.gov/uploadedfiles/hhrg-116-ba00-wstate-brummerc-20190717.pdf [https://perma.cc/XK9R-WWXW] (archived Feb. 17, 2020); Chris Giancarlo & Daniel Gorfine, *We Sent a Man to the Moon. We Can Send the Dollar to Cyberspace*, WALL ST. J. (Oct. 15, 2019), https://www.wsj.com/articles/we-sent-a-man-to-the-moon-we-can-send-the-dollar-to-cyberspace-11571179923 [https://perma.cc/HD9U-ST4N] (archived Feb. 18, 2020); Greeley, *supra* note 2.

5. The definitions of what constitutes fintech can vary between commentators. *See, e.g.*, Christophe Williams, *What is Fintech?*, WHARTON FINTECH (Feb. 16, 2016), http://www.whartonfintech.org/blog-archive/2016/2/16/what-is-fintech [https://perma.cc/CCV9-SKL5] (archived Feb. 7, 2020) (describing fintech as "an economic industry composed of companies that use technology to make financial systems more efficient"); Mark Carney, Governor of the Bank of Eng. & Chair of the Fin. Stability Bd., The Promise of FinTech—Something New Under the Sun?, Speech at the G20 Conference on "Digitizing Finance, Financial Inclusion and Financial Literacy" (Jan. 25, 2017) (noting the significance of disintermediation as a feature of fintech). For further discussion, *see* Douglas W. Arner et al., *The Evolution of Fintech: A New Post-Crisis Paradigm?* 1 (Univ. H.K. Faculty of Law, Research Paper No. 2015/047, 2016); Dirk A. Zetzsche et al., *From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance* 1 (Eur. Banking Inst., Working Paper No. 6, 2017) (highlighting the role of big

technological innovation across industries, promising to revolutionize how financial services are delivered. From innovations like Bitcoin to online-only lenders, digital wallet providers, or peer-to-peer payments technologies (like Venmo), technological flourishing in finance has exposed regulators to complex ideas and inquiries on the significance of these innovations for existing modalities in regulation.[6]

Still a central inquiry turns on the determination of what, if anything, about this wave of financial innovation is really new. After all, markets have always evolved, invented, and come up with creative propositions that change how finance works. From the automated teller machine (ATM) to the financial engineering seen in the run-up to the 2008 Crisis, innovation has shaped and then reshaped markets through the ages.[7] This truism suggests that if fintech represents just another iteration of innovation, regulators should be able to rely on existing tools and strategies for oversight. From the standpoint of international financial regulation, a lack of newness means that regulators can look to the mechanisms established by the post-2008 international regulatory framework to promulgate standards for fintech (if these are really needed) and to motivate compliance from countries.[8] Following the Crisis, this post-2008 regulatory order—comprising standard-setting bodies as well as enforcers like the International Monetary Fund (IMF)—has shown great success at leading an overhaul of the global financial system in response to the lessons learned.

This Article underscores, however, that fintech *is* different and that it poses a new regulatory conundrum for policymakers. Earlier work has highlighted features of fintech that distinguish it from earlier eras of financial innovation, including: (i) its reliance on automation and artificially intelligent algorithms; (ii) the pervasive use of big data, including categories of data (e.g., social media use) that are entirely unique to the digital age; and (iii) the proliferation of nontraditional firms, start-ups, and newcomers specializing in tech rather than just financial expertise and disintermediating common financial functions.[9]

This earlier work also introduced the "Innovation Trilemma" (or the Trilemma): that is, in modeling the trade-offs facing regulators when overseeing innovation, protecting market integrity, and legislating through clear and simple rules, regulators can—at best—

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data in fintech). In Part II, *infra*, we define what we consider to be the major features of fintech: (i) reliance on algorithms; (ii) big data; and (iii) disintermediation in financial supply chains as well as reliance on non-traditional firms in financial markets).

6. *See* discussion and sources in Chris Brummer & Yesha Yadav, *Fintech and the Innovation Trilemma*, 107 GEO. L.J. 235, 237–42 (2019).

7. *See id.* at 244–58.

8. On the international financial regulatory order, *see infra* Part I.

9. *See* Brummer & Yadav, *supra* note 6, at 264–81.

achieve only two out of these three objectives.[10] For example, regulators can encourage innovation through clear and simple rules such as expansive permissions to conduct novel (risky) activities. Such actions, while likely to nurture new products and services, can jeopardize market integrity. Similarly, policymakers wishing to safeguard the market through simple rules, such as outright bans on certain activities, will discourage innovation. Finally, when looking to promote innovation while also ensuring market integrity, regulators can likely only succeed through a complex set of rules.[11]

The application of the Trilemma to fintech represents an especially challenging task. Artificially intelligent algorithms generate deep information asymmetries, creating a high analytical burden for regulators looking to understand how these programs will operate in real-world markets.[12] The informativeness of big data remains partial in some contexts, especially for new types of digital data that lack a history of use and testing.[13] Although regulators have faced similar difficulties in the past (e.g., to understand the complex financial modeling), fintech creates a special challenge. Whereas policymakers have long been used to overseeing a cadre of familiar Wall Street firms, usually well resourced and experienced, fintech has opened the door to start-ups, newcomers, and tech experts that compete with incumbents.[14] As a consequence, regulators face the bind that imposing compliance costs on these new entrants can drive them out of finance.[15] However, leaving them to create risks for a highly regulated industry may well imperil the financial system as a whole.[16]

This Article makes three points. First, the trade-offs laid out in the Trilemma have outsized implications for global regulators relative to those acting only within domestic legal systems. Rules clarity in international standard setting is particularly difficult to achieve owing to differences between national legal systems, civil and common law jurisprudence, as well as divergences across administrative and legislative processes. Similarly, costs to market integrity from cross-border fintech can be harder to estimate in light of these domestic differences that govern how international standards are implemented and enforced within home borders. Inadequate home-state regulation of innovative fintech can have spillover effects into host-state markets, and local regulators can struggle to sanction bad actors situated beyond their jurisdiction and expertise. Owing to the difficulty of

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10. *Id.* at 244.
11. *See id.* at 244–49.
12. *Id.* at 264–74.
13. *Id.*
14. *Id.* at 275–78.
15. *Id.*
16. *See generally* William Magnuson, *Regulating Fintech*, 71 VAND. L. REV. 1167 (2018) (arguing that the financial regulatory reforms following the 2008 economic crisis fail to take into account the quickly changing face of financial services).

protecting market integrity through clear and simple rulemaking, the objective of fostering global innovation becomes especially impacted where fintech aims to reach across national borders to capture scale, data, efficiencies, and network effects.

Secondly, achieving cross-border consensus on fintech regulation entails high negotiation costs compared to more traditional fields of finance owing to a more heterogenous set of principals wielding influence and power. Boasting successful and influential innovation hubs, fintech is driven as much by emerging economies like Kenya, India, and China as by the usual grouping of developed economies that have long dominated regulatory agenda setting in areas such as banking, securities, or derivatives regulation.[17] With eye-catching transaction volumes, widespread adoption of new technologies, and a younger population of digitally savvy consumers, a number of emerging economies are leading the way in transposing innovative fintech into their financial markets.[18] In China, for example, WePay—the mobile payments app—has achieved a monthly user base of around 900 million people.[19] A larger and more varied set of actors increases the negotiation costs involved in crafting a regulatory agenda that matches each of their particular policy preferences and market demands. For a number of economies, fintech products have grown to fill consumer needs that have not otherwise been met by conventional legacy products like bank accounts or credit cards.[20] In developing new technologies that large population centers depend on, emerging economies constitute power centers that bring a complicated set of distributive costs and trade-offs to standard-setting negotiations.

Finally, the Article shows that international financial regulation for fintech requires creating standards capable of bridging national market structures that are variously experiencing disintermediation and increasing complexity within financial supply chains. As described in earlier work, fintech is characterized by a more crowded cast of industry players that comprise the traditional vanguard of Wall Street firms alongside newer upstarts and technology providers.[21] In some

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17. DANIEL K. TARULLO, BANKING ON BASEL: THE FUTURE OF INTERNATIONAL FINANCIAL REGULATION 15–42 (2004) (showcasing the significance of the United States and Japan in driving the creation of the Basel Accords on bank regulation to reflect the policy dynamics and preferences of these countries). *See also* KEES CAMFFERMAN & STEPHEN A. ZEFF, FINANCIAL REPORTING AND GLOBAL CAPITAL MARKETS: A HISTORY OF THE INTERNATIONAL ACCOUNTING STANDARDS COMMITTEE, 1973–2000, at 295 (2007) (noting the essential role of the Securities and Exchange Commission in the rise of International Organization of Securities Commissions, or IOSCO).

18. Jon Frost et al., *BigTech and the Changing Structure of Financial Intermediation* 11 (Bank for Int'l Settlements Working Paper No. 779, 2019), https://www.bis.org/publ/work779.pdf [https://perma.cc/G5D4-UPMP] (archived Feb. 17, 2020).

19. *Id.*

20. *Id.*

21. *See* Brummer & Yadav, *supra* note 6, at 264–81.

cases, such as for payment networks like Kenya's M-Pesa or China's WePay, fintech firms can entirely displace the intermediation usually provided by more traditional financial firms like banks.[22] In other economies and contexts, however, fintechs add to and can lengthen the financial supply chain by working alongside legacy players to offer discrete services such as a digital wallet or encryption as add-ons to bank or investment accounts.[23] The varying structural composition of national financial market structures—undergoing diverging levels of disintermediation and changes to their financial supply chains—amplifies the difficulties of rulemaking. Strict, high-compliance rules to safeguard market integrity may work for economies dominanted by the traditional financial firm. However, they will likely falter in those dominated by less traditional and likely less well-capitalized and regulated entities. Achieving consensus to bridge emerging structural divergences in market structure thus represents a tall order for even skilled and highly technocratic international standard setters.

In concluding, this Article briefly outlines initial ideas to help navigate the new challenges posed by fintech in international financial regulation. It points to the potential of minilateralism as well as private self-regulation as offering pathways forward. Recalibrating international financial regulation for digital fintech can help ensure that it remains as resonant for the coming decade as much as it has been for the one just passed. This Article proceeds as follows. Part II provides an overview of the framework for international financial regulation. Part III explains the rise of fintech and describes the Innovation Trilemma, with Part IV analyzing the new landscape faced by international regulators to tackle the risks of cross-border digital innovation. Part V concludes with brief ideas for future reform.

II. THE CASE FOR INTERNATIONAL FINANCIAL REGULATION

International financial regulation has experienced impressive successes in the decade following the 2008 Crisis.[24] Guided by the Pittsburgh Declaration, global regulators have worked in lockstep to develop a body of legislative and institutional fixes to overhaul the financial system and remedy the major weaknesses exposed by the

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22. Frost et al., *supra* note 18, at 11.

23. *See* Brummer & Yadav, *supra* note 6, at 264–81.

24. *See generally* CHRIS BRUMMER, MINILATERALISM: HOW TRADE ALLIANCES, SOFT LAW, AND FINANCIAL ENGINEERING ARE REDEFINING ECONOMIC STATECRAFT (2014) [hereinafter BRUMMER, MINILATERALISM] (noting the central place of regional regulatory alliances); CHRIS BRUMMER, SOFT LAW AND THE GLOBAL FINANCIAL SYSTEM: RULE MAKING IN THE 21ST CENTURY (2012). *But see* Pierre Hugues-Verdier, *The Political Economy of International Financial Regulation*, 88 IND. L.J. 1405 (2013) (noting the drawbacks of the system of informal international financial regulation).

2008 financial collapse.[25] Rarified technocratic bodies—such as the Financial Stability Board, the Basel Committee on Banking Supervision (BCBS), and the International Organization of Securities Commissioners (IOSCO)—have crafted detailed standards that have been implemented into domestic legal systems across the G-20 economies.[26] The World Bank and the International Monetary Fund (IMF) have bolstered these efforts by assessing national regulatory frameworks to benchmark their compliance with agreed-upon international standards.[27] This informal framework of global legislative bodies (like the BCBS), combined with the enforcement of their work products by the IMF and World Bank, have conferred a hard edge to the otherwise soft nature of international financial regulation.[28] Reflecting the resulting power of this framework, domestic financial systems around the world have been reformed wholesale. In the United States, for example, the Dodd-Frank Wall Street Reform and Consumer Protection Act 2010 (the Dodd-Frank Act) showcased the implementation of international standard setting,

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25. *See generally Leader's Statement: The Pittsburgh Summit*, EUROPEAN COMM'N 9 (Sept. 24–25, 2009), http://ec.europa.eu/commission_2010-2014/president/pdf/statement_20090826_en_2.pdf [https://perma.cc/6GES-SGQN] (archived Feb. 17, 2020). This is not to suggest that countries have not diverged in their implementation of international standards, nor that regulators have always agreed on implementation strategies and enforcement approaches. *See, e.g.*, *Report on the Danger of Divergence: Transatlantic Financial Reform & the G20 Agenda*, ATLANTIC COUNCIL 29–31 (2013) https://www.atlanticcouncil.org/wp-content/uploads/2013/12/Danger_of_Divergence_Transatlantic_Financial_Reform_1-22.pdf [https://perma.cc/JAG5-TUVA] (archived Feb. 17, 2020) [hereinafter ATLANTIC COUNCIL]; Joe Rennison, *U.S. Superior to Europe on Futures Margin*, FIN. TIMES (May 14, 2015) [https://perma.cc/CQ2E-2HG4] (archived Feb. 18, 2020).

26. *See, e.g.*, BASEL COMM. ON BANKING SUPERVISION, CORE PRINCIPLES FOR EFFECTIVE BANKING SUPERVISION (2012); INT'L ORG. OF SEC. COMM'NS, OBJECTIVES AND PRINCIPLES OF SECURITIES REGULATION 4 (2011); *Basel III: International Regulatory Framework for Banks*, BANK FOR INT'L SETTLEMENTS, https://www.bis.org/bcbs/basel3.htm (last visited Feb. 6, 2020) [https://perma.cc/YPQ6-855X] (archived Feb. 17, 2020); Committee on Payment and Settlement Systems, *Principles for financial market infrastructures*, BANK FOR INT'L SETTLEMENTS (Apr. 2012), https://www.bis.org/cpmi/publ/d101a.pdf [https://perma.cc/L6SG-M7AN] (archived Feb. 6, 2020).

27. IMF Staff, *Financial Sector Assessment Program*, INT'L MONETARY FUND, https://www.imf.org/en/About/Factsheets/Sheets/2016/08/01/16/14/Financial-Sector-Assessment-Program (last visited Feb. 6, 2020) [https://perma.cc/CVG7-MPG7] (archived Feb. 17, 2020).

28. *See generally* Chris Brummer, *How International Law Works (and How It Doesn't)*, 99 GEO. L.J. 257, 262–65 (2011) (setting out the foundations of international financial law and the mechanisms that help harden its soft character) [hereinafter Brummer, *How International Law Works*]; David Zaring, *Financial Reform's Internationalism*, 65 EMORY L.J. 1255, 1256–62 (2016) (noting the increasing internationalization of financial regulation and its impact on traditional domestic administrative process and the role of Congress); BRUMMER, MINILATERALISM, *supra* note 24, at 63–120 (discussing the architecture of international finance law).

producing a far-reaching program of reform that has transformed domestic regulation in just a handful of years.[29]

The surging popularity of fintech, however, sets a new and intractable challenge for this global regulatory order. How effectively it rises to meet it will, in part, determine its continuing viability for the decade ahead. This Part sets out a short primer on the international financial regulatory framework, particularly over the last decade as post-Crisis rulemaking has more fully institutionalized its workings.[30] In setting out its key features, this Part makes the case that the complexities of fintech create a serious challenge for regulators, straining the capacity of the current international financial regulatory system to serve as a workable coordination and consensus-building mechanism going forward.

A. *The Need for International Financial Regulation*

The cross-border economic carnage triggered by the 2008 Crisis, followed by the global fallout from the COVID-19 pandemic, serve as abject lessons on the need for a robust international regulatory order for finance. Owing to gradually loosening controls, capital no longer remains fixed within the borders of a single country. Rather, facilitated by dense networks of cross-border bank branches and subsidiaries, it can move fluidly and rapidly across the globe. Electronic fund transfers permit these movements to occur digitally, rather than requiring the slow and costly handover of cash and paper documents.[31]

Scholars have pointed to thickening financial linkages between countries in the decades preceding the Crisis as evidence of growing cross-border economic interdependencies. René Stulz observed that foreign investors trading in US securities increased from 5.8 percent of gross domestic product (GDP) in 1977 to 344.2 percent by 2003.[32] In 2009, US investors bought around $4 trillion in foreign stocks, up from a relatively meager $51.7 billion in 1986.[33] Between 1986 and 2009, US investors grew their purchases of private debt securities from $169.8 billion to almost $2 trillion.[34] Similarly in banking, the rise of

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29. Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010, Pub. L. No. 111-203, tit. VII (codified as amended in sections of 7 U.S.C. and 15 U.S.C.). In the European Union, *see* Commission Regulation 648/2012, 2012 O.J. (L 201) 1 (EU).

30. Brummer, *How International Law Works*, *supra* note 28, at 259–61 (describing the "dizzying array" of international rulemaking in response to the 2008 Crisis).

31. *Id.* at 265–66.

32. HAL S. SCOTT & ANNA GELPERN, INTERNATIONAL FINANCE: TRANSACTIONS, POLICY, AND REGULATION 18–19 (18th ed. 2011); René Stulz, *The Limits of Financial Globalization* 7–8, 54 (Nat'l Bureau of Econ. Research, Working Paper No. 11070, 2005), https://www.nber.org/papers/w11070.pdf [https://perma.cc/7T3S-GK62] (archived Feb. 7, 2020).

33. SCOTT & GELPERN, *supra* note 32, at 89.

34. *Id.*

international banks has contributed to a deeper global market for banking services. According to Hal Scott and Anna Gelpern, foreign claims constituted around 23 percent of bank assets in the United States in 2007, compared to around 90 percent for Switzerland.[35] Foreign banks in the United States lent out 25 percent of business loans at the close of 2010.[36] As the Crisis's most notable failure, Lehman Brothers collapsed with around $600 billion worth of assets located all across the world.[37] Its insolvency implicated hundreds of subsidiaries in eighty bankruptcy proceedings across sixteen jurisdictions, illustrating the unavoidably global nature of modern markets.[38]

This hypermobility of capital raises red flags for domestic financial regulators that they cannot address by themselves. First, cross-border capital flows foster deep information asymmetries.[39] Regulators must understand what kinds of risks their home-state firms are assuming as they conduct business across jurisdictions. Moreover, their interactions can contribute to system-wide risks that add an additional and indeterminate valence of danger for possible import into domestic markets.[40] As Dan Awrey writes, information asymmetries can be especially pernicious where firms engage with innovative and complex financial products.[41] In the paradigmatically international market for over-the-counter derivatives—where almost 80 percent of trades in certain securities can sometimes be with

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35. *Id.*

36. SCOTT & GELPERN, *supra* note 32, at 235–46.

37. Tracey Samuelson, *Why Lehman Still Exists Ten Years After Its Collapse*, MARKETPLACE (Sept. 10, 2018), https://www.marketplace.org/2018/09/10/why-lehman-still-exists-ten-years-after-its-collapse/ [https://perma.cc/PN36-U7YK] (archived Feb. 7, 2020).

38. *Id.* For a discussion of cross-border large firm insolvency and the insolvencies affecting Long Term Capital Management, Herstatt Bank, and the Bank of Credit and Commerce International (BCCI), *see generally* Richard Herring, *The Challenge of Resolving Cross Border Financial Institutions*, 31 YALE J. REG. (2014).

39. *See, e.g.*, Alan Aherene et al., *Information Costs and Home Bias: An Analysis of U.S. Holdings of Foreign Equities* (Fed. Reserve Bank Int'l Fin. Discussion Paper No. 691 2001), https://www.federalreserve.gov/pubs/ifdp/2000/691/ifdp691.pdf [https://perma.cc/JG6F-QX29] (archived Feb. 7, 2020) (discussing the impact of information asymmetries on US firms investing in sometimes opaque foreign securities).

40. *See generally* Jeffrey Gordon & Wolf-Georg Ringe, *Bank Resolution in the European Banking Union: A Transatlantic Perspective on What It Would Take*, 115 COLUM. L. REV. 1297 (2014) (analyzing the importance of understanding systemic spillovers in designing banking reform); Emilio Avgouleas, Financial Regulation, Behavioural Finance, and the Global Credit Crisis: In Search of a New Regulatory Model 1 (May 13, 2008) (unpublished manuscript) (on file with SSRN), https://pdfs.semanticscholar.org/9c22/2054b32e88dcd8c6940ef2576f161f0cdf1f.pdf [https://perma.cc/KE8F-22NV] (archived Feb. 7, 2020) (highlighting the transmission channels for systemic risk flows).

41. *See* Dan Awrey, *Regulating Financial Innovation: A More Principles-Based Alternative?*, 5 BROOK. J. CORP. FIN. COM. L. 273, 291 (2011); Dan Awrey, *The FSA, Integrated Regulation, and the Curious Case of OTC Derivatives*, 13 U. PA. J. BUS. L. 1, 40–60 (2010).

counterparties from a different jurisdiction—large financial firms have historically enjoyed ample rein to innovate and invest in opaque securities like credit default swaps (CDS).[42] Individual firms like the American International Group (AIG) assumed significant (and then-unknown) levels of exposure to credit risks. Ultimately the broader collapse of the CDS market triggered systemic spillovers as firms struggled to manage complex credit risks they had relied on this market to contain.[43] Measuring these risks constitutes an essential policy objective for regulators whose domestic markets rely heavily on foreign firms or domestic firms with risky foreign operations for financial services. Certain EU countries (like the Baltic nations), for example, have been dominated by foreign banks as critical providers of deposits and loans, fostering heavy dependence on highly mobile capital providers.[44]

Secondly, firms do not always have an incentive to report to regulators as well as to collect information for themselves in order to ensure that they sufficiently provision for the risks that they assume. Importantly, the costs of such research can sometimes be prohibitive, especially in sophisticated and innovative markets. Even diligent firms may not properly understand the risks that they are taking on (e.g., in the case of the opaque CDS market).[45] Further, they could well underestimate the systemic content of their activities owing to difficulties inherent to the task of guesstimating the risk-taking of others. In other words, those firms that do take care may still be left vulnerable where more dangerous ones are able to transmit risks broadly across the market (e.g., AIG).[46] More worryingly, firms routinely seek out ways to deliberately amplify their risk-taking by

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42. Commodity Futures Modernization Act of 2000, Pub. L. No. 106-554, 114 Stat. 2763 (2000) (permitting essentially self-regulation by the biggest international firms that were active in transacting over-the-counter derivatives); PRESIDENT'S WORKING GRP. ON FIN. MKTS., OVER-THE-COUNTER DERIVATIVES MARKETS AND THE COMMODITY EXCHANGE ACT 11, 15–17 (1999), https://www.treasury.gov/resource-center/fin-mkts/Documents/otcact.pdf [https://perma.cc/2Y6Z-2P27] (archived Feb. 7, 2020). On the international nature of the credit default swap market, *see* ATLANTIC COUNCIL, *supra* note 25, at 36–40.

43. On the regulation of derivatives historically, *see* Dan Awrey, *The Mechanisms of Derivatives Market Efficiency*, 91 N.Y.U. L. REV. 1104, 1175–77 (2016) (noting that even with reporting understanding the level of leverage in CDS markets with an adequate level of granularity can be difficult, if not impossible). For an analysis on the difficulty of establishing the right amount of bailout funds for AIG, *see* Noam Schreiber, *Finally, the Truth About the A.I.G. Bailout*, N.Y. TIMES (Sept. 28, 2014), https://www.nytimes.com/2014/09/29/opinion/finally-the-truth-about-the-bailout.html [https://perma.cc/E3UC-HQM9] (archived Feb. 7, 2020).

44. *See, e.g.*, Vedran Obućina, *Estonian Debate Over Foreign Banks*, FIN. OBSERVER (Feb. 2, 2019), https://www.obserwatorfinansowy.pl/in-english/financial-markets/estonian-debate-over-foreign-banks/ (describing the near total penetration of the Estonian banking sector by Scandinavian banks) [https://perma.cc/2PZP-VPDU] (archived Feb. 7, 2020).

45. Awrey, *supra* note 43, at 1127–29.

46. *Id.* at 54–65.

carrying out activities in jurisdictions where the regulatory environment is lax and undemanding.[47] Regulatory divergence between jurisdictions raises an obvious danger that firms will go where they are offered a chance to do business within the cheapest and lowest-rung compliance ecosystem.[48]

Thirdly, foreign regulators themselves may not wish to help remedy information and larger compliance defects. In an effort to boost their own market's attractiveness and to encourage innovative mobile capital providers to do business from their borders, countries might expressly look to create a low-cost regulatory environment in order to compete. Far from simply looking the other way when firms take risks, regulators may intentionally deprive themselves of key levers of control that could otherwise have helped mitigate costly frictions within their financial markets. Such regulatory generosity to financial firms was richly bestowed by US authorities in the decade preceding the Crisis, when legislation was passed to expressly deregulate OTC derivative markets and to allow complex financial transactions to take place without systematic reporting and risk-mitigation arrangements being in place.[49] To compete with the European Union (EU) in the run-up to 2008, the U.S. Securities and Exchange Commission (SEC) offered major investment banks a wide berth when it came to supervising their global operations.[50] Under the now-defunct Consolidated Supervised Entities program, the SEC agreed to only monitor investment banks at the parent-company level, rather than taking a more granular approach that might have subjected their vast network of subsidiaries to more careful scrutiny.[51] Even where regulations did bite—for example, when firms were required to file reports of their activities—the SEC failed to enforce breaches or indeed to read the filings that were submitted to the agency.[52]

International financial regulation thus confronts dynamics that necessitate a coordinated response from national authorities. Disappearing boundaries that would once have constrained capital flows, the digitization of fund transfers, and a proliferation of global firms that can rapidly transmit the risks and opportunities of finance render a purely domestically oversight strategy essentially moot. As made clear by the Crisis and the COVID-19 catastrophe, domestic regulators confront unpredictable cross-border spillovers of risk,

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47. Brummer, *How International Law Works*, *supra* note 28, at 267

48. *Id.* at 267. For a seminal treatment of this problem, *see* Ethiopis Tafara & Robert Peterson, *A Blueprint for Cross-Border Access to U.S. Investors: A New International Framework*, 48 HARV. INT'L L.J. 31, 50–55 (2007).

49. *See* sources cited *supra* note 42.

50. Stephen Labaton, *S.E.C. Concedes Oversight Flaws Fueled Collapse*, N.Y. TIMES (Sept. 26, 2008), https://www.nytimes.com/2008/09/27/business/27sec.html [https://perma.cc/7P2S-M6P8] (archived Feb. 7, 2020).

51. *Id.*

52. *Id.*

information deficits, and a vulnerability to the supervisory deficiencies of other overseers. The weaknesses of the pre-2008 regulatory model—as is now painfully obvious—resulted in national markets paying an immeasurably high price economically and politically.

B. *Fundamentals of the Post-Crisis Regulatory Order*

In response to fallout from the 2008 Crisis, international financial regulation has undergone a structural recasting to place its workings on a more credible footing. Scholars have theorized extensively on the institutionalization of this post-Crisis regulatory order and delivered their verdict on its many implications for regulatory policy, domestic rulemaking, and administrative legitimacy.[53] This Article does not analyze or critique these accounts. Instead, the aim here is to briefly describe this new design and highlight the levers of influence that have caused an informal system of cooperation between countries to deliver transformational regulatory reform programs across domestic economies.

Crafting Standards: standard setting constitutes a basic and critical goal of international financial regulation. This exercise is organized largely around functional lines. Institutions are unabashedly technocratic, specializing in banking and prudential regulation (under the Basel Committee), securities markets (IOSCO), and insurance (International Association of Insurance Supervisors).[54] Their efforts are coordinated under the aegis of the Financial Stability Board whose membership convenes representatives from the G-20 economies to decide the overall objectives and agenda driving the work of expert standard setters.[55]

This architecture has generated a flurry of standard-setting activities in the wake of the Crisis, reflecting the preferences of the major G-20 world economies. These include, for example, updated standards on the amount and quality of capital that banks must provision to protect themselves against the fallout from risk-taking. Regulators have crafted new standards to better safeguard over-the-counter derivatives markets, imposing operational and prudential standards to mitigate the risks that parties assume *vis-à-vis* one another.[56] The post-Crisis regulatory framework also includes more exacting standards for securitization, credit rating agencies, executive

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53. *See, e.g.*, Brummer, *How International Law Works*, *supra* note 28, at 265–68; Hugues-Verdier, *supra* note 24, at 1459–70; Zaring, *supra* note 28, at 1262–73.

54. Brummer, *How International Law Works*, *supra* note 28, at 279.

55. *Work of the FSB*, FIN. STABILITY BD., https://www.fsb.org/work-of-the-fsb/ (last visited Feb. 18, 2020) [https://perma.cc/4LJX-EB69] (archived Feb. 17, 2020).

56. *See generally* BANK OF INT'L SETTLEMENTS, *supra* note 26; Committee on Payment and Settlement Systems, *supra* note 26.

compensation for bank executives, and corporate governance, as well as insolvency and creditor rights systems.[57]

Crucially, standard setters also prescribe benchmarks that regulators themselves must live up to in order to place domestic supervisors on a more even playing field. In an effort to foster trust and mutual reliance, regulators are expected to internally calibrate their own governance to ensure sound policymaking, monitoring, transparency, analysis, information sharing with others, and resolving firm failure.[58]

Enforcement: scholars of international financial regulation query exactly why sovereign national regulators appear to dutifully comply with informal standards when there is no real binding constraint on them to do so.[59] Rather than formal treaties that would exert maximal compliance pressure, financial regulation's reliance on less legally invasive standards should generate frequent defection, apathy, and inertia in domestic implementation.[60] Further, countries that are likely to suffer costly allocative consequences as a result—for example, if updated banking laws reduce the capacity of local banks to extend credit—have strong incentives to forgo efforts at compliance.[61] Yet, as Chris Brummer has previously highlighted, post-Crisis regulation has instead been characterized by national regulators committing seriously to compliance.[62] This reflects a harder edge to rulemaking than might first be assumed given the soft nature of standard setting.[63] He posits a number of rationales that explain why domestic regulators have strong reasons to enact international standards into local legal systems.[64] First, developing these standards represents an earnestly undertaken exercise between peer supervisors, creating pressure to respect the result and implement the needed legislation.[65] Secondly, firms seeking to do business across borders increase pressures on

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57. FINANCIAL STABILITY BOARD, IMPLEMENTING THE FSB PRINCIPLES FOR SOUND COMPENSATION PRACTICES AND THEIR IMPLEMENTATION STANDARDS: PROGRESS REPORT (June 2019); Board of the International Organization of Securities Commissions, *Global Developments in Securitisation Regulation*, INT'L ORG. OF SEC. COMM'NS (Nov. 16, 2012), https://www.iosco.org/library/pubdocs/pdf/IOSCOPD394.pdf [https://perma.cc/GGY5-GY2E] (archived Feb. 7, 2020); *see also Key Standards for Sound Financial Systems*, FIN. STABILITY BD., https://www.fsb.org/work-of-the-fsb/about-the-compendium-of-standards/key_standards/ (last visited Feb. 18, 2020) [https://perma.cc/8FRH-JGLX] (archived Feb. 7, 2020).

58. BASEL COMM. ON BANKING SUPERVISION, *supra* note 26; INT'L ORG. OF SEC. COMM'NS, *supra* note 26, at 4.

59. Brummer, *How International Law Works*, *supra* note 28, at 259–71.

60. *Id.* at 259–65.

61. *Id.*

62. *See generally* BRUMMER, MINILATERALISM, *supra* note 24 (describing how international financial regulation can be more concrete than it seems); Brummer, *How International Law Works*, *supra* note 28.

63. *Id.*

64. Brummer, *How International Law Works*, *supra* note 28, at 284–90.

65. *Id.*

national regulators to implement international standards. Such stickiness reflects the ability of large global firms to act as transmission channels for legal change.[66] Concretely, periodic assessments by the IMF and the World Bank increase accountability for domestic regulators by publicly advertising the outcomes of regulator benchmarking assessments.[67]

To be sure, the picture is not one of perfect, or even uniform, compliance. Countries diverge, sometimes in meaningful ways. For example, domestic legal systems vary in how they calibrate the format of reporting requirements for derivatives, the composition of protective resources buffers for financial institutions like clearinghouses, and the scope of activity restrictions for banks.[68] In addition, supervisory conventions can depend on such factors as a country's internal administrative resources for funding national supervisors, the court system, and the relationships between the supervisor and supervised firms.[69] However, as evidenced by the widespread adoption of major regulatory standards post-Crisis, international financial regulation has exerted a lasting economic impact on financial markets, impacting capital allocation and the manner in which capital flows between jurisdictions.

III. THE PROMISE AND PITFALLS OF FINTECH

As domestic financial systems have retooled to respond to the lessons learned from the 2008 Crisis, an influx of technological innovation has catalyzed the prospect of deep structural disruption to traditional modes of delivering financial services. Tantalizing users with Silicon Valley–style advances in artificial intelligence, big data, and consumer experiences enhanced through more direct, digital interaction with users (e.g., using cellphones or chatbots), "fintech" represents a new and headline-grabbing cycle of evolution for financial markets. From cryptocurrencies like Bitcoin to the use of so-called alternative data to expand access to credit, digital innovation,

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66. *See* BRUMMER, MINILATERALISM, *supra* note 24, at 33–34; Brummer, *How International Law Works*, *supra* note 28, at 286–90.

67. *Financial Sector Assessment Program*, INT'L MONETARY FUND (June 3, 2019), https://www.imf.org/en/About/Factsheets/Sheets/2016/08/01/16/14/Financial-Sector-Assessment-Program [https://perma.cc/P6D7-MTB2] (archived Feb. 7, 2020).

68. ATLANTIC COUNCIL, *supra* note 25, at 36–44; *see also* Dermot Turing & Yesha Yadav, *The Extraterritorial Regulation of Clearinghouses*, 2 J. FIN. REG. 21 (2016) (identifying the divergences in the regulation of clearinghouses between the US and the EU); Julian T.S. Chow & Jay Surti, *Making Banks Safer: Can Volcker and Vickers Do It?* 3–4 (IMF Working Paper No. 11/236, 2011), https://www.imf.org/external/pubs/ft/wp/2011/wp11236.pdf [https://perma.cc/76GG-MQW4] (archived Feb. 7, 2020) (noting the activity restrictions for banks under the Volcker Rule (US) and the Vickers Rule (UK)).

69. *Id.*

automation, big data, and start-up culture are pushing to recalibrate finance for the twenty-first century. For the most part, regulators have been caught flat-footed.[70] Faced with this surge of innovation post-Crisis, they have been forced, in short order, to confront complex questions about the implications of these new technologies for existing regulation.[71] Is fintech really so different from past cycles of innovation that current rules are ill adapted to control its risks and harness its opportunities? Does fintech create novel externalities for financial markets that present-day regulatory paradigms fail to address? From the standpoint of international financial regulation, does fintech demand action from policymakers to craft new transnational strategies for action—or can post-2008 approaches suffice in providing a coordinated response? Indeed, is such a response even needed?

This Part briefly introduces and analyzes these changes and the challenges they pose for regulators. It offers a short survey of fintech and describe what we see as its key features. In so doing, the discussion that follows summarizes arguments advanced in earlier work that posit that fintech represents a truly novel category of innovation distinct from past iterations of technological evolution in financial markets.[72] It suggests that fintech creates unique difficulties for international regulators that the post-2008 framework is presently insufficiently equipped to address effectively.

A. *The Trade-Offs of Regulating Innovation in Financial Markets*

Innovation represents a constant fixture of capital markets. Creative engineering produced the destructive CDS and junk mortgage-backed securities of the late 1990s and 2000s. Before that, regulators handled the transformations initiated by the arrival of telephones, faxes, and rudimentary computers that helped to gradually increase the speed and global reach of capital.[73] Put simply, on the face of it, fintech should be nothing new: just another page in the history of markets that are continually evolving, adapting, and growing.[74]

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70. *See* Nathaniel Popper, *Despite S.E.C. Warning, Wave of Initial Coin Offerings Grows*, N.Y. TIMES (Aug. 7, 2017), https://www.nytimes.com/2017/08/07/business/dealbook/initial-coin-offerings-sec-virtual-currency.html [https://perma.cc/FAY9-7QM7] (archived Feb. 7, 2020); William Hinman, Dir., Div. of Corp. Fin., Sec. & Exch. Comm'n, Remarks at the Yahoo Finance All Markets Summit, Digital Asset Transactions: When Howey Met Gary (Plastic) (June 14, 2018) (detailing the complexities of classifying digital assets into existing regulatory categories, notably those governing the definition of "security" under the Securities Act 1933).

71. *See infra* notes 4–5.

72. *See generally* Brummer & Yadav, *supra* note 6 (introducing the fintech trilemma and defining three novel factors that constitute the salient features of today's fintech).

73. *Id.* at 254–64.

74. *Id.* at 249–64.

However, earlier work argues that fintech, in fact, presents a novel species of innovation whose distinctive permutations constitute a break from past cycles of market ingenuity.

This preceding work introduced the Innovation Trilemma to capture the trade-offs confronting regulators when they balance the objectives of encouraging innovation, protecting market integrity, and legislating through clear rulemaking.[75] To be sure, regulators must juggle a multitude of other considerations, such as ensuring administrative legitimacy or addressing domestic or international political concerns. The Trilemma focuses simply on the interplay of three animating goals out of this larger list of policy objectives. It posits that, when seeking to manage these three priorities—innovation, market integrity, and clear and simple rulemaking—regulators can, at best, achieve only two out of these three aims.[76] For example, if regulators wish to encourage innovation and protect markets, they will only be able to do so through a thick and complex rulebook (e.g., in the case of the Dodd-Frank Act).[77] In balancing investor protection and rule simplicity (e.g., by straightforwardly banning certain financial activities), financial innovation is likely to suffer.[78] Finally, if innovation is a guiding goal that needs to be realized through straightforward regulation (e.g., by implementing the kind of broad deregulatory permission seen in the 2000s for OTC derivatives), then market integrity stands to be jeopardized.[79]

B. *What Defines Fintech?*

The regulation of fintech presents challenges for this taxonomy owing to three constitutive features: (i) a reliance on ever-fuller levels of artificial intelligence and automation; (ii) the use of entirely new types of data to calibrate algorithms in the delivery of products and services; and (iii) a shift away from large, Wall Street banks toward innovation being guided by nontraditional tech-focused firms that seek to disintermediate the design of financial products and services, adding efficiencies through technical rather than just financial expertise.[80] These three factors, when taken together, create a quite novel proposition for policy designed to situate fintech within historical

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75. *Id.*
76. *Id.*
77. For example, the Dodd-Frank Act seeks to encourage innovation under Titles VII and IX of the Act by introducing the possibility of greater electronification of the swaps market while also seeking to maintain the integrity of this market through careful risk management, reporting and investor protection. The result, as posited by the Trilemma, is reflected in a technically complex set of rules to govern this innovation. *See* Dodd–Frank Act, §§ 721-740, 901 124 Stat. 1376, 1822.
78. Brummer & Yadav, *supra* note 6, at 249–64.
79. *Id.*
80. *Id.* at 264–82.

trends and to balance the trade-offs that generally underpin the regulating of innovation.[81]

Reliance on Automation and Artificial Intelligence: fintech has flourished in the wake of rapid advances in computing technology and processing power, fiber optics, and communications tools, as well as the availability of internet-based cloud storage services for data. Combined with the rise of a digital generation that has matured alongside the internet, one well used to procuring services through their smartphones, the deeper digitization of financial services has arisen in inevitable response to these wider trends.[82] From payments and lending to investment advisory and stock picking, fintech has introduced automation and artificial intelligence to the delivery of once-analog, highly intermediated products and services.[83] As a result, instead of just relying on Wall Street banks, brokers, and bricks-and-mortar investment advisers, financial services can increasingly be performed by artificially intelligent algorithms—that is, preset computerized processes that can be programmed to capture data, apply "intelligent" analysis to value it, and extract an outcome in the form of a lending decision or determination of which securities to buy and sell.[84]

Broadly, artificially intelligent algorithms provide the backbone for the delivery of a range of fintech products and services. Computerized instructions, rather than granular human decision-making, help guide the production of efficiencies across a variety of financial services such as lending, stock trading, investing, or

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81. *Id.*

82. Mark Carney, Governor, Bank of Eng., Speech at the Mansion House: New Economy, New Finance, New Bank (June 21, 2018); *How the Adoption and Evolution of Cloud Technology are Changing the Fintech Landscape*, BLOOMBERG PROFESSIONAL SERVICES (Aug. 27, 2019), https://www.bloomberg.com/professional/blog/adoption-evolution-cloud-technology-changing-fintech-landscape/ [https://perma.cc/3M4C-JTRM] (archived Feb. 17, 2020).

83. Jack M. Balkin, *The Path of Robotics Law*, 6 CALIF. L. REV. CIR. 45, 48–60 (2015); U.K. GOV'T OFFICE FOR SCI., THE FUTURE OF COMPUTER TRADING IN FINANCIAL MARKETS: AN INTERNATIONAL PERSPECTIVE 30–55 (2012), https://www.cftc.gov/sites/default/files/idc/groups/public/@aboutcftc/documents/file/tacfuturecomputertrading1012.pdf [https://perma.cc/KC4V-3PJ2] (archived Feb. 7, 2020) (noting the various forces, such as cloud computing, that have facilitated the growth of various financial technologies); FIN. STABILITY BD., ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN FINANCIAL SERVICES: MARKET DEVELOPMENTS AND FINANCIAL STABILITY IMPLICATIONS 3–10 (2017), https://www.fsb.org/wp-content/uploads/P011117.pdf [https://perma.cc/4ASV-BM9M] (archived Feb. 7, 2020) (highlighting the significance of algorithms and artificial intelligence, and their technological foundations); Sherisse Pham, *Facebook Defends Sharing User Data with Phone Makers*, CNN (June 4, 2018), https://money.cnn.com/2018/06/04/technology/facebook-apple-samsung-blackberry/index.html [https://perma.cc/7AB8-JK5F] (archived Feb. 7, 2020) (discussing the comfort of younger generations and social media users to easily share data over the internet).

84. Brummer & Yadav, *supra* note 6, at 269–75.

payments. For example, sophisticated algorithms are fast becoming a mainstay in the investment advisory industry.[85] Where a saver might once have visited a money manager to work out how best to organize her investment portfolio, this task can instead be accomplished electronically with artificially intelligent firms as the driving engine.[86] So-called robo-advisors can cut out the traditional intermediary by relying on algorithms to collect data from the saver and her preferences, directly inputting this information into statistical and financial models to decide what kinds of investments would generate the most optimal returns.[87] Algorithms can be designed to "learn" from the quality of their own processing and rework their own programming in response to feedback.[88] Where they stumble and allocate capital into unsuccessful investments, they can review and recode to avoid similar pitfalls in the future.[89]

In other examples, artificially intelligent algorithms have automated the task of buying and selling securities like shares, treasuries, and exchange-traded derivatives.[90] Online lending is adopting algorithms instead of loan officers to decide whether a loan ought to be extended and on what terms, eroding the usual domain of intermediaries like banks.[91]

The expansive appeal of such programs across the financial market speaks to the enormous gains that artificially intelligent automation can offer. Computers can extract large quantities of data, do so at speed, apply highly complex financial models, and decipher patterns from statistics that may not be obvious to human actors.[92] This can ensure that the allocation of capital rests on a more informed

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85. *Id.*
86. *Id.*
87. *Id.*
88. *Id.*
89. For discussion, *see, e.g.*, Tom Baker & Benedict Dellaert, *Regulating Robo Advice Across the Financial Services Industry*, 103 IOWA L. REV. 713 (2018); Barbara Novick et. al., *Digital Investment Advice: Robo Advisors Come of Age*, BLACKROCK (Sept. 2016), https://www.blackrock.com/corporate/literature/whitepaper/viewpoint-digital-investment-advice-september-2016.pdf (noting that automated advisory technologies can also be harnessed by established incumbents and not just newer entrants) [https://perma.cc/7RGQ-V42P] (archived Feb. 7, 2020); *Update to the Report on the IOSCO Automated Advice Tools Survey: Final Report*, INT'L ORG. OF SEC. COMM'NS 3 (2016), https://www.iosco.org/library/pubdocs/pdf/IOSCOPD552.pdf [https://perma.cc/2ZSY-ZB9S] (archived Feb. 7, 2020) (providing an overview of the major regulatory strategies for robo-advisors).
90. U.K. GOV'T OFFICE FOR SCI., *supra* note 83.
91. Julapa Jagtiani & Catharine Lemieux, *Fintech Lending: Financial Inclusion, Risk Pricing, and Alternative Information* 7 (Fed. Reserve Bank of Phila., Working Paper No. 17–17, 2017), https://www.fdic.gov/bank/analytical/cfr/bank-research-conference/annual-17th/papers/14-jagtiani.pdf [https://perma.cc/3ZSM-JLQM] (archived Feb. 7, 2020).
92. *Id.* (on automated lending and its potential for increasing financial inclusion); U.K. GOV'T OFFICE FOR SCI., *supra* note 83, at 30–50 (underscoring the gains of algorithmic markets in the context of securities trading).

and analytically precise footing. In addition, the use of algorithms—instead of human, bricks-and-mortar intermediaries—can reduce the transaction costs that might historically have impeded access to financial services for excluded or underserved communities. To take two examples, automated robo-advisors are attracting younger, millennial investors with the promise of lowered fees and minimum investment requirements—reflecting cheaper operating costs and reduced overhead.[93] This group of otherwise neglected savers, however—with less money and a shorter working history than other age groups—can thus be motivated to invest earlier than they might have done before the ready availability of automated robo-advisors. For historically underserved communities of color—long subject to overt or implicit discrimination in their ability to access financial services—artificial intelligence holds out the promise of interacting with a nonbiased, more data-driven financial system.[94]

But algorithms also raise concerns for regulators. On the one hand, algorithms simply automate existing financial functions—like picking stocks, deciding whether to make a loan, or helping savers invest for retirement.[95] Yet their use history remains limited and their longer-term effects on capital allocation untested. Algorithms within a particular industry—such as money managing—may use common assumptions and models and respond in similar ways to new information, potentially amplifying the reaction. Scholars have drawn into relief the potential risks of algorithms creating correlated risks in the aggregate.[96] For example, if all millennials automatically allocate their savings into common risk pools (given their age and limited savings), the wider effects on this community may be problematic if such investments are all affected by a large disruptive shock in the future, hurting their collective savings all at once.[97]

Importantly, regulators and market participants suffer from steep information gaps to work out how an artificially intelligent algorithm is likely to perform over time. Commonly described as a "black box," the manner in which algorithms reprogram themselves, what explains their decision-making, and how this process may shift in response to evolving conditions can often be impervious to scrutiny.[98] These

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93. Ilana Polyak, *Millennials and Robo-advisors: A Match Made in Heaven?* CNBC (June 22, 2015), https://www.cnbc.com/2015/06/21/millennials-and-robo-advisors-a-match-made-in-heaven.html [https://perma.cc/VMD4-HR5J] (archived Feb. 7, 2020).

94. On the promise of fintech for financial inclusion, *see generally* Jagtiani & Lemieux, *supra* note 91, at 4–6.

95. Brummer & Yadav, *supra* note 6, at 269–75.

96. *Id.*

97. *See, e.g.*, Baker & Dellaert, *supra* note 89. For a discussion of the literature, *see* Brummer & Yadav, *supra* note 6, 269–75, 278–82.

98. FRANK PASQUALE, THE BLACK BOX SOCIETY: THE SECRET ALGORITHMS THAT CONTROL MONEY AND INFORMATION 19–25 (2015); Will Knight, *The Dark Secret at the Heart of AI*, MIT TECH. REV. (Apr. 11, 2017), https://www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/

information gaps will be especially costly if artificially intelligent algorithms make decisions in a manner that, while privately profitable for any individual market actor, create wider risks for the system as a whole. For example, a trading algorithm can generate profit by behaving manipulatively or disruptively, reaping gains for its firm, while compromising the larger integrity of the system.[99] Algorithms can be programmed to exit the market if it becomes too turbulent to continue operations.[100] This will limit the losses for a trader.[101] In the aggregate, however, the market suffers as a whole where available trading opportunities disappear suddenly.[102] Worryingly for policymakers, these externalities are difficult to predict.[103] Analyzing the underlying programming of an artificially intelligent algorithm may fail to yield any real insight about its future performance if such a program can recode itself in response to the feedback it receives. Further, the costs of bad or risky programming can be difficult to control *ex post*. In the world of high frequency algorithms, a market-wide crash can unfold in milliseconds.[104] In the case of online or money-management algorithms, an impression of their allocative impact may not fully emerge for years.[105]

One solution here would look to big data as a remedy to cure the informational deficits created by smart algorithms. As earlier work notes, reliance on big data represents a further defining feature of fintech.[106] Algorithms need data in order to function. With computing power growing continuously and information ever-more readily digital, the amount and types of data that algorithms can process have surged

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[https://perma.cc/6KYB-K6CJ] (archived Feb. 7, 2020). *But see* Vijay Pande, Opinion Editorial, *Artificial Intelligence's "Black Box" Is Nothing to Fear*, N.Y. TIMES (Jan. 25, 2018), https://www.nytimes.com/2018/01/25/opinion/artificial-intelligence-black-box.html [https://perma.cc/B5ET-RG6E] (archived Feb. 7, 2020).

99. *See, e.g.*, Alexander Osipovic, *Futures Exchange Reins In Runaway Trading Algorithms*, WALL ST. J. (Oct. 29, 2019), https://www.wsj.com/articles/futures-exchange-reins-in-runaway-trading-algorithms-11572377375 [https://perma.cc/QF5E-65DV] (archived Feb. 7, 2020).

100. Yesha Yadav, *The Failure of Liability in Modern Markets*, 102 VA. L. REV. 1031, 1080–85 (2016).

101. *Id.*

102. *Id.* (noting the tendency of traders to individually exit the market during a crisis. This strategy, while privately gainful, is problematic if a large segment of traders all exit at once, draining liquidity).

103. *See, e.g.*, Matt Levine, Opinion Editorial, *Algorithms Had Themselves a Treasury Flash Crash*, BLOOMBERG L.P. (July 13, 2015), https://www.bloomberg.com/opinion/articles/2015-07-13/algorithms-had-themselves-a-treasury-flash-crash [https://perma.cc/A4TG-962A] (archived Feb. 7, 2020).

104. *See, e.g.*, UNITED STATES TREASURY ET AL., JOINT STAFF REPORT: THE U.S. TREASURY MARKET ON OCTOBER 15, 2014, at 15–19 (July 13, 2015), https://home.treasury.gov/system/files/276/joint-staff-report-the-us-treasury-market-on-10-15-2014.pdf [https://perma.cc/GPP6-8UWC] (archived Feb. 7, 2020); Levine, *supra* note 103.

105. Baker & Dellaert, *supra* note 89.

106. Brummer & Yadav, *supra* note 6, at 265–69.

in recent years.[107] The availability of cloud-based storage, powerful computing, online sharing, and the spreading multiplicity of sources offer algorithms a data environment of unprecedented richness.[108] This phenomenon is uniquely modern. In the 2000s, about 25 percent of the world's stored information existed in digital form; today, only about 2 percent of all such information remains analog.[109] This newness is reflected in the availability of innovative data sources that are distinct from those traditionally used by financial services providers. Algorithms are able to scrape social media sites and mine GPS data, online shopping habits, social contacts, and weather patterns—so-called alternative data points that can bolster information conveyed by more well-known sources like balance sheets, income statements, price-related information from trading markets, or routine corporate disclosures.[110]

This proliferation of big data can constitute powerful fuel for smart algorithms as a way to make financial services more accurate, calibrated, and responsive to signals contained in a mix of information. In online lending, for example, big and alternative data is much touted by fintech lenders as a basis for ensuring that loans more precisely and fairly reflect borrower risk.[111] New kinds of digital data can offer a creative way for lenders to look beyond conventional information sources like credit scores or income statements—that may be in short or patchy supply for certain demographic groups such as millennials or communities of color facing historic exclusion from the financial system. In observing factors such as social contacts, online shopping habits, or the quality of the punctuation in a borrower's text messages, lenders claim that big data and sophisticated algorithms can help

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107. Navigating Big Data in the Cloud, FINRA TECH., https://technology.finra.org/articles/fastola.html (last visited Feb. 18, 2020) [https://perma.cc/V8ZN-RFHY] (archived Feb. 7, 2020).

108. *Id.*

109. Kenneth Neil Cukier & Viktor Mayer-Schoenberger, *The Rise of Big Data*, FOREIGN AFFAIRS (May–June 2013), https://www.foreignaffairs.com/articles/2013-04-03/rise-big-data [https://perma.cc/V7XF-2P9H] (archived Feb. 7, 2020). For detailed discussion, *see generally* KENNETH NEIL CUKIER & VIKTOR MAYER-SCHOENBERGER, BIG DATA: A REVOLUTION THAT WILL TRANSFORM HOW WE LIVE, WORK, AND THINK (2013).

110. Kevin McPartland, *Alternative Data for Alpha*, GREENWICH (Jan. 31, 2017) https://www.greenwich.com/equities/alternative-data-alpha [https://perma.cc/8W7W-4XER] (archived Feb. 7, 2020); Phillip Stafford, *Rise of Machine Trading Forces Data Providers to Pivot*, FIN. TIMES (Oct. 30, 2019), https://www.ft.com/content/8099ed9e-f028-11e9-ad1e-4367d8281195 [https://perma.cc/W9FV-45GH] (archived Feb. 17, 2020).

111. See Charles Lane, *Will Using Artificial Intelligence to Make Loans Trade One Kind of Bias for Another?*, NAT'L PUB. RADIO (Mar. 31, 2017), https://www.npr.org/sections/alltechconsidered/2017/03/31/521946210/will-using-artificial-intelligence-to-make-loans-trade-one-kind-of-bias-for-anot [https://perma.cc/ET57-BLZF] (archived Feb. 7 , 2020).

reduce instances of discrimination and bias by providing a more informative gauge of real credit risk.[112]

Similarly, in securities markets, investors are paying handsomely for feeds of alternative data as a means of getting that all-important edge. By feeding algorithms with seemingly new kinds of information—like social media feeds, visual data from drones, or airline ticket purchases—investors expect such data to offer deeper insights into market movements than might otherwise have been possible through the usual data sources.[113]

Without question, big data holds out the promise of great gains for market participants as well as for regulators looking to gain granular insight into market behavior. But caution is also in order. For one, this data is only as reliable as the credibility of its sources. The sheer diversity of data producers—from social media and online news feeds to academic studies from around the world—creates demonstrable risk that such sources may be compromised and impossible for any private or public entity to regulate for authenticity.[114] "Fake news," twitterbots, the overall superficiality and manipulability of social media, or the multiplicity of online news feeds represent a first source of risk.[115] Whereas past eras may have seen certain data sources—like credit reporting agencies or exchanges—become undisputed major data intermediaries, big data creates a much more chaotic information environment.[116] Crucially, it remains largely untested longitudinally. Without more evidence and a long-term history of use, regulators and market participants cannot credibly determine the effectiveness of big and alternative data for purposes of capital allocation.[117] More to the point, the emergence of entirely new types of data, like social media feeds, cellphone contacts, or online shopping habits, represent an innovative new frontier in risk measurement whose probative utility remains largely unknown for now.

To be sure, regulators have long faced questions about the longer-term effects of new financial innovation. As made clear by the post-Crisis fallout, the complex modeling underlying OTC derivatives like CDS confounded regulators and market participants. Policymakers had little idea about the destructive potential of new financial engineering and its impact on long-term capital allocation.[118] It is

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112. Jagtiani & Lemieux, *supra* note 91, at 4–6 (investigating whether fintech and alternative data can promote the goals of financial inclusion); Lane, *supra* note 111.

113. McPartland, *supra* note 110; Stafford, *supra* note 110.

114. Brummer & Yadav, *supra* note 6, at 268–69.

115. *Id.*

116. For a discussion and sources, *see generally id.*; *see also* Madeline Lamo & Ryan Calo, *Regulating Bot Speech*, 66 UCLA L. REV. 998 (2019) (noting the proliferation of influential bots across the internet).

117. Jagtiani & Lemieux, *supra* note 91, at 7–9 (showing the difficulties of analyzing successes for financial inclusion).

118. Brummer & Yadav, *supra* note 6, at 254–62.

therefore not especially novel that regulators must deal with unknown algorithms or new kinds of data given that, in many ways, such information deficits constitute a baked-in risk of cycles of market creativity.

But fintech charts a new course by challenging incumbent dominance through the introduction of new, tech-focused entrepreneurs as key drivers of innovation. Conventionally, regulators have long looked to big Wall Street firms as the major hubs of activity and financial creativity.[119] Innovation in the pre-2008 derivatives markets, for example, was expressly permissioned on the fact that it would be led by the biggest and most established financial firms.[120] Fintech, by contrast, is characterized by a much greater diversity of central players that encompass social media and Silicon Valley tech giants like Amazon, WeChat, Google, Facebook, and Apple, new entrants like Betterment or Robinhood as well as start-ups that offer tech-savvy alternatives to well-worn financial products and services.[121] In some cases, fintech firms seek to take on major banks and investment banks on their own turf: online lenders, to take one example, can compete on account of their avowed expertise in utilizing a broader array of alternative data; user-friendly, digital-only interfaces; and reduced overhead than traditional bricks-and-mortar players.[122] By more directly targeting users online (e.g., online lending, robo-advising), fintech is reducing the dominance of Wall Street intermediaries and introducing a culture where users and service providers interact on a more disintermediated basis.

Other fintech firms, however, look to enhance the efficiencies of existing, incumbent-dominated market structure. This is evident in the context of the payments industry—where online peer-to-peer payment systems like Venmo, ApplePay, or PayPal—offer an add-on service for bank or credit-card users, rather than a way to replace them altogether.[123] By offering a cellphone-based, digital wallet, Apple Pay permits users to harness encryption-based communications technology as a way to transfer payments-related data between their phones and a merchant.[124] Similarly, incumbents themselves are harnessing fintech-based products, either building their own versions of emerging

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119. *Id.* at 275–78.

120. Commodity Futures Modernization Act of 2000, Pub. L. No. 106-554, 114 Stat. 2763 (2000).

121. Brummer & Yadav, *supra* note 6, at 275–78.

122. *Id.*

123. *Id.*

124. *Apple Pay*, APPLE, https://www.apple.com/apple-pay/ (last visited Feb. 18, 2020) [https://perma.cc/GGD6-MPXD] (archived Feb. 7, 2020); *XRP: The Digital Asset for Payments*, RIPPLE, https://ripple.com/insights/xrp-digital-asset-payments/ (last visited Feb. 18, 2020) (a token-based payment service designed to reflect value transfers within the international banking system and to overcome inefficiencies in correspondent banking systems) [https://perma.cc/Z6RG-FYAV] (archived Feb. 17, 2020).

technologies,[125] assimilating new entrants into their own larger organizations, or developing their own innovative products.[126]

In short, far from simply regulating the usual cohort of traditional Wall Street firms, fintech brings together a much more diverse and crowded set of players that vary in size and experience in the financial industry. As they make themselves more valuable by offering services such as digital wallets, encryption technology, cloud storage, and data aggregation, Silicon Valley is blurring into Wall Street, holding out a more complex regulatory proposition for policymakers.

The interplay of fintech's defining features—its use of algorithms, big data, and a leading role played by nontraditional firms that are breaking the dominance of traditional intermediaries—heightens the difficulties inherent to the Trilemma.[127] Artificially intelligent algorithms introduce deep information asymmetries that impede a clear understanding of what kinds of risks they pose for market integrity.[128] While big data may go some way toward remedying the deficit, it is far from a panacea. New kinds of alternative data remain untested. And the quality of information may become tainted by data whose provenance is of questionable quality.[129] The variety and volume of data sources can impede how easily and cheaply market actors extract insights from this information.[130] Further, verifying data within this more chaotic environment can be difficult in real time.[131] As a consequence of such steep information gaps, regulators face serious challenges in understanding risks and legislating for them through clear rules.[132] Finally, regulators confront the new problem that fintech innovation is being led by smaller, nontraditional firms that are disintermediating financial services and/or enlarging the financial supply chain through discrete products and services.[133] As a consequence, a high compliance burden created by complex rulemaking is impracticable within a market that is populated with start-ups and nonfinancial specialists.[134] Such firms bring innovation, but they can

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125. *See, e.g.*, Natt Garun, *Zelle, a Payment Network Backed by Major US Banks Is Launching a Standalone App*, THE VERGE (Sept. 8, 2017), https://www.theverge.com/2017/9/8/16270238/zelle-app-payment-service-us-banks-venmo-competitor [https://perma.cc/L9FR-ES2Z] (archived Feb. 7, 2020).

126. *JPM Creates Digital Coin for Payments*, J.P. MORGAN, https://www.jpmorgan.com/global/news/digital-coin-payments (last visited Feb. 18, 2020) [https://perma.cc/Y2AS-SACX] (archived Feb. 7, 2020).

127. Brummer & Yadav, *supra* note 6, at 278–82.

128. *Id.*

129. *Id.*

130. *Id.*

131. *Id.*

132. *Id.* at 278–83.

133. *Id.*

134. *Id.*

lack the experience and resources to absorb the costs of the (often opaque) externalities being created by fintech.[135]

IV. FINTECH AND THE CHALLENGE FOR INTERNATIONAL FINANCIAL REGULATION

Fintech represents a profoundly creative force in financial regulation with obvious global reach. Cryptocurrencies, like Bitcoin, have explicitly committed to a transnational, poststatist conception of monetary design.[136] Social media behemoths, like Facebook and WeChat, are looking to transform themselves into pillars of the global payments ecosystem.[137] Regulators are enthusiastically courting innovators from around the world to bring their inventions and experiments to domestic markets as a way of showcasing their own leadership and farsighted vision.[138]

But just as with modern finance, the global ambition and entrepreneurial potential of fintech (e.g., Libra) creates the risk that harms from a failed product can spread widely across borders. Where a major payments provider experiences an outage, suffers a cyberattack, or goes bankrupt, the costs could redound across multiple jurisdictions and impact vulnerable consumers in similar ways, irrespective of nationality.[139] Beyond the worst-case risk of outright failure, innovations with transnational appeal raise thorny questions revolving around day-to-day concerns about crafting commonly accepted standards of investor protection, data security, prudential provisioning, reporting, monitoring, and enforcement.[140]

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135. For a full discussion, *see id.* at 279–83.

136. Steven Johnson, *Beyond the Bitcoin Bubble*, N.Y. TIMES MAG. (Jan. 16, 2018), https://www.nytimes.com/2018/01/16/magazine/beyond-the-bitcoin-bubble.html [https://perma.cc/QQ9B-JFUR] (archived Feb. 7, 2020).

137. Arjun Kharpal, *Tencent to Push WeChat Pay in U.S. Despite China Trade War*, CNBC (July 18, 2018), https://www.cnbc.com/2018/07/19/tencent-to-push-wechat-pay-in-us-despite-trade-war-with-china.html [https://perma.cc/TT8N-KMFV] (archived Feb. 17, 2020); *An Introduction to Libra: White Paper*, *supra* note 1.

138. *See, e.g.*, Hilary J. Allen, *A US Regulatory Sandbox?*, 87 GEO. WASH. L. REV. 579 (2018) (discussing the US government's creation of a "sandbox" for innovators to try out start ups with less regulatory constraint); Michelle Price, *Hong Kong, Singapore Rivalry Hobbling Asia in $100 Billion Fintech Race: Lobby Group*, REUTERS, June 9, 2017, https://www.reuters.com/article/us-asia-fintech-idUSKBN1900LN [https://perma.cc/C392-XPHZ] (archived Feb. 7, 2020).

139. Reed Stevenson & Steve Slater, *Bank Savers Run at the Click of a Mouse*, REUTERS, Oct. 6, 2008, https://www.reuters.com/article/us-financial-silentrun/bank-savers-run-at-the-click-of-a-mouse-idUSTRE49600Z20081007 [https://perma.cc/756V-9K5P] (archived Apr. 6, 2020).

140. *See generally* MCKINSEY & CO., A VISION FOR THE FUTURE OF CROSS-BORDER PAYMENTS (Oct. 2018), https://www.mckinsey.com/~/media/McKinsey/Industries/Financial%20Services/Our%20Insights/A%20vision%20for%20the%20future%20of%20cross%20border%20payments%20final/A-vision-for-the-future-of-cross-border-payments-web-final.ashx

The discussion below reveals that fintech poses a particularly thorny challege for international financial regulation. First, as highlighted in earlier work, fintech complicates the usual trade-offs involved in the Trilemma of balancing innovation, market integrity, and rules simplicity. This complexity is further exacerbated by the difficulties inherent in regulating markets through simple, clear rules where national legal systems, legislative and administrative processes, as well as enforcement practices vary considerably by jurisdiction. Secondly, the growth of fintech highlights a turn away from the historic cadre of developed countries being the major drivers of financial innovation—and thus the likely key suppliers of regulatory standards and enforcement, increasing negotiation costs faced by global standard setters. With digital innovation flourishing in developing countries as well as from developed ones, agenda setters in international financial regulation look set to become more diffuse and heterogenous geographically. Finally, the objectives of rules clarity and financial innovation are especially difficult to achieve where national markets vary in the extent to which new firms and technologies are structurally disintermediating their home markets. Developing clear rules that cater to an arriving class of new tech-focused firms is a task that is made even more intractable in contexts where countries diverge in how fully fintech has reshaped their markets and encourged nontraditional players to disintermiate and supplant the old guard of banks and investment banks.

A. *Information Deficits as Barriers to Cooperation and Clear Rulemaking*

As noted in Part II, fintech is characterized by steep information deficits on account of artificially intelligent algorithms and the untested nature of new kinds of digital data. With big data and smart algorithms essential to much of fintech, the difficulties of fully understanding the import of these technologies pose a real problem for protecting global market integrity through clear and simple standard setting. Importantly, the challenge of crafting workable, straightforward rules for fintech suffers a further and significant hurdle in international financial regulation. In contrast to domestic regulation that primarily legislates for a home market using local administrative and enforcement practices, international rulemaking must account for a multitude of diverging legal environments. This can

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[https://perma.cc/9AK5-YBR3] (archived Apr. 6, 2020); *Monitoring of FinTech*, FIN. STABILITY BD., https://www.fsb.org/work-of-the-fsb/policy-development/additional-policy-areas/monitoring-of-fintech/ (last visited Apr. 6, 2020) [https://perma.cc/TL65-QRUC] (archived Apr. 6, 2020) (setting out the Financial Stability Board's work-program for the global monitoring of fintech).

invariably add difficulty to achieving consensus between countries on new standards as well as their adoption into home regulatory systems.

The ability for businesses to create cross-border products and services adds to the information deficits already pervasive to fintech. First, regulators must determine how adaptable innovations are to differing national financial systems. Lending algorithms designed to analyze alternative data and to attribute a value to this input can suffer if these data points might have different weights in different countries. The "meaning" attached to regular purchases of cigarettes and alcohol, for example, may be different in a jurisdiction where such practices are frowned upon socially relative to those where they are common and more culturally accepted. While such lending algorithms usually build an overall profile from the various impressionistic data points available to them, mistakes and ambiguities in scoring certain kinds of data across jurisdictions may lead to systematically skewed loan books for some countries. In other words, the artificial intelligence underlying complex fintech can end up making determinations from the analytical starting point of programming conceived and designed for Country X, even though this program is also running in Countries Y and Z. What impact this might have over time and the credit risks it might create for a cross-border fintech represents a question that regulators can only solve through close cooperation and information sharing. Artificially intelligent programs that reprogram themselves over time can pose especially tough information deficits. If such algorithms are trained on data that is procured from Country A, with limited economic and racial inequities, how well will its programming perform in a more unequal environment?

Relatedly, regulators might rightfully worry about the quality of the data that fintech innovators are using. An automated money manager deploying long-term allocative algorithms may be relying on data of untested quality and reliability. It may overweigh new types of data such as GPS information, metadata, social media sentiment analysis, and so on. Probing and testing new kinds of data, understanding their valence, and determining which kinds have real informative potential represents a task that regulators can struggle to perform individually. Certain country regulators may be more familiar with the workings of some categories of new data (e.g., social media) but not of others (e.g., metadata analysis). In all, regulators are all likely to suffer from information deficits regarding the authenticity of data sources (e.g., fake news), how to ascribe meaning to new data types, and how this data impacts the efficacy of financial algorithms within their jurisdictions.

Secondly, regulators may struggle to determine how well fintech from other countries is likely to fit into the payment and settlement systems, risk measurement, and mitigation mechanisms within their own country. In other words, host countries will want to know how interoperable a new innovation will be with the operational and

technological systems of local firms and infrastructure. Where a new innovation lacks synchronicity with another country's financial system, it can be susceptible to unpredictable failures or cause disruptions for other firms that rely on a new fintech. Understanding questions of interoperability can be difficult within an environment dominated by rapidly moving algorithms. For example, an innovation may work well in testing because user volumes are low and the logistical environment relatively predictable. Under strained conditions, the same algorithms may struggle to cope with high demand and to adjust their behavior accordingly. For example, an online peer-to-peer payments processor will have to achieve fluid interoperability within the country's payment system connecting its banks, credit card companies, and consumers. It will need to use country-specific levels of encryption and ensure that payments data is stored according to domestic rules. Where a system builds its service into social media services like Facebook, its payment services will have to link into these platforms. Within such a complex ecosystem, an innovation can be susceptible to failures at different parts of the supply chain. It may only weakly encrypt data. Communicating data accurately to and from local banks may be partial, easily disrupted, or suffer an outage during periods of particularly high demand.

Finally, algorithms and decentralized data flows can build complex interconnections between country financial systems that may be unknown to single regulators alone. Fintech innovations in Country Y may deploy technologies developed through testing and oversight in Country Z, creating dependence on the surveillance and certification systems of Country Z. Regulators in Country Z may not necessarily be fully aware of the costs of their decisionmaking as innovations licensed by them are transposed into different national market ecosystems. Take the case of India, for example, where the national database of biometric identification information for citizens includes data on over one billion people.[141] Regulators might question whether encryption that is licensed to work within a smaller, less centralized information environment is adequate to fully protect enormous volumes of Indian citizen data, given the value that such a unique database would have for bad actors. Information sharing and coordination between countries is thus essential to the task of finding out and ensuring that national regulators can better understand the cross-border interdependencies created by their decisions.

These information deficits—and the analytical cost of understanding how fintech innovations vary in how they operate in different markets—impede a real grasp of the risks they pose to global market integrity. Where regulators cannot easily share information

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141. GOV'T OF INDIA, AADHAR DASHBOARD, https://uidai.gov.in/aadhaar_dashboard/index.php (last visited Feb. 18, 2020) [https://perma.cc/RB4R-GWPZ] (archived Feb. 17, 2020).

and collectively decipher the workings of artificially intelligent algorithms, none may really understand what content is needed to populate a global regulatory standard. Moreover, such frictions are magnified by the difficulties of understanding how different markets, legal systems, and regulators might respond to the risks create by fintech. A failure of a digital payments processor active in Country A, for example, may be unexpectedly damaging for its economy relative to Country B's owing to a historic absence of banks and investment banks, a younger, more impoverished population, and limited government resources to counteract the losses. As a result, these national differences in market, legal, and administrative environments foster even greater difficulties for the Trilemma. Imposing clear and straightforward global standards for opaque products faces a near herculean challenge where such rules must navigate varying national regimes and be implemented into diverging legal and market environments. The Trilemma highlights the long odds faced by domestic regulators seeking to legislate simply in response to fintech. For international standard setters, looking to legislate across borders, these trade-offs become even sharper.

B. *Diffuse Regulatory Power and Increased Negotiation Costs*

Greater diversity in fintech standard setters: fintech increases the negotiation costs involved in developing new standards owing to a larger and more economically diverse set of country actors now actively dominant in delivering innovation. The complexities of applying the Trilemma to fintech, especially in the cross-border context, sharpen the need for international regulators to cooperate and coordinate in standard setting and enforcement. Yet, in confronting this task, regulators must also adapt to a new landscape in which the usual cohort of developed economies are no longer the major locus of financial innovation. As a result, a more diffuse group of countries—developed and developing—possess an economic stake in becoming agenda setters for fintech and in exporting their domestic standards internationally, likely increasing the time and effort involved in negotiating new rules.

China's rapid adoption of online payments and lending technologies is case in point. In 2017, mobile payment platforms processed around RMB 14.5 trillion or 16 percent of GDP.[142] Launched in 2011, WeChat Pay boasts around 900 million active users, or 65 percent of the population. Alipay, having started business in 2004, hosts around 500 million active monthly users, or 36 percent of the overall population.[143] Ant Financial, in its online lending business, had

142. Frost et al., *supra* note 18, at 5–8.
143. *Id.*

lent out a total of RMB 645 billion ($95 billion) at the end of 2017.[144] WeBank had around RMB47.7 billion ($8 billion) in credit extended to consumers as of 2017, and cumulatively lent around RMB 870 billion ($127 billion).[145]

Across Asia, as much as in Canada, the United Kingdom, and the United States, regulators are jostling ever more vigorously to capture the latest in tech talent within their jurisdictions. The proliferation of national sandboxes, for example—allowing entrepreneurs to experiment and test out their inventions within a controlled environment—is illustrative, having set off an international race between countries to find big winners.[146] Intense competition between countries has prompted regulators to create tantalizing incentives for innovators to come to their markets and test out novel financial technologies.[147]

This geographical diversity stands in contrast to past eras in financial innovation, where major technological exports—such as ATMs, over-the-counter derivatives products like CDS, or securitization—have originated largely from developed economies.[148] Unsurprisingly, regulators from these markets have played an outsized role in shaping the policy priorities of international standard setters, such as the Basel Committee and IOSCO, historically.[149]

To be sure, following the 2008 Crisis, a broader grouping of G-20 countries has become the organizing hub for post-Crisis standard setting. As a result, major economies such as those of China, India, Brazil, South Korea, and South Africa now have a formal seat at the table of decision-makers. Nevertheless, the thrust of post-Crisis financial regulatory reform has still fixed on the problems arising out of the fallout in the United States and the European Union as the basis for setting the agenda for reform. Indeed, scholars have pointed to the adaptive strategies that developing countries routinely have to follow in order to adopt international standards (such as those governing bank capital) into their domestic markets and legal systems.[150] Bank capital standards, that may act as a protective force in developed

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144. *Id.*

145. *Id.*

146. Allen, *supra* note 138.

147. Brummer & Yadav, *supra* note 6, at 294–97.

148. Harry Wilson, *A Short History of the CDS*, TELEGRAPH (Sept. 6, 2011), https://www.telegraph.co.uk/finance/newsbysector/banksandfinance/8745511/A-short-history-of-credit-default-swaps.html [https://perma.cc/PYG8-ZJY8] (archived Feb. 7, 2020); *see also* Brummer & Yadav, *supra* note 6, 249–63.

149. *See* TARULLO, *supra* note 17, at 15–42; *see also* CAMFFERMAN & ZEFF, *supra* note 17, at 295.

150. Caio Ferreira, Nigel Jenkinson & Christopher Wilson, *From Basel I to Basel III: Sequencing Implementation in Developing Economies* 5 (IMF Working Paper No. 19/127, 2019), https://www.imf.org/en/Publications/WP/Issues/2019/06/14/From-Basel-I-to-Basel-III-Sequencing-Implementation-in-Developing-Economies-46895 [https://perma.cc/5K4L-G93A] (archived Feb. 7, 2020).

economies, may result in constraining scarce credit flows within an emerging market.[151]

Implications of Diffuse Agenda Setters: the greater variety of potential decision-makers for international fintech offers up a number of novel considerations for policymakers seeking to overcome the Trilemma in international financial regulation.

An initial difficulty, as outlined above, lies in fully understanding what risks regulators need to control and how these might impact their home jurisdictions and the interconnections that bridge markets across borders. Information asymmetries attaching to algorithms and big data are pervasive and remain unsolved. Moreover, innovations in fintech have, at least thus far, avoided triggering major cross-border collapses to sound the alarm and trigger collective action. To be sure, automated stock exchanges have suffered outages on account of faulty systems.[152] Bitcoin trading platforms have collapsed overnight to the distress of holders across multiple jurisdictions.[153] However, fintech, at least so far, lacks a large and systemic crisis that might have motivated action to calibrate standards.

Put more simply, regulators lack a clear understanding of the costs that a failure to regulate fintech globally might entail. Whereas the 2008 Crisis made the price of inaction abundantly clear, discrete crises pertaining to singular innovations (e.g., crypto exchanges) have failed to catalyze real action and to focus the minds of policy makers on a goal.

Additionally, fintech from emerging economies can force regulators to face a more complex market environment where large banks and investment banks may not always be the major players. In other words, future standards have to provide a fit for countries where nonbank firms such as AliPay, WePay or, PayTM play a leading role in delivering financial services and products. Put even more simply, standard setting can no longer assume that banks, hedge funds, mutual funds, or clearinghouses will necessarily comprise the core cohort of regulated companies. Instead, divergences in national markets may well see the likes of tech companies, telecoms, or online

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151. *Id.* (noting differential distributive costs within jurisdictions).

152. Graeme Wearden, *London Stock Exchange Hit By Worst Outage Since 2011*, GUARDIAN (Aug. 16, 2019), https://www.theguardian.com/business/2019/aug/16/london-stock-exchange-hit-by-worst-outage-since-2011 [https://perma.cc/BNL9-8ZYS] (archived Feb. 7, 2020).

153. Billy Bambrough, *A Major Canadian Bitcoin Exchange Has a Major Problem*, FORBES (Feb. 5, 2019), https://www.forbes.com/sites/billybambrough/2019/02/05/a-major-canadian-bitcoin-exchange-has-a-big-problem/#73d20ee75236 [https://perma.cc/XFS5-HN6Z] (archived Feb. 7, 2020); Doug Watt, *45% of Bitcoin Exchanges Fail*, COINDESK (Apr. 23, 2013), https://www.coindesk.com/45-percent-of-bitcoin-exchanges-fail-study-finds [https://perma.cc/FNW6-JF2H] (archived Feb. 7, 2020). On the ability of smaller fintech players to trigger systemic crisis, *see* Magnuson, *supra* note 16, at 1169–72.

retailers join the ranks of those supervised by financial regulatory authorities.

Relatedly, the more fundamental issue here speaks to the role played by fintech in different economies to fulfill local demand for financial services that may have gone unmet by banks. That is to say, the reasons for the local popularity of certain fintech may reflect the superior ability of certain innovations to fulfill unmet need for services within the financial system. For historically underdeveloped markets, lacking a sound payments system, reliable banks, or affordable credit, fintech can help fill gaps in the availability of financial services. As a result, the footprint of particularly popular innovations can run especially deep in some countries relative to those that have been well served by a more sophisticated financial market for longer. To take one example, mobile payment services by fintech firms have gained rapid ground in China and other developing economies like Kenya or India.[154] When the Indian government decided to demonetize certain currency overnight—turning some denominations into worthless paper—the population turned to electronic wallets and payment processors as a way to overcome the lack of cash within the system. PayTM, a local electronic provider of digital wallets, saw its user base explode, growing from 110 million in 2016 to around 280 million in the space of a year.[155] Often underserved countries may well have lacked prior penetration of bank account and credit card products. Evidencing this gap, many fintech firms (e.g., AliPay or WeChat Pay) have had to build their own payment networks to service local populations rather than relying on existing bank or credit card systems.[156] By contrast, the United States, with a more developed payments environment, has seen a smaller uptake of mobile payment services (as measured by percent of GDP).[157] US Fintech products like ApplePay have been able to utilize existing bank and credit card networks as the basis for their product offerings.[158]

An international financial regulatory framework, animated by a more varied and economically diverse range of agenda setters, can require regulators to confront more complex and costly bargaining costs in crafting new standards for fintech. In particular, the varying distributive impact of fintech innovations—and their ability to fill gaps in the availability of local financial services—complicates the difficulty of developing international standards.

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154. Frost et al., *supra* note 18, at 5–9.

155. Suman Layak, *After Note Ban Boost, It's Time for the Next Growth Trigger for Paytm*, ECON. TIMES (Nov. 5, 2017), https://economictimes.indiatimes.com/small-biz/startups/after-note-ban-boost-its-time-for-the-next-growth-trigger-for-paytm/articleshow/61510703.cms?from=mdr [https://perma.cc/XLB2-YMNY] (archived Feb. 7, 2020).

156. Frost et al., *supra* note 18, at 5–9.

157. *Id.*

158. *Id.*

Importantly, domestic regulators may be especially wary of agreeing to rules that increase the costs of procuring core financial services in their countries. Where a historical paucity of services has stymied economic growth and development, regulators may be reticent to give up the gains made. They may fear popular backlash, worry about losing their reputation as innovation leaders, and fear missing out on future talent that might bring entrepreneurship to their domestic markets. The cut-throat competition between regulators, notably in the Asia-Pacific region, to build innovation-friendly sandboxes highlights the resources and reputation being deployed by domestic regulators to nurture fintech innovation to meet local needs.[159] Giving up on hard-won economic gains will be especially unpalatable in the presence of information asymmetries on the risks of innovation. Without a clear idea of costs, the urgency of investing in international standard setting and implementation is likely to be limited.

In sum, regulating fintech internationally is likely to impose higher negotiating and decision costs than in prior years owing to the emergence of powerful economies as key voices in agenda setting. Past eras have permitted a cadre of developed economies to lead rule setting owing to their significance as major global money centers, where those rules would have an outsize impact. By contrast, as emerging economies take center stage in innovating, fintech standards will have to more expressly take into account a broader array of economies, distributive concerns, and public policy goals for financial markets.

C. *Bridging Differences in National Market Structure*

International standard setting for fintech faces the daunting challenge of crafting rules that are applicable to markets at varying stages of structural disruption by new and disintermediating fintech.

As noted by the Trilemma, protecting market integrity and innovation through clear rules must now contend with the prospect of ensuring these rules can be absorbed by a more varied type of firm: not only traditional banks and investment banks but also start-ups, tech specialists, or retail behemoths like Alibaba or Apple. Such newcomers have disintermediated services offered by conventional financial firms (e.g., in online lending, payments processing, or wealth management) and enhanced financial supply chains by offering user-friendly products like digital wallets. Imposing complex rules to both protect market integrity and financial innovation thus represents a poor fit to

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159. *See, e.g.*, Price, *supra* note 138. Singapore recently launched its "sandbox express," designed to encourage testing of ideas within three weeks. Alanna Tan, *MAS Launches 'Sandbox Express' So Fintech Firms Can Start Testing Ideas Within 3 Weeks*, VULCAN POST (Aug. 7, 2019), https://vulcanpost.com/671638/mas-fintech-sandbox-express-singapore/ [https://perma.cc/44C7-C9ZQ] (archived Feb. 7, 2020).

match the profile of these fintech firms that may lack the resources, expertise, and experience to internalize high compliance costs.

International financial regulation further exacerbates this difficulty as standards have to be sufficiently flexible and adaptive to oversee national markets at various stages of fintech adoption. In other words, national markets vary in the degree to which traditional financial products, services, and firms have been structurally impacted by fintech. As discussed above, for example, China, India, and Kenya have experienced expansive adoption of non-bank-driven fintech exemplified by the successes of firms like AliPay, WePay, M-Pesa, or PayTM.[160] By contrast, other economies like the United States continue to rely on a mix of Wall Street firms as well as fintechs, offering a bevy of products and services and showcasing different intensities of disintermediation. Where popular services like Apple Pay or Venmo offer add-ons to traditional bank or credit-card driven intermediation, online lenders and robo-advisors have sought to effect a sharper break from the usual Wall Street old guard.[161]

The depth of fintech adoption and the degree of structural change underway in different markets increases the difficulty of crafting standards that are globally acceptable and capable of widespread implementation. In ecomomies experiencing intense structural disintermediation (e.g., where payments firms have developed their own non-bank-affiliated processing networks), complex rules carrying a high compliance burden and designed for adoption by banks may prove deeply unpopular. By contrast, in countries that still maintain high degrees of traditional intermediation and where regulated financial firms predominate, a light set of rules may fail to impose sufficiently strict controls on firms that are practiced in taking risks, perhaps backstopped by government support (e.g., through deposit insurance). Divergences in national market structures thus present a major challenge for international financial regulation seeking to craft a uniform and well-fitting set of standards designed to be adopted across economies. In addition to information deficits, divergences in national legal systems, and higher negotiation costs, a new and more diverse cast of financial firms further complicate the task of navigating the poles of the Trilemma in international financial regulation.

V. CONCLUSION

Fintech represents a new chapter in financial regulation that marks a break from past cycles of innovation. Its unique features—reliance on intelligent algorithms, big data, and the flourishing of nonfinancial firms within the ranks of the more seasoned—amplify

160. Frost et al., *supra* note 18, at 11. Thanks to Chris Brummer for this insight.
161. *See* discussion *infra* Part III.B.

existing trade-offs in regulating financial markets. Earlier work proposed the Innovation Trilemma as an analytical prism through which to understand the balancing act that regulators perform when seeking to oversee markets.[162] When negotiating between the goals of protecting financial market integrity, fostering innovation, and in legislating through clear and simple rules, regulators can achieve only two out of these three goals. This earlier work argued that the singular characteristics of fintech complicate these already tough trade-offs. Information asymmetries obscure an understanding of what kinds of rules are needed to protect market integrity. New types of data can lack informativeness. And perhaps most difficult of all, the changing cast of regulated firms force regulators to really wrestle with the puzzle of how to promote innovation by start-ups and fintech entrepreneurs while maintaining market integrity through clear rulemaking.

International financial regulation further exacerbates these difficulties and imports a novel dimension that heightens the barrier to successful global standard setting. As argued here, information asymmetries constitute a significant challenge to international standard setting and enforcement, obscuring the risks to global market integrity. This difficulty is amplified by the need to craft straightforward standards that can overcome differences in national legal systems, markets, and administrative processes. The intensity of this problem for global regulators is made more severe within a context where the power to set the agenda is now shared between a more heterogenous mix of economies. Greater diffusion of power brings new and higher bargaining costs for decision-makers. With fintech playing a more significant economic role in some economies relative to others, future standard setting will have to account for the differences in how fintech has impacted countries and regions distributively. Finally, international regulation must account for divergences in national market structures that vary in their embrace of fintech and the scale of disintermediation underway within their economies. This reduces the ability for international regulation to achieve rules clarity as standards must be applicable to a more diverse set of national market environments, each distinctive in its adoption of fintech products and services.

To be sure, international technocratic bodies like the FSB, IOSCO, and the Basel Committee have sought to engage on matters of fintech.[163] They have pursued valuable research, offered guidance on

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162. *See generally* Brummer & Yadav, *supra* note 6.

163. *See, e.g.*, Basel Committee on Banking Supervision, *Sound Practices: Implications of Fintech Developments for Banks and Bank Supervisors*, BANK FOR INT'L SETTLEMENTS (Aug. 2017), https://www.bis.org/bcbs/publ/d415.pdf [https://perma.cc/EG73-8DFS] (archived Feb. 7, 2020); FIN. STABILITY BD., *supra* note 83, at 3–7; *Update to the Report on the IOSCO Automated Advice Tools Survey: Final Report*, *supra* note 89, at 3.

new technologies, and suggested best practices. Nevertheless, despite these efforts, successful standard setting remains a work-in-progress. There may be some partial solutions. For example, instead of trying to align all G-20 markets within a common set of standards, regulators may try to pursue more "minilateral" approaches.[164] In other words, domestic regulators may seek out regional solutions to common risks. Such a strategy might see countries within regional blocs, such as Asia-Pacific, the EU, Africa, and the Americas, work together to craft standards tailored to impact fintech within the region. Countries that are geographically close may host a common set of firms providing services across the region. For example, digital wallet providers may be well placed to build infrastructure more easily across borders where countries are proximate to one another. Algorithms may be easier to adapt to countries whose close borders mean that programmers have greater knowledge of local customs, financial habits, and market participants. As a result, countries may be better placed to negotiate with one another if they are already well used to doing so on matters of regional interest. Nevertheless, such a solution remains a partial one. For one, regional players can compete ruthlessly with one another.[165] Fintech firms may wish to compete across multiple regions. Minilateral rulemaking does not inoculate participating countries from enacting rules that lack fullest information on new innovations or that are insufficiently protective against risks that significant innovations may create.

Regulators might also look to private firms to develop industry standards as a form of self-regulation. Powerful players like Apple, Facebook, Amazon, WeChat, Alibaba, and others might work to develop common rules of the road. Such a solution could overcome some information gaps by allowing the industry to harness its native expertise. Further, it might reduce time and administrative resources if firms themselves take the lead. However, while a helpful supplement to public regulation, private action is unlikely to be fully successful as a way of contracting around the difficulties of the Trilemma. Private firms may be unwilling to share information about themselves and their proprietary algorithms. They may be unwilling or unable to acknowledge the risks they are likely to create, develop standards that benefit themselves at the expense of competitors looking for a foothold, or underestimate the costs of collective behaviors. These problems are far from unprecedented: industry self-regulation of over-the-counter derivatives markets, for example, offers a cautionary tale from the recent past.

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164. *See* BRUMMER, MINILATERALISM, *supra* note 24, at 17–21 (analyzing past "minilaterlist" approaches in international financial regulations).

165. *See* Price, *supra* note 138 (discussing the intense competition between regulators to cater in fintech in the Asia-Pacific region).

Put simply, as fintech is fast becoming a part of mainstream finance, regulators face the possibility of being caught on the back foot once again. Where innovations might spread the risk of operational failure, data loss, intrusive surveillance, or catastrophic defaults, the damage is unlikely to respect borders or the nationality of the digital consumers affected. As Facebook's attempt at creating Libra shows, it is only a matter of time before regulators confront transnational phenomena with ever greater frequency. Given the costs highlighted in this Article, the question remains whether it will take another global crisis for them to realize it.