

THE LAYERS OF DIGITAL FINANCIAL INNOVATION: CHARTING A REGULATORY RESPONSE

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ABSTRACT

The increasing penetration of digital technologies in financial markets is evidenced by promising adoption rates among users, expanding presence of fintech firms and bigtech providing techfin services, and the growing use of fintech solutions by incumbents. The increasingly popular term “fintech” captures the accelerated transformation of contemporary financial markets driven and enabled by technology, and encapsulates its multifarious potential impact on services, market structures, and business models. This Article first aims to devise and propose an analytical framework to understand the digital challenges to financial regulation based on the “layers of digital financial innovation” theory. Accordingly, digital innovation (fintech) is stratified in three layers: the structure layer, activity layer, and players layer—each of which identifies and analyses the impact of digital innovation on a financial-market dimension. Consequently, a multi-layered regulatory response is proposed. This Article will consider different regulatory strategies devised to face each layer of fintech, as risks and benefits differ in each layer. This Article’s starting premise is that any attempt to approach fintech as a single, global phenomenon will sink in the vast complexity of a multifaceted, open process phenomenon and is bound to fail. Our understanding is that the intricacies in embracing the impact of fintech on financial markets and the difficulties in apprehending its consequences for regulation and supervision are largely exacerbated by the lack of perception of its multi-layered nature. Based on a three-variable function to assess the adequacy of regulation and devise a fit-for-purpose regulatory response, a taxonomy of policy challenges will be addressed, and a multi-layered regulatory strategy is proposed accordingly.

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I. DISASSEMBLING DIGITAL FINANCIAL INNOVATION: WHY FINANCIAL REGULATION IS PROFOUNDLY CHALLENGED

The increasing penetration of digital technologies in financial markets is evidenced by promising adoption rates¹ among users, expanding presence of fintech firms,² and the growing use of fintech solutions³ by incumbents.⁴ The increasingly popular term “fintech”

1. See EY, EY FINTECH ADOPTION INDEX 2017, THE RAPID EMERGENCE OF FINTECH 5-7, 12 (2017), [https://www.ey.com/Publication/vwLUAssets/ey-fintech-adoption-index-2017/\\$FILE/ey-fintech-adoption-index-2017.pdf](https://www.ey.com/Publication/vwLUAssets/ey-fintech-adoption-index-2017/$FILE/ey-fintech-adoption-index-2017.pdf) [<https://perma.cc/969D-2CZ9>] (showing a global fintech adoption of 33 percent compared to the 16 percent rate in 2015; the adoption increases up to 46 percent across five emerging markets (Brazil, China, India, Mexico and South Africa), whereas the adoption rates are disparate in European countries. Among the twenty countries studied, the highest percentage in a European country corresponds to the United Kingdom with 42 percent, followed by Spain with 37 percent. Other European countries surveyed, except Germany, are at or below the threshold of 30 percent. The report pivots on a definition of Fintech that includes not only early-stage start-ups and new entrants, but also scale-ups, maturing firms and even non-financial services firms).

2. See A. Fraile Carmona et al., *Competition issues in the Area of Financial Technology (FinTech)*, POLICY DEP'T FOR ECON., SCI. AND QUALITY OF LIFE POLICIES, EUROPEAN PARLIAMENT 32 (2018), [https://www.europarl.europa.eu/RegData/etudes/STUD/2018/619027/IPOL_STU\(2018\)619027_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2018/619027/IPOL_STU(2018)619027_EN.pdf) [<https://perma.cc/MSN9-XBTC>] (illustrating the size of the fintech market in number of fintech-labeled technologies, according to Crunchbase database provides 4,359 companies in 2018 classified as fintech). The authors refine the overall number of fintech-labeled companies adjusting the figure to 3,852. Upon the adjustment, the report identifies that the European Union contributes to the global fintech sector with 1,020 fintech companies.

3. Fintech is not only describing an ecosystem of innovative startups invading the financial markets with groundbreaking technological solutions to revolutionize the delivery of financial services; it also comprises incumbent firms that adopt advanced technological strategies to effectively compete and innovate. BERNARDO NICOLETTI, THE FUTURE OF FINTECH: INTEGRATING FINANCE AND TECHNOLOGY IN FINANCIAL SERVICES 13 (2017).

4. Traditional commercial banks indicated increasing adoption of machine learning techniques to increase efficiency. INSTITUTE OF INTERNATIONAL FINANCE, MACHINE LEARNING IN CREDIT RISK: AUGUST 2019 2d EDITIONS SUMMARY REPORT 2 (2019). That strategy would provide signs that incumbents are reacting to fintech challenges by the implementation of technology-driven solutions. *Id.* PwC's 2018 Digital Banking Consumer Survey does also stress the need for traditional banks to reconsider how they sell and provided their services and how interact with their customers. See generally PwC FINANCIAL SERVICES, PwC'S 2018 DIGITAL BANKING CONSUMER SURVEY: MOBILE USERS SET THE AGENDA (2018), <https://www.pwc.com/il/he/bankim/assets/2018/PwC%202018%20Digital%20Banking%20Consumer%20Survey.pdf> [<https://perma.cc/53B9-RVM7>]. The incorporation of

captures the accelerated transformation of contemporary financial markets driven and enabled by technology, and encapsulates its multifarious potential impact on services, market structure, and business models.⁵ Thus, fintech is an umbrella term used to describe “technology-enabled innovation in financial services that could result in new business models, applications, processes or products, with an associated material effect on the provision of financial services”.⁶ A burgeoning fintech market⁷ fuelled by an exponential proliferation of fintech-labeled

digital technologies—namely, as highlighted by the report, mobile-based services and products—is crucial. *Id.*

5. See generally CAPGEMINI ET AL., WORLD FINTECH REPORT 2018 (2018), <https://www.capgemini.com/wp-content/uploads/2018/02/world-fintech-report-wftr-2018.pdf> [<https://perma.cc/7A6U-LLAX>] (spotting and describing the potential impact of emerging technologies in the provision of customer-oriented financial services—artificial intelligences, data analytics, robotics, distributed ledger technologies, biometrics, platforms, internet of things and sensors, augmented reality, chatbots, etc.).

6. FSB, FINANCIAL STABILITY IMPLICATIONS FROM FINTECH 7 (2017), <https://www.fsb.org/wp-content/uploads/R270617.pdf> [<https://perma.cc/Z5VK-SDKF>].

7. The perimeters of the fintech sector are blurred and imprecise. See KPMG, REGULATION AND SUPERVISION OF FINTECH: EVER-EXPANDING EXPECTATIONS 5 (2019), <https://assets.kpmg/content/dam/kpmg/xx/pdf/2019/03/regulation-and-supervision-of-fintech.pdf> [<https://perma.cc/37AY-KSGB>]. Therefore, sound data on the size and the growth of the market are not easy to collect. *Id.* Furthermore, the evolving nature of fintech as an emerging sector introduces complexity in the measures and the estimation of value. Statistics differ but reports and data coincide in showing growing trends for the sector. See KPMG, THE PULSE OF FINTECH 2018: BIENNIAL GLOBAL ANALYSIS OF INVESTMENT IN FINTECH 3 (2019), <https://assets.kpmg/content/dam/kpmg/xx/pdf/2019/02/the-pulse-of-fintech-2018.pdf> [<https://perma.cc/USZ4-DWFQ>] [hereinafter *KPMG, THE PULSE OF FINTECH*] (“In 2018 investment in fintech companies in Europe hit \$34.2”); S&P GLOBAL MARKET INTELLIGENCE, 2018 US FINTECH MARKET REPORT 2 (2018), <https://www.spglobal.com/marketintelligence/en/documents/2018-us-fintech-market-report.pdf> [<https://perma.cc/HC79-YGGD>] (“Insurance technology was a prime destination for investor dollars in 2018 More than \$1.8 billion of capital had flowed into the sector as of Dec. 11 [2018]”); *Value of Fintech investments globally 2008–2018*, STATISTA (Oct. 21, 2019), available at <https://www.statista.com/statistics/502378/value-of-fintech-investments-globally/>. Data on fintech investment signals the growth potential of the sector and the expected financial return. Global fintech investment has more than doubled, whereas in Europe investment “hit USD 34.2 billion with 536 deals.” KPMG, THE PULSE OF FINTECH, *supra* note 7, at 3. “The global Fintech ecosystem continued to mature at an accelerated pace over the course of 2018.” *Id.* at 9; see also *Value of Fintech investments globally 2008–2018*, STATISTA (Oct. 21, 2019), available at <https://www.statista.com/statistics/502378/value-of-fintech-investments-globally/> (presenting the value of fintech investments globally from 2008 to 2014 and a forecast until 2020). In 2014, fintech

business models and the irruption of bigtech companies providing techfin solutions constitutes a meaningful indicator of that profound transformation of the financial sector at the pace of technological innovation.⁸ Whereas genuine fintech companies irrupt in the financial markets to provide financial services with the assistance of digital technologies with the aim to enhance effectiveness, reduce costs, improve customer experience, or fill a gap in the market,⁹ bigtech firms are technology companies¹⁰ that incorporate in their gamut of non-financial activities the delivery of financial services, leveraging on their competitive advantages gained in other sectors—network effects, large customer bases, economies of scale and economies of scope,¹¹ global

investment amounted to 10 billion USD, whereas the estimation for 2020 increases up to 46 billion USD. *Id.* There are growing trends in variables related to the evolution of the fintech sector (including insurtech). S&P GLOBAL MARKET INTELLIGENCE, 2018 US FINTECH MARKET REPORT 2 (2018), <https://www.spglobal.com/marketintelligence/en/documents/2018-us-fintech-market-report.pdf> [https://perma.cc/E3CU-KN37]. Equally, there was a dramatic growth of investment in fintech companies from 2000 to November 2016. INTERNATIONAL ORGANIZATION OF SECURITIES COMMISSIONS, IOSCO RESEARCH REPORT ON FINANCIAL TECHNOLOGIES (FINTECH) 5 (2017), <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD554.pdf> [https://perma.cc/5238-R5ZW]. The report quotes in over 100 billion USD the cumulative investment in more than 8,800 Fintech companies. *Id.* A similar growing trend in investment amount and deals is evidenced in insurtech companies, as a subsector in the fintech realm. *Id.* Such an increasing global trend also reveals the same point of inflection of the ‘hype cycle’ in 2016, in terms of investment amount, despite the non-interrupted increasing trend of the number of deals. OECD, TECHNOLOGY AND INNOVATION IN THE INSURANCE SECTOR 13 (2017).

8. WORLD ECONOMIC FORUM, BEYOND FINTECH: A PRAGMATIC ASSESSMENT OF DISRUPTIVE POTENTIAL IN FINANCIAL SERVICES 22 (2017), available at weforum.org/reports/beyond-fintech-a-pragmatic-assessment-of-disruptive-potential-in-financial-services.

9. See In Lee and Yong Jae Shin, *Fintech: Ecosystem, business models, investment decisions, and challenges*, 61 BUSINESS HORIZONS 35, 38 (2018) (explaining different fintech business models).

10. Google, Amazon, Facebook and Apple (GAFA) and Baidu, Alibaba and Tencent (BAT) are the most illustrative examples of bigtech firms providing techfin solutions. Jim Marous, *The Future of Banking: Fintech or Techfin?*, FORBES (Aug. 27, 2018 11:18AM), <https://www.forbes.com/sites/jimmarous/2018/08/27/future-of-banking-fintech-or-techfin-technology/#7023c40d5f2d> [https://perma.cc/4K6S-T3GF] (“[T]echfin usually references a technology firm that finds a better way to deliver financial products as part of a broader offering of services.”).

11. To understand the evolution of the banking industry towards multiproduct strategies and, more importantly, the irruption of big technological companies in the financial markets, see Munehisa Kasuya, *Economies of Scope: Theory and Application*

reach, data analytics, personalizing opportunities, and technological advances.¹²

The transformative power of digital technology has been clearly perceived and increasingly internalized by market players with multiple innovation strategies¹³ for the provision of financial services, and a creative development of disruptive¹⁴ business models.¹⁵ As further elaborated *infra* Part II, emerging technologies hold a clear potential for transforming the financial sector by streamlining processes, enhancing risk management, reshaping business models, deploying personalized customer-oriented strategies, developing new products and services,

to *Banking*, BANK OF JAPAN MONETARY AND ECON. STUDIES, Oct. 1986 at 59 (citing John C. Panzar and Robert D. Willig, *Papers and Proceedings of the Ninety-Third Annual Meeting of the American Economic Association*, 71 THE AM. ECON. REV. 268 (1981)).

12. These are the main drivers for bigtech companies to invade the financial realm with techfin solutions. Agustín Carstens, Gen. Manager, Bank for Int'l Settlements, Keynote Address at the London FT Banking Summit: Big tech in finance and new challenges for public policy in BANK FOR INT'L SETTLEMENT, Dec. 2018, at 3.

13. See generally OSCAR FLYNT, FINTECH: UNDERSTANDING FINANCIAL TECHNOLOGY AND ITS RADICAL DISRUPTION OF MODERN FINANCE (2016) (surveying fintech innovations).

14. “The technological changes that damage established companies are usually not radically new or difficult from a *technological* point of view.” Joseph Bower & Clayton Christensen, *Disruptive Technologies: Catching the Wave*, HARV. BUS. REV. Jan.–Feb. 1995, at 43–53 (explaining the main features of disruption). “They do, however, have two important characteristics: First, they typically present a different package of performance attributes—ones that, at least at the outset, are not valued by existing customers. Second, the performance attributes that existing customers do value improve at such a rapid rate that the new technology can later invade those established markets. Only at this point will mainstream customers want the technology. Unfortunately for the established suppliers, by then it is often too late: the pioneers of the new technology dominate the market.” *Id.*

15. See PWC, GLOBAL FINTECH REPORT 2017: REDRAWING THE LINES: FINTECH’S GROWING INFLUENCE ON FINANCIAL SERVICES 5 (2017), <https://www.pwc.com/jg/en/publications/pwc-global-fintech-report-17.3.17-final.pdf> [HTTPS://PERMA.CC/222S-UQZB] [hereinafter PWC GLOBAL FINTECH REPORT 2017]. Even if 80 percent of incumbents perceive business at risk and are increasingly concerned about the losing of benefits to innovators—in Europe that perception has increased from 83 percent in 2016 to 89 percent in 2017 of incumbents—financial institutions are embracing the disruptive nature of Fintech. *Id.* Yet, 70 percent of financial institutions are proactively reacting to increase innovation and 82 percent expect and are working on Fintech partnerships in the next 3–5 years. *Id.* at 7. Interestingly, the report shows that prospects on the reinforcement of internal efforts to innovate in next five years as a strategy to embrace Fintech disruption are the lowest in Europe (75%) compared to the rest of the world and slightly below the global average (77%). See *id.* at 5.

automatizing tasks and decision-making, filling gaps in traditional banking, reducing transactions costs, and creating new business opportunities. Nevertheless, the real impact of digital technology has not yet been entirely comprehended; hence, there may be difficulty in properly and effectively formulating good regulatory and supervisory responses.¹⁶

On one hand, despite the promise of a fintech revolution, the actual application of digital solutions in the financial markets is still gradual, premature, and irregular for the purposes of formulating a definitive regulatory response. Following high expectations, the penetration of fintech solutions declined¹⁷ after the “hype cycle”¹⁸ peaked¹⁹ in 2017. Such a deceleration in growth may have infused a dose of prudence in the estimation of future prospects and regulatory intervention. Therefore, it can be fairly contended that regulators and supervisors need time to observe the progressive penetration in the market, understand the fintech sector at a distance, and assess the very impact on the competition due to the consolidation of the sector.

On the other hand, the difficulties in comprehending the impact of digital innovation on financial markets are mainly provoked by the lack of perception of its multi-layered nature. Although financial regulation is

16. See generally EUROPEAN COMMISSION, BETTER REGULATION GUIDELINES, <https://ec.europa.eu/info/sites/info/files/better-regulation-guidelines-better-regulation-commission.pdf> [<https://perma.cc/BQ4H-58PG>]; EUROPEAN COMMISSION, BETTER REGULATION TOOLBOX (2017), https://ec.europa.eu/info/sites/info/files/better-regulation-toolbox_2.pdf [<https://perma.cc/TEA6-Y82A>]; OECD, ON PRINCIPLES FOR INTERNET POLICY MAKING (2011), <https://www.oecd.org/internet/ieconomy/49258588.pdf> [<https://perma.cc/A286-M8YL>].

17. Deceleration has been perceived in the number of new fintech companies created and the pace of formation, but the investment in fintech projects remains robust. See DELOITTE, FINTECH BY THE NUMBERS: INCUMBENTS, STARTUPS, INVESTORS ADAPT TO MATURING ECOSYSTEM 3, 7 (2017), <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-dcfs-fintech-by-the-numbers-web.pdf> [<https://perma.cc/98B4-6J8V>] [hereinafter DELOITTE, FINTECH BY THE NUMBERS]. This observation, together with trends suggesting increasing levels of private equity and debt financing in the fintech sector, is an important indicator of a maturing market. *Id.* Hence, data could be signalling that the fintech sector is maturing and consolidating more than fading. Repercussions on financial regulation will be interesting. See *id.* at 6.

18. Gartner Hype Cycle: Interpreting technology hype, GARTNER.COM, <https://www.gartner.com/en/research/methodologies/gartner-hype-cycle> [<https://perma.cc/78S9-GQDR>].

19. See KPMG, THE PULSE OF FINTECH, *supra* note 7.

accustomed to grappling with a dynamic²⁰ and demanding market,²¹ technological progress has been an important force in the transformation of finance,²² the vertiginous pace of technological innovation, and the unpredictable effects of its application on a large scale, which represent unprecedented challenges for financial regulators and supervisors.²³ In addition to the substantial challenges arising from the disruptive potential of digital innovation in activities, market structure, intermediaries, and transactions, the time component acts as a multiplying factor of the disruption effect. The accelerated pace of technological change exerts additional pressure not only on rules and legal solutions, but also on policymaking processes, regulatory strategies, and supervision practices. In effect, digital financial innovation does equally touch “substance” and “form” in the regulation and supervision realm—what to regulate and supervise, and how to regulate and supervise.²⁴

Whether the digital transformation of financial markets will be simply evolutionary or totally revolutionary in the medium and/or long

20. Matthew Saal, Susan Starnes & Thomas Rehmann, *Digital Financial Services: Challenges and Opportunities for Emerging Market Banks*, EMCOMPASS: IFC WORLD BANK GROUP 1 (Aug. 2017), <https://www.ifc.org/wps/wcm/connect/067d6a0c-f1b5-4457-97aa-2982a7dfda69/EMCompass+Note+42+DFS+Challenges+updated.pdf?MOD=AJPERES&CVID=ITM-26u> [<https://perma.cc/KA8M-RSUG>]. Financial markets have incorporated digital channels and computing applications for more than twenty years. Regulations have gradually accommodated those transformations. *Id.*

21. See generally Jean Dermine, *Digital Banking and Market Disruption: A Sense of Déjà Vu?*, Bank of France, No. 20 FIN. STABILITY REV., 1–8, Apr. 2016.

22. IMF STAFF DISCUSSION NOTE, FINTECH AND FINANCIAL SERVICES: INITIAL CONSIDERATIONS 8 (June 2017), available at <https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2017/06/16/Fintech-and-Financial-Services-Initial-Considerations-44985>.

23. WORLD ECONOMIC FORUM, THE FUTURE OF FINANCIAL SERVICES: HOW DISRUPTIVE INNOVATIONS ARE RESHAPING THE WAY FINANCIAL SERVICES ARE STRUCTURED, PROVISIONED AND CONSUMED 13 (June 2015), http://www3.weforum.org/docs/WEF_The_future_of_financial_services.pdf [<https://perma.cc/49SE-HMLE>].

24. An unsteady balance has to be achieved by financial regulators. On one hand, premature regulatory intervention in an emerging fintech sector can suffocate innovation and distort competition. See DELOITTE, FINTECH, REGULATORY CHALLENGES AND FINANCIAL CRIME EXPOSURE 4 (Nov. 2018), https://www2.deloitte.com/content/dam/Deloitte/de/Documents/finance/Deloitte_FinTech.pdf [<https://perma.cc/ES4Z-Y5JM>]. On the other hand, delays, regulatory gaps, or loopholes leave room for abusive or fraudulent activities, unfair competition, and loss of confidence. Balanced, proportioned, agile, and timely regulatory action is critical. *Id.*

term requires a close follow-up observation of the technological progress and its applications. But it seems fairly irrefutable that the mere process of understanding the challenges, identifying the risks, and considering policy alternatives is already demanding innovative forward-looking approaches based on collaboration between supervisors, regulators, and market players, and is poised for dynamic solutions consisting of regulatory and supervisory sandboxes, experiment-based initiatives, hubs, and portals.²⁵

In the model developed in this Article, contemporary digital financial innovation can be silhouetted with three distinctive features: multidimensional impact, disruptive character, and accelerated pace. Hence, despite the fact that the assertion of a total and absolute novelty of technologies applied to fintech markets and their outcomes cannot be upheld, the convergence of those three factors signals that current digital technology represents a point of inflexion in the adaption process of financial regulation and supervision. That point of inflection symbolizes a “point of disruption” that requires a more thorough and courageous reconsideration of regulatory strategies, supervisory methods and practices, concepts, principles, and rules.

Nevertheless, this process of catharsis and diagnosis should not necessarily lead to a total transformation of the components of financial regulation and supervision. But while it is conceivable for the current system to perfectly adapt to the challenges of digital innovation, a thorough assessment of its challenges is imperative. Otherwise, a conformist and excessively continuist attitude in facing the digital

25. For a sample of strategies, methods, and initiatives exemplary of the adaptive response of regulators and supervisors to the rapidness and dynamism of the Fintech market, see, e.g., *[Joint Media Release] Financial Regulators of Japan and Abu Dhabi Global Market Cooperate on Fintech*, FIN. SERVS. AGENCY, THE JAPANESE GOV'T (Sept. 21, 2017), <https://www.fsa.go.jp/en/news/2017/20170921-1.html> [https://perma.cc/U2T3-EVV5]; see generally *Overview of Regulatory Sandbox*, MONETARY AUTH. OF SING. (Aug. 7, 2019), <https://www.mas.gov.sg/development/fintech/regulatory-sandbox> [https://perma.cc/H6HF-CUFK]; *Fintech Supervisory Sandbox (FSS)*, H.K. MONETARY AUTH. (Feb. 17, 2020), <https://www.hkma.gov.hk/eng/key-functions/international-financial-centre/fintech/fintech-supervisory-sandbox-fss/> [https://perma.cc/CP6L-PNNE]; *Fintech Proofs of Concept*, BANK OF ENG. (Jan. 8, 2020), <https://www.bankofengland.co.uk/research/Fintech/proof-of-concept> [https://perma.cc/S34C-D2CM]; *Portal FinTech / Portal de Innovación [Fintech Portal/Innovation Portal]*, COMISIÓN NACIONAL DEL MERCADO DE VALORES [NATIONAL STOCK MARKET COMMISSION] (last visited Mar. 4, 2020), <https://www.cnmv.es/portal/Fintech/Innovacion.aspx> [https://perma.cc/JRK6-YQZT].

challenges for financial regulation could result in inadequate solutions, unresolved problems, unmanaged new risks, or unfocused approaches. The transformative potential of three distinctive features of the modern era of digital financial innovation—multidimensional impact, disruptive character, and accelerated pace—should not be overlooked in the analysis of the current regulatory and supervisory system.

First, the impact of technology on financial markets and services is multidimensional. Digital technology has the potential to transform market structures and business models, products and services, commercial strategies, relationships, regulation and supervision practices and methods, and market players. All dimensions of the financial sector are exposed to the transformative impact of technology. Such an extensive repercussion disconcerts regulators and makes any attempt to produce an all-embracing regulatory strategy infeasible, ineffective, and significantly unfocused.

Second, digital technological innovation is potentially disruptive.²⁶ Unlike previous incremental transformation processes of financial markets, digital technology exerts a rupturist and ground-breaking pressure on their foundations. Thus, the continuity in the policy strategies tend to fail to a certain extent and at first sight. The wrong perception—that digital technology is simply a next step in market sophistication and a technological progress—leads to short-sighted regulatory reactions. Digital transformation of financial markets is potentially radical, all-encompassing, and complex.

Third, the increasing pace of technological innovation infuses a high level of uncertainty in regulation and supervision. Regulatory strategies are essentially devised to produce enduring solutions. However, legal obsolescence is the affliction of regulation in technology-intensive societies. Regulators have to learn how to incorporate change as a natural feature of regulation without compromising certainty and predictability. New regulatory strategies and techniques should be derived through

26. The disruptive potential of emerging technologies arises from the concurrence of some disruptive features, as explained by the Commission Staff Working Document, *Liability for emerging digital technologies*. Accompanying the document, *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: Artificial intelligence for Europe*, at 2–3, COM (2018) 237 final (Apr. 25, 2018) (explaining that the disruptive potential of emerging technologies arises from the concurrence of some disruptive features: complexity, autonomy, data-drivenness, openness).

experimentation, observation, and an acceptable level of flexibility. Maintaining the delicate balance between (1) the promotion of innovation and competition, and (2) the preservation of market stability and integrity might become particularly difficult in a financial industry facing the fintech buffetings.

Therefore, the combination of the disruptive character, the time factor, and the multidimensional impact adds significant intricacies to the discussion about the challenges of fintech for regulation and supervision and the possible responses.

This Article aims first to devise and propose an analytical framework to understand digital challenges to financial regulation based on the “layers of digital financial innovation” theory. Accordingly, digital financial innovation (fintech) is stratified in three layers: the structure layer, activity layer, and players layer—each of which identifies and analyses the impact of digital innovation on a financial-market dimension. Consequently, a multi-layered regulatory response is proposed. This Article will consider different regulatory strategies devised to face each layer of fintech, as risks and benefits differ in each layer. This Article’s starting premise is that any attempt to approach fintech as a single, global phenomenon sinks in the vast complexity of a multifaceted, open process, and is condemned to fail. Our understanding is that the intricacies in embracing the impact of fintech on financial markets and the difficulties in apprehending its consequences for regulation and supervision are largely exacerbated by the lack of perception of its multi-layered nature. Based on a three-variable function to assess the adequacy of regulation and devise a fit-for-purpose regulatory response, a taxonomy of policy challenges will be addressed, and a multi-layered regulatory strategy is proposed.

The Article is structured as follows: Part II elaborates on the “layers of digital financial innovation” theory on which the analytical framework pivots. The “layers of digital financial innovation” theory depicts a multi-layered image of digital innovation and financial market transformation that will identify, classify, and categorize the challenges of fintech for regulation and, incidentally, supervision. Part III devises, under the format of a theoretical formula with three variables, a basic strategy to assess the adequacy of existing regulatory and supervisory solutions to the different layers of digital financial innovation. This basic formula defines the interaction among three variables—a modernised version of the functional equivalence paradigm, a revisited conception of technological neutrality, and a balanced assessment of risks—to assess the soundness and test the resistance of the current system and guide the legal response to

digital challenges, under the pressure of the second generation of digital innovation. In the context of the formula defined by Part III, Part IV delineates a proposal of regulatory and supervisory strategies.

II. ELABORATING ON THE “LAYERS OF DIGITAL FINANCIAL INNOVATION” THEORY

The “layers of digital financial innovation” theory is based on the idea that the impact of digital technology on financial markets penetrates all of its layers and thus, produces specific effects and poses singular challenges at each layer. Dismembering or disassembling the digital impact in different layers provides a better structured framework to classify new models, new products or services, and new operators, identify and assess the resultant risks, where they arise, and detect which traditional components of the regulatory and supervisory schemes could more likely be affected.

Before describing the three layers, it is pertinent to remark that they are not conceived as hermetic categories. Several aspects of digital innovation and its consequences, as described below, have transversal effects and, therefore, could be explained in relation to two layers or permeating all of them. Hence, the “layers of digital financial innovation” theory is essentially an analytical framework to clear and systematize the complexities of the fintech challenge to financial markets.

A. THE STRUCTURE LAYER: THE NEW ARCHITECTURE OF FINANCIAL MARKETS

The first visible impact of digital technology is on financial market architecture: particularly, market structure and business models. The architecture of financial markets is being reshaped under new structures. It is therefore described as the structure layer of the fintech challenge.

Digital innovation has contributed to the development of two structural models in the market, which interestingly reflect two diametrically opposed architectures: platforms and distributed ledgers. On one hand, as the digital economy has transformed into a platform economy, platform-based models have populated the financial sector.²⁷

27. The continuous growth of crowdfunding platforms and other alternative finance platforms illustrates this statement. *See e.g.*, THE CAMBRIDGE CENTRE FOR ALTERNATIVE FINANCE, SHIFTING PARADIGMS: THE 4TH EUROPEAN ALTERNATIVE FINANCE

The expansion of crowdfunding, aggregators, multilateral trading systems, and other sharing-inspired financial models²⁸—including social trading and copy trading—has been substantially facilitated and accelerated by platform models.²⁹ Platforms offer self-regulated, multilateral, centralized, and trustworthy models for the provision of financial services.³⁰ On the other hand, platforms do concurrently coexist and compete with decentralized schemes operating on distributed ledger technologies (DLT). Unlike platforms, the use of distributed ledgers relies on decentralized schemes, distributed trust, and peer-to-peer (P2P) operations.³¹

BENCHMARKING REPORT (2019), <https://www.crowdfundinsider.com/wp-content/uploads/2019/04/CCAF-4th-european-alternative-finance-benchmarking-industry-report-shifting-paradigms-April-2019.pdf> [https://perma.cc/7265-H43T]. According to this report, in 2017, alternative finance volume from across Europe grew by 36 percent, while the Asia-Pacific region experienced a 4-year average annual growth rate of 145 percent and in the Americas of 89 percent. *Id.* at 22–23. In numbers of operating crowdfunding platforms, as per the data provided by Massolution, in 2014 the threshold of 1,250 platforms active in the world had been reached. MASSOLUTION, THE CROWDFUNDING INDUSTRY REPORT 2015CF 82 (2015), <https://www.smv.gob.pe/Biblioteca/temp/catalogacion/C8789.pdf> [https://perma.cc/RAR4-3S6A] [hereinafter MASSOLUTION, CROWDFUNDING REPORT 2015]. Without specifying which fintech are based on platforms, Deloitte also reports growing data in fintech. See DELOITTE, FINTECH BY THE NUMBERS, *supra* note 17.

28. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A European Agenda for the Collaborative Economy*, at 1, COM (2016) 356 final (June 2, 2016), <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590005364413&uri=CELEX:52016DC0356> [https://perma.cc/38A5-X29Q].

29. *See generally Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Online Platforms and the Digital Single Market Opportunities and Challenges for Europe*, at 2, COM (2016) 288 final (May 25, 2016), <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590005545023&uri=CELEX:52016DC0288> [https://perma.cc/2JRZ-JBTL].

30. Teresa Rodríguez de las Heras Ballell, *The Legal Anatomy of Electronic Platforms: A Prior Study to Assess the Need of a Law of Platforms in the EU*, 3 ITALIAN L.J. 149 (2017); *see generally* TERESA RODRÍGUEZ DE LAS HERAS BALLELL, EL RÉGIMEN JURÍDICO DE LOS MERCADOS ELECTRÓNICOS CERRADOS (E-MARKETPLACES) [THE JURIDICAL REGIME OF THE CLOSED ELECTRONIC MARKETS (E-MARKETPLACES)] 56–58, 210–29 (2006) (describing platforms as closed, self-regulated environments and explaining the functions and role of platform operators as regulators, supervisors, and trust-generators).

31. Distinctive features of DLT-based schemes are based on the structural and operational characteristics of distributed ledger technologies as explained by scholars and

The transformation of the financial architecture is therefore of an immense magnitude. Both platform-based and DLT-based architectures provide extraordinary enablers for innovation to emerging fintech companies, as well as traditional financial institutions. Not only do new entrants consider these architectures promising infrastructures to penetrate the market, but incumbents also appreciate the value-creating potential of platforms and DLT for reshaping financial models in the context of a highly competitive and innovate market.³²

The structural layer has a two-fold impact on regulatory strategies and practices. First, it dilutes the classical distinction between markets and financial service providers, insofar as the use (primarily) of platforms to provide financial services assimilate its structure and operation to genuine markets.³³ As the boundaries among markets (exchanges and exchange-like models), traditional financial intermediaries, and new services providers are blurring, the classical regulatory and supervisory schemes seem unsuited, or at least too simplified, to embrace hybrid models. The emergence and flourishing of multilateral trading facilities represents an illustrative example of how these firm-market figures require a hybrid regulatory approach.³⁴ Despite the value of this suitable precedent, the contemporary multiplication of hybrid models³⁵ and their proliferation in the fintech sector invite dynamic solutions to deal with architectural transformation on a large scale. In the context of a digital economy that has evolved into a platform economy, market-like models

experts Aaron Wright & Primavera De Filippi in *Decentralized Blockchain Technology and the Rise of Lex Cryptographia* (Mar. 10, 2015), <https://ssrn.com/abstract=2580664> [<https://perma.cc/DD9U-AB5L>].

32. Thomas F. Dapp, *Fintech Reloaded—Traditional Banks as Digital Ecosystems*, DEUTSCHE BANK RESEARCH, June 9, 2015, at 5.

33. Ruben Lee, WHAT IS AN EXCHANGE? THE AUTOMATION, MANAGEMENT, AND REGULATION OF FINANCIAL MARKETS 117–39 (Oxford U. Press 1998) (defining and describing trading platforms as alternative trading systems to traditional exchanges).

34. Jan De Bel, *Automated Trading Systems and the Concept of an “Exchange” in an International Context. Proprietary Systems: A Regulatory Headache!*, 14 U. PA. J. INT’L BUS. L. 169, 208 (1993); Jonathan R. Macey & Maureen O’Hara, *Regulating Exchanges and Alternative Trading Systems: A Law and Economics Perspective*, 28 J. LEGAL STUD. 17 (1999).

35. Thomas W. Malone, *Modeling Coordination in Organizations and Markets*, 33 MGMT. SCI. 1317 (1987); Thomas W. Malone et al., *Electronic Mkt. and Electronic Hierarchies*, 30 COMM. OF THE ACM 484 (1987).

compete with traditional exchanges,³⁶ platform operators act as new intermediaries, and platforms serve as support for the provision of new services and the running of innovative business activities, e.g., aggregators, social trading, copy trading, and trading platforms.

Interestingly, the rise of platforms as the dominant organizational model in the digital economy simultaneously pierces the structure layer, the activity layer, and the player layer. As further explained *infra* Section C, the rise of platforms confronts regulation and supervision with tricky dilemmas in all three layers. Competition increases with the entry of new players, whereas market concentration risk grows due to the creation of new barriers to entry based on network effects and economies of scale. Certain traditional financial activities lose relevance, whereas new financial services associated with fintech and techfin gain momentum—i.e., correspondent banking³⁷ vs. crowdfunding,³⁸ robo advisors³⁹ vs. traditional financial advisors, P2P payment models⁴⁰ vs. traditional

36. See generally MARTIN BICHLER, *THE FUTURE OF E-MARKETS. MULTIDIMENSIONAL MARKET MECHANISMS* (Cambridge Univ. Press 2001).

37. Correspondent banking relationships are arrangements between banks in different locations aimed to enable them to access financial services and provide cross-border payment services in other jurisdictions. See BANK FOR INTERNATIONAL SETTLEMENTS, CORRESPONDENT BANKING 9 (July 2016), <https://www.bis.org/cpmi/publ/d147.pdf> [<https://perma.cc/5YE2-MFJ3>] (listing some definitions of correspondent banking as formulated by several institutions).

38. As per the definition proposed by the World Bank, “crowdfunding is an Internet-enabled way for businesses or other organizations to raise money in the form of either donations or investments from multiple individuals.” THE WORLD BANK/INFODEV, CROWDFUNDING’S POTENTIAL FOR THE DEVELOPING WORLD 8 (2013), https://www.infodev.org/infodev-files/wb_crowdfundingreport-v12.pdf [<https://perma.cc/2XEY-XHQL>].

For a general comparative analysis of Crowdfunding regulation, see Teresa Rodríguez de las Heras Ballell, *A Comparative Analysis of Crowdfunding Rules in the EU and U.S.*, (Stanford-Vienna TTLF Working Paper No. 28, (2017)), https://www-cdn.law.stanford.edu/wp-content/uploads/2017/08/rodriguez_wp28.pdf [<https://perma.cc/UJF4-QKTX>].

39. “Robo advisers” are interactive tools used to produce automated recommendations for asset allocation, investment strategies, or specific financial instruments. See IOSCO, UPDATE TO THE REPORT ON THE IOSCO AUTOMATED ADVICE TOOLS SURVEY, FR15/2016, December 2016, at 2 n. 2, <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD552.pdf> [<https://perma.cc/Q3H6-8PS3>] (referring to IOSCO, REPORT ON THE IOSCO SOCIAL MEDIA AND AUTOMATION OF ADVICE TOOLS SURVEY, FR04/2014, July 2014, at 7, <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD445.pdf> [<https://perma.cc/2Y6E-3L2F>]).

40. P2P payment models enable the transfer of funds between two parties’ (individuals) banking accounts or credit cards through online or mobile apps (m-

payment services. New entrants in the markets multiply the number of intermediaries, whereas the use of digital technologies reduces information asymmetries and consequently, the need for intermediaries.

Second, these new structures do not fit into the current regulatory framework, as they relocate the regulation/supervision focus. Under platform models, new players come to the financial fore: platform operators. As platform operators are not—in some business models—direct providers of financial services, but mere enablers for platform users to interact and carry out financial-like activities, it is reasonable to wonder how the financial market regulations should address platform operators. Are platform operators new financial intermediaries or instead, simply intermediary service providers (digital intermediaries) facilitating the delivery of financial services? The regulatory response to crowdfunding platforms, for instance, illustrates a genuine financial-operator-based regulatory strategy. However, other platforms (such as social trading, aggregators, and copy trading) have not attracted the same regulatory attention and might not deserve an equivalent response. Contrarily, distributed-ledger-based models pose a completely different challenge to regulators. These models operate on a decentralized and disintermediated basis. In the absence of an identifiable central operator, the traditional operator-based regulatory strategy does not work. Although the ecosystem of distributed-ledger-based models comprises a variety of variants—from permissioned to permissionless—the regulator faces the question of how to regulate a decentralized structure.

Likewise, this trend towards distributed-ledger-based models, besides disintermediation, adds complexity in determining which regulation is applicable and which supervisor should monitor the activity, given that connecting factors can be multiple or uncertain in decentralized systems. Connecting factors are facts that may be deemed relevant for conflict-of-law rules in connecting a transaction or a situation with a particular jurisdiction, law or regulation. In a decentralized system, possible factors connecting the activity with a jurisdiction are multiple (due to the multiplicity of nodes and users) and may be uncertain (as they must be irrelevant, overlap, or be incompatible to each other). In effect,

payments). A description and analysis of P2P payments—which are among most innovative payments trends—can be found in Payment Methods Report 2019. *See* INNOVATION IN THE WAY WE PAY, THEPAYPERS (June 2019), <https://thepaypers.com/reports/payment-methods-report-2019-innovations-in-the-way-we-pay-2/r779461> [<https://perma.cc/YW88-FM6C>].

the fact that decentralized structures lack single central operators—considering that DLT-based models range from pure public systems to private ones in different scales—affects decisions on applicable legislation, jurisdiction, liability,⁴¹ jeopardizes market stability, and creates new risks.

B. THE ACTIVITY LAYER: THE UNDEFINED PERIMETER OF FINANCIAL ACTIVITY

The second angle of digital impact is on the nature and attributes of financial products and services and, therefore, on the perimeters of financial activity. The activity layer represents the second layer of the fintech challenge.

Technology applications to products and services can transform the characteristics of financial activities and enable the configuration of new products and services. Accordingly, the applicable legal regime might need to be reconsidered to some extent.

Several examples may serve as illustrations: First, the application of artificial intelligence (AI) throughout the value chain (front-office, middle-office, and back-office)⁴² and along the entire array of financial services. Among them, robo-advisors provide customized, low-cost, highly efficient algorithm-driven financial advice. Considering their level of automation, can robo-advisors be legally treated as human financial advisors? Can liability rules and regulatory requirements be applied to robo-advice, or exclusively to the development of the software and the establishment of the pre-conditions of the program? Thus, robo-advisors represent another expression of fintech that might require regulatory attention. On one hand, the advent of robo-advisors entails the emergence of new actors in the financial markets. Robo-advising solutions can be provided by fintech start-ups, technological companies, or traditional

41. *Communication from the Commission to the European Parliament, the Council, the European Central Bank, the European Economic and Social Committee and the Committee of the Regions, Fintech Action plan: For a more competitive and innovative European financial sector*, at 10, COM (2018) 109/2, <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590006759489&uri=CELEX:52018DC0109> [<https://perma.cc/AGL5-53RV>].

42. Chatbots, virtual assistants, credit scoring, KYC/AML applications or smart contracts exemplify varied possibilities for the use of AI in all financial sectors. ANA FERNÁNDEZ, *INTELIGENCIA ARTIFICIAL EN LOS SERVICIOS FINANCIEROS*, BOLETÍN ECONÓMICO 2/2019, Mar. 29, 2019, 3–4. These prospective applications show today different level of maturity in the market. *Id.*, *Diagram 1* at 3.

financial institutions. In the two former cases, it implies the irruption of new actors competing with incumbents (fintech companies and bigtech firms). On the other hand, the automation of financial advice also poses a conceptual challenge. The existing rules for human-centric financial advice have to be applied to an algorithm-driven system. To a certain extent, that implies a shift of the regulatory focus from a human activity to an automated process. In fact, the spotlight changes from behavioural aspects of human conduct to the design and the operation of an algorithm-driven system.

Second, P2P payments enable the completion of payments between users. The decentralized network enables users to complete payments. Should payment services rules be applied there? And if so, to whom?

Third, if insurance companies incorporate big data to foresee the likelihood of the covered risks, and adjust the insurance fees accordingly (“dynamic insurance”), would the duty to notify a change in risk be relevant?

Finally, as a result of a burgeoning trend towards the tokenization of assets, values, and services, the market is receiving digital assets and customized tokens with an uncertain and intricate legal characterization. In conjunction with DLT, tokenization unleashes opportunities for asset management, fund raising, investing, and other financial services. Nonetheless, despite the initial perception of the endless invasion of digital assets in the financial markets, latest data show that “the hype of 2017 was unsustainable.”⁴³ The U.S. market share of global digital assets has significantly dwindled, although the average digital asset trading volume doubled in 2018. And while the volatility of digital assets trended lower in 2018 compared to previous years, it remains high in relation to traditional financial markets.⁴⁴

These examples reveal that the technological impact on the activity layer may affect four groups of attributes of products, services, and activities in the financial markets. Insofar as algorithm-driven solutions enable highly automated tasks and processes and increasingly autonomous decision-making, technology impacts the procedural attributes of the activity, infusing celerity, automation, and autonomy.

43. Anton Muehleemann, *The Evolution of the Digital Asset Market in 2018*, BLOCKCHAIN AT BERKELEY, (Jan. 21, 2019), <https://medium.com/blockchain-at-berkeley/the-evolution-of-the-digital-asset-market-in-2018-9af4c5de176c> [<https://perma.cc/UDW6-8LBA?type=image>].

44. *Id.* (citing data collected by Cryptocompare).

The facilitation of P2P schemes for the provision of financial—or quasi-financial—services, represents the impact on structural attributes. A widespread use of big data along the successive stages of the activity process affects the attributes related to the magnitude, scale, and scope of the activity.⁴⁵ Interestingly, such a scale shift is not a mere incremental change, but a radical transformation likely to redefine the information asymmetries and reshape the traditional schemes to allocate duties and liabilities. Finally, the possibilities and the extent of tokenization touch the very core of the legal categorization of financial instruments by challenging the current demarcation for financial supervision and regulation.

The picture sketched above—describing potential disruptions on the attributes of products, services, and activities—is widely consistent with the investment interest shown by financial institutions in emerging technologies.⁴⁶ At the pace of fintech trends, large financial institutions are highly concentrating their innovation efforts on data analytics, mobile technology, and artificial intelligence,⁴⁷ whereas large fintech companies are placing their spotlight on blockchain, artificial intelligence and biometrics, and identity management—doubling their attention to those areas.⁴⁸

45. According to the European Commission Communication, the term “big data” refers to “large amounts of different types of data produced with high velocity from a high number of various types of sources,” whose processing requires new tools and methods, such as powerful processors, software and algorithms. Hence, the disruptive character of big data pivots on three “V_s”: velocity, volume, and variety. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Towards a Thriving Data-Driven Economy*, at 4, COM (2014) 442 final (July 2, 2014), <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590006916232&uri=CELEX:52014DC0442> [<https://perma.cc/K8VJ-R3BF>].

46. See PWC GLOBAL FINTECH REPORT 2017, *supra* note 15, AT 6, 9 (showing that technological areas of investment in the following twelve months are declared to be in order of priority: 74 percent data analytics, 51 percent mobile technology, and 34 percent artificial intelligence).

47. *Id.* at 9, Figure 8.

48. *Id.* at 9, Figure 9.

C. THE PLAYERS LAYER: FROM DISINTERMEDIATION TO
REINTERMEDIATION

Digital technology has not only reconfigured the profile of incumbents but has also triggered the emergence of new players competing with incumbents. Fintech has then put in motion a cycle of disintermediation and reintermediation.⁴⁹ The entry of crowdfunding platforms in the credit market, the emergence of aggregators and comparators in the insurance and the banking sector, or the increasing competition of bigtech companies providing techfin solutions in payments are some examples of the transformation of the financial intermediation arena. These examples reveal a circular process of removing intermediaries in certain areas, followed by the emergence of new intermediaries in others.

New market players have become protagonists with the proliferation of platform models. Platform operators are not necessarily financial intermediaries or financial service providers, who can indeed become platform users. In particular, sharing-based platform models have raised concerns about the genuine role of platform operators and consequently, the applicable legal regime. The recent Court of Justice decisions on the Uber Spain Case⁵⁰ in 2017, the Uber France Case⁵¹ in 2018, and, lately, the Airbnb Ireland Case⁵² in 2019 have contributed with a case study to the debate.⁵³ Likewise, burgeoning fintech models give rise to new players: aggregators, comparators, robo-advisors, and recommenders.

49. See Shaun French & Andrew Leyshon, *The New, New Financial System? Towards a Conceptualization of Financial Reintermediation*, 11:2 REV. OF INT'L POLITICAL ECON. 263 (2004).

50. See generally Case C-434/15, *Asociación Profesional Elite Taxi v. Uber Systems Spain SL*, 2017 E.C.R. 981.

51. Case C-320/16, *Uber France SAS v. Nalib Bensalem*, 2018 E.C.R. 221.

52. Case C-390/18, *Airbnb Ireland*, 2019 E.C.R. 1112.

53. In the three cases described above, the European Court of Justice has been asked about the role of platforms operators—Airbnb and Uber—in the rental industry and the urban transport sector, respectively. The Court held that Uber is not a mere digital intermediary-information society services provider. Rather, Uber operates as a genuine transport service provider, insofar as it exercises certain control over the quality of the service, the drivers, and the cars. The Court also held that by determining the maximum fare, Uber exerts decisive influence over the conditions under which drivers provide their services. Accordingly, Uber is not subjected to the legal regime applicable to intermediary service providers, but instead, to the regime applicable to transport service providers. However, the Court held under the same analysis that Airbnb has neither

The three-layer theory traces a broad and comprehensive—yet structured—description of digital financial innovation, as it comprises the development of new products and services, innovative entrants to the market providing competing and value-adding services, and the transformation of processes, practices, and business models by incumbents.⁵⁴

The three-layer theory's contribution to the mapping of the fintech realm for regulatory purposes is two-fold. First, it provides an analytical framework to identify and understand the impact of technological innovation on the different dimensions of financial activity, rather than describing the fintech challenges on a specific-technology basis. Second, it conveys the key idea that the disruptive potential of digital financial innovation fundamentally arises from the multi-dimensional nature of its impact. Such a cross-cutting impact enhances the potential disruptive effect on regulation and supervision. Therefore, it is the symbiotic interconnection of emerging technologies that triggers their disruptive potential: the integration in platforms and DLT-based models of algorithm and AI-driven systems fed by huge amounts of data collected by Internet of Things (IoT) devices, observed and predicted by big data analytics reflects a symbiosis of technologies triggering disruptive effects.

Hence, the “layers of digital financial innovation” theory provides a framework to map the impact areas, identify and classify the nature of the potential disruption—on the structure, activity, or market players—and trace a future-proof blueprint of fintech challenges to devise regulatory strategies.

III. A THREE-VARIABLE FUNCTION TO ASSESS THE ADEQUACY OF REGULATION AND DEVISE A FIT-OR-PURPOSE REGULATORY RESPONSE

The adequacy of the regulatory response to digital financial innovation should be assessed by applying three variables: (1) an economic-functional analysis of fintech models, (2) financial risks

control nor decisive influence on the rental transactions conducted between the users within its platform. Consequently, Airbnb is not treated as a real estate agent, but as a mere digital intermediary instead. The diverse legal treatment entails different legal obligations as well as liability regimen.

54. BANK FOR INTERNATIONAL SETTLEMENTS-BASEL COMMITTEE ON BANKING SUPERVISION, SOUND PRACTICES: IMPLICATIONS OF FINTECH DEVELOPMENTS FOR BANKS AND BANK SUPERVISORS 9 (2018), <https://www.bis.org/bcbs/publ/d431.pdf> [<https://perma.cc/72E2-BEK3>].

triggered by digital financial innovation, and (3) technological neutrality. Whereas greater magnitudes of the first and second variables invite more intense regulatory responses, the principle of technological neutrality acts as a calibrator that discourages any intervention on the basis of the applied technology where functional equivalence between classical activity and fintech version can be proved. Hence, the estimation and the assessment of these variables help to trace a strategy to understand digital financial innovation challenges, gauge the impact on risks, and chart regulatory options.

A. VARIABLE 1: A FIRST ASSESSMENT BASED ON THE EQUIVALENCE OF
ECONOMIC FUNCTIONS

From a regulatory perspective, the disruptive potential of the fintech sector cannot be simply derived from the intensive use and pervasive application of technology, but from the capacity of delivering economic functions that are similar to or instead, fundamentally different from existing financial services.⁵⁵ Therefore, a functional analysis of the fintech sector enables us to effectively delimit the perimeters of the regulation scope and the contours of the supervision sphere over digital financial innovation.

Fintech models generally serve as enablers in the credit economy for effectively allocating financial resources. In that regard, models articulating digital financial innovation aim to enhance effectiveness, fill gaps, and infuse innovation to the traditional performance of the economic functions as fulfilled by financial markets in the classic shape. The highly atomized nature and low entry barriers to the fintech sector seem to explain the initial perception that digital financial innovation permeates the entire financial industry. Fintech models penetrate the traditional financial sector not only to replace incumbents but, above all, to complement, add value, and fill gaps in the financial terrain. Therefore, a perfect correspondence between innovative and classical financial models is not always visible. A combination of several digital financial innovations may converge to deliver and enhance the performance of

55. FINANCIAL STABILITY BOARD, FINANCIAL STABILITY IMPLICATIONS FROM FINTECH: SUPERVISORY AND REGULATORY ISSUES THAT MERIT AUTHORITIES' ATTENTION 3 (2017) (classifying fintech innovations precisely "by their primary economic functions and activities, rather than the underlying technologies and the regulatory classification").

economic functions that are traditionally carried out as a bundle and attributed to a single financial activity; other developments do, however, traverse several layers of financial areas and economic functions—e.g., big data applications or DLT.⁵⁶

Yet, digital innovation models enable bundling and unbundling of the delivery of financial activities and services under diverse innovative formats. Whereas some fintech models impact financial core activities, others disrupt the market with the provision of peripheral services (e.g., aggregation services, search services, comparators, and social trading). In such cases, it might be challenging to decide whether such innovative peripheral activities should be included in the scope of financial regulation and supervision, insofar as they deliver the same economic functions and are subject to similar risks, or they simply converge on the functioning of the financial markets and therefore, can contribute to its economic benefits and risks. Some fintech entrants irrupt in the market as challengers to the incumbent financial players with a clear competitive strategy,⁵⁷ whereas other models operate as collaborators assisting traditional institutions in mastering digital innovation and providing added value.⁵⁸ Such a dualist competitive role of fintech must be taken into account when assessing the impact of digital financial innovation in

56. Compare PWC, *BLURRED LINES: HOW FINTECH IS SHAPING FINANCIAL SERVICES*, GLOBAL FINTECH REPORT, 31, 33 (2016) (stating that big data applications may improve credit risk assessments, financial analysis and investment, and enhance pricing mechanisms in insurance contracts) with Rebecca Lewis et al., *Blockchain and Financial Market Innovation*, 7 FED. RESERVE BANK OF CHICAGO, ECON. PERSPECTIVES (2017) (indicating that DLT-based models provide solutions for clearing and settlement, capital-raising, transfer of financial instruments, and interbank payments).

57. See Larry Downes & Paul Nunes, *Big Bang Disruption*, HARV. BUS. REV. (Mar. 2013), <https://hbr.org/2013/03/big-bang-disruption> [<https://perma.cc/RM9K-ZJC9>] (“[P]erhaps the biggest challenge to incumbents is that big-bang innovations come out of left field, combining existing technologies that don’t even seem related to your offerings to achieve a dramatically better value proposition. Big-bang disrupters may not even see you as competition. They don’t share your approach to solving customer needs. And they’re not sizing up your product line and figuring out ways to offer slightly better price or performance with hopes of gaining a short-term advantage. Usually, they’re just tossing something shiny in the direction of your customers, hoping to attract them to a business that’s completely different from yours.”).

58. CAPGEMINI, *WORLD FINTECH REPORT* 40 (2018), capgemini.com/wp-content/uploads/2018/02/world-fintech-report-wftr-2018.pdf [<https://perma.cc/P289-U583>] (analyzing the factors determining an effective symbiosis and possibilities for collaboration between fintech firms and traditional financial institutions).

the market structure and demarcating the regulation and supervision perimeters.

Furthermore, the unbundling of activities challenges the traditional focus of regulation and supervision, as a single fintech service might not demand supervision on an isolated basis but might contribute to market risks when it is observed in the context of financial activity as a whole. Aggregators or comparators of financial services and products or platforms for copy trading are illustrative of such value-added services whose financial nature is unclear.

The first variable would then convey the degree of functional equivalence between fintech activities and traditional financial activities through the lens of the regulatory and supervisory interests. Rather than a formal analysis of innovative models, a substantial assessment of digital financial innovation on the basis of the economic functions to be delivered is imperative. The higher the functional equivalence is between incumbents and new entrants, the lower the need to formulate new rules and develop new supervision practices becomes. Fintech models would be subject to existing regulations and oversight in that extent.

B. VARIABLE 2: AN EVALUATION OF THE TENSION BETWEEN RISKS AND BENEFITS

Variable 2 focuses on the risks associated with fintech activities. Insofar as fintech models are subject to similar micro-prudential and macro-prudential risks, the rationale to regulate and oversee the different market expressions of digital financial innovation would be substantially similar to traditional financial activities. However, the assertion of similarity or total equivalence in the risks triggered by fintech models and traditional financial markets may be daring. On one hand, the lack of conclusive data due to the emerging nature of the sector hinders any attempt to produce sound comparative assessments based on quantitative patterns.⁵⁹ On the other hand, the fact that digital financial innovation seems to concurrently aggravate some risk factors and mitigate others makes a comparison of net results necessary. Digital financial innovation confronts financial regulation with several dilemmas that appear to

59. W. Scott Frame & Lawrence J. White, *Empirical Studies of Financial Innovation: Lots of Talk, Little Action?*, 42 J. OF ECON. LITERATURE 116 (2004) (discussing the lack of empirical studies concerning the economic/environmental conditions that encourage financial innovation).

embody tensions of risks and benefits consubstantial to digital financial innovation.⁶⁰

First, digital technology allows new platform-based models and non-traditional digital intermediaries, such as fintech and techfin solution providers, to compete with existing players. An expected greater competition would lead to a reduction in concentration and a more granular provision of financial services. Decentralization of financial activity and increasingly atomized intermediation would be the natural tendency. Nevertheless, economies of scale, network externalities, and a strong competitive value of data reinforce the market position of incumbents, raise barriers to entry to newcomers, and fossilize legacy oligopolistic market structures. Hence, in terms of competition and market structure, digital financial innovation pushes the two buttons of the market structure transformation. A more competitive market is possible, but concentration and incontestability of financial incumbents seem to increase in parallel.

Second, insofar as technology alleviates operational risks, concerns related to the impact of new cybersecurity risks on the market stability are accentuated. These risks display the intrinsic vulnerability of emerging technologies' ecosystems. Data dependency and cybersecurity risks, such as hacking or security breaches, expose technological ecosystems to high levels of vulnerability. Digital financial innovation, insofar as it relies on technological ecosystems and inserts them in the financial cycle, infuses financial markets with the vulnerabilities inherent in technology.

Third, the inherent dynamism of digital innovation represents a disconcerting and highly disturbing factor for the pace and legacy methods of regulation and oversight practices. However, the same technological developments that infuse a vertiginous rate to the evolution of financial markets provide regulators, supervisors, and financial institutions—both incumbents and new entrants—with effective tools aimed to process big data,⁶¹ conduct predictive analyses, automatize tasks,

60. Thorsten Beck et al., *Financial Innovation: The Bright and the Dark Sides*, 72 J. OF BANKING & FIN. 2 (2012) (“While the *innovation-growth* view predicts a positive relationship between financial innovation, resource allocation and economic growth, the *innovation-fragility* view predicts higher financial and real sector fragility and volatility.”).

61. EUROPEAN SUPERVISORY AUTHORITIES (ESAs), JOINT COMMITTEE DISCUSSION PAPER ON THE USE OF BIG DATA BY FINANCIAL INSTITUTIONS (2016) (acknowledging the wide presence and the varied application of Big Data in financial industries (banking, securities, and insurance) and provides illustrative examples: “aggregator services use financial and payment data from bank accounts of consumers for dashboard and

and efficiently prioritize objectives in complex contexts to adopt smart decisions.⁶² These technologies create unprecedented opportunities to ensure compliance with financial regulations and enhance the effectiveness of regulation and supervision.⁶³ Regtech and suptech⁶⁴ applications⁶⁵ would facilitate real-time supervision, automatic reviews for supervisory actions, dynamic and preemptive supervision, or algorithm-driven regulation. Concurrently, financial institutions⁶⁶ could improve their compliance rates with automated compliance, even in an environment of changing regulatory requirements, AI-guided risk management, and streamlined regulatory reporting.⁶⁷

accounting products,” “banks use financial and payment data for consumer credit worthiness,” “telematics boxes in cars monitoring driving behavior are being applied to offer individualized policies and prices according to the customer’s driving behavior,” “smart (connected) homes and wearable devices in the health sector may lead to more granular segmentation of risks, pricing more risk-based, and increase the effectiveness of risk-selections,” “High Frequency Traders has already been based on the analysis of large volumes of data, from a wide variety of datasets, at very high velocity through the use of algorithms to make investment decisions,” “asset managers’ operations are also increasingly using Big Data technologies to inform their investment strategies or for their financial risk management,” “some investment funds have developed sophisticated strategies which include non-traditional data ranging from social media news to satellite images.”)

62. See generally Dirk A. Zetsche et al., *Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation*, 23 FORDHAM J. CORP. & FIN. L. 31 (2017).

63. See generally Douglas W. Arner et al., *Fintech, RegTech and the Reconceptualization of Financial Regulation*, 37 NW. J. INT’L L. & BUS. 371 (2017).

64. See FIN. STABILITY INST. OF THE BANK FOR INT’L SETTLEMENTS (BIS), FSI INSIGHTS ON POLICY IMPLEMENTATION, INNOVATIVE TECHNOLOGY IN FINANCIAL SUPERVISION (SUPTECH)—THE EXPERIENCE OF EARLY USERS 13–14 (July 2018), <https://www.bis.org/fsi/publ/insights9.pdf> [<https://perma.cc/3P3L-F3GD>].

65. Toronto Center, *Fintech, RegTech and SupTech: What They Mean for Financial Supervision*, Aug. 2017, <http://res.torontocentre.org> [<https://perma.cc/BCK7-AP5E>].

66. Yvonne Lootsma, *Blockchain as the Newest Regtech Application—the Opportunity to Reduce the Burden of KYC for Financial Institutions*, 36 BANKING & FIN. SERV. POL’Y REP. 16 (Aug. 2017), <https://static1.squarespace.com/static/567bb0614bf118911ff0bedb/t/59ca5fc4017db2da07ec290c/1506435012176/Article+-+Blockchain+as+the+Newest+Regtech+Application+-+Yvonne+Lootsma+%281%29.pdf> [<https://perma.cc/7YGD-LNR3>].

67. INSTITUTE OF INTERNATIONAL FINANCE, REGTECH: EXPLORING SOLUTIONS FOR REGULATORY CHALLENGES (Oct. 2015), <https://www.iif.com/topics/regtech/regtech-exploring-solutions-regulatory-challenges> [<https://perma.cc/LYQ2-Q3DE>].

Therefore, policy decisions must internalize the intrinsic tensions that digital financial innovation embodies. All-or-nothing solutions will rarely resolve the complex dilemmas posed by emerging technologies. The transversal implementation of digital financial innovation through the financial sector's layers equally triggers and contains risk chains. Hence, the rationale behind fintech-specific regulatory and supervisory actions must be the assessment of positive net risk values, due either to new risks resistant to legacy regulatory and supervisory schemes, or to an imbalanced result between risk-mitigating and risk-increasing effects of technology in the financial markets.

Notwithstanding the foregone assertion, there is an alternative reading of the impact of digital innovation on financial risk. Technology does not only alter the level of risk—it fundamentally transforms its nature and reallocates it. The implementation of digital innovation strategies reshapes the risk scheme and, accordingly, the regulatory focus might need to be readjusted. The adoption of regtech solutions by financial institutions to improve and streamline compliance provides a revealing example.

Regtech solutions certainly alleviate compliance costs and enhance the effectiveness in the fulfilment of regulatory requirements, but besides that first evidence, it entails a reallocation of the compliance risk to assess the correct design of the regtech process, its proper functioning, and the production of expected compliant outcomes. The costs of compliance are reduced by automation and the risks of non-compliance have not been only mitigated, but above all, transferred to an algorithm-driven system.

Financial institutions will then pay attention and devote resources to develop and deploy effective regtech processes. The focus slightly turns from the efforts to directly comply with regulations to the efforts to design and operate an effective regtech system that is indirectly compliant. Such an observation exerts a subtle—but critical—pressure on the regulation strategies for digital financial innovation. Should the regtech system become the new regulatory spotlight? One must wonder whether regulations should be focused on setting technical standards and design requirements for algorithm-driven compliance and reporting processes, instead of establishing rules; supervisors should then monitor and oversight the adequacy of the design, operation, and outcomes of automatic processes.

In sum, the legal nature of the compliance obligations might be changing. If so, the focus of regulation and supervision should shift towards the design and operation of the regtech system, in conformity with the standards set to that end. That approach means to opt for a

regulatory strategy based on “procedural compliance.” Regulation would then provide for procedural standards (e.g. designs, operations, security levels, data-related measures, monitoring duties, and evaluating updates). Accordingly, “substantial compliance” is presumed from the fulfilment of “procedural compliance” standards.

As the example above demonstrates, the risk is also transformed when it is reallocated. The risks and costs⁶⁸ associated with the intricacies of complying with regulatory requirements—the burdensome reporting obligations, prompt response of supervisory requests, and the inevitable mistakes and human errors—significantly decline with regtech solutions. Concurrently, regtech solutions entail new risks based on the inherent complexity⁶⁹ of algorithmic decision-making (e.g., in the design, in the operation due to certain levels of unpredictability, and in the results), third-party dependencies (e.g., cloud computing services and service providers), data quality and quantity, and cyber security, along with other operational and technical vulnerabilities.⁷⁰

In other cases, the reallocation of risks is the result of a reshaping of the architecture devised to channel the activity and configure the distribution of interests.⁷¹ The blooming of crowdfunding platforms and P2P systems for trading conveys these new patterns of risk allocation in credit and investment transactions.⁷² By replacing the full intermediation

68. The Institute of International Finance provides the following exemplifying data to gauge the cost and the complexity of the compliance challenge: “JPMorgan Chase said that it added 13,000 employees from 2012–14 to support regulatory, compliance and control efforts, at a cost of \$2 billion. In the same years, it spent a combined \$600 million on regulatory and control technology. Deutsche Bank spent an additional €1.3 billion on new regulatory requirements in 2014. UBS spent \$946 million on regulatory demands in 2014, almost half of which was permanent cost. Deloitte estimates the European insurance industry spent between \$5.7 and \$6.6 billion in 2012 to comply with new regulations.” INSTITUTE OF INTERNATIONAL FINANCE, REGTECH: EXPLORING SOLUTIONS FOR REGULATORY CHALLENGES, (Oct. 2015).

69. Kathryn Judge, *Fragmentation Nodes: A Study in Financial Innovation, Complexity, and Systemic Risk*, 64 STAN. L. REV. 657, 686 (2012) (discussing the consequences of complexity in financial innovation in the rise of systemic risk).

70. FIN. STABILITY BD., FINANCIAL STABILITY IMPLICATIONS FROM FINTECH. SUPERVISORY AND REGULATORY ISSUES THAT MERIT AUTHORITIES’ ATTENTION 4 (2017).

71. Iris H-Y Chiu, *Fintech and Disruptive Business Models in Financial Products, Intermediation and Markets-Policy Implications for Financial Regulators*, 21 J. TECH. L. & POL’Y 55, 79 (2016).

72. *Id.* at 80.

model starred by traditional financial intermediaries with a disintermediation alternative that presumably empowers investors with direct investment and credit decisions, the scheme for risk allocation is upset.⁷³ The array of disclosure duties, conduct rules, and portfolio composition requirements formulated for a full intermediation model do not operate in a completely or partially disintermediated model, unless the proper accommodating adjustments are made. Regulators and supervisors must understand the implications of such risk reallocation⁷⁴ and ponder the adequacy of existing legal architectures. Revealingly, a policy decision to treat crowdfunding platform operators as financial intermediaries—either completely or partially—would represent a clear strategy to shape the new model into the existing risk allocation scheme.

In conclusion, this second risk/benefit-assessing variable in the equation to devise policy strategies for regulation and supervision should encompass both net risks and new risks created by digital financial innovation. Interestingly, whereas addressing net risks would only impact the scale of expected regulation and supervision—and it is unlikely to require specific regulatory action or supervisory adjustments—containing new risks can invite proposals for regulatory and supervisory improvements and developments.

C. VARIABLE 3: THE NEW APPROACH OF ARCHITECTURAL NEUTRALITY AND EFFECTS NEUTRALITY

Throughout 2000–2020, the accommodation of legal rules to the pervasive expansion and consolidation of technology has been masterly managed via the principle of technological neutrality.⁷⁵ On the basis of that conciliatory principle, legal systems around the world have widely embraced technological developments with legacy concepts, rules, and

73. *Id.*

74. *Id.* at 79–80 (using this example to explain the change in the risk allocation and resultant consequences).

75. The principle of technological neutrality means that legal rules should be “neutral” from the perspective of the technology, that is, they should not depend on or presupposed the use of particular types of technology, and they should not differ only on the basis of the technology use in equivalent situations. See Explanatory note by the UNCITRAL secretariat in U.N. COMMISSION ON INT’L TRADE L., UNITED NATIONS CONVENTION ON THE USE OF ELECTRONIC COMMUNICATIONS IN INTERNATIONAL TRADE, U.N. Sales No. E.07.V.2 (2007), at 26, https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/06-57452_ebook.pdf [https://perma.cc/CS4F-PMSY].

principles. The technological principle, as originally enshrined in the UNCITRAL instruments on electronic commerce and electronic signatures⁷⁶—and subsequently adopted as a guiding principle by regional and domestic legislations—has a two-fold effect. On one hand, it bans legislators from discriminating on grounds of the use of technology (e.g., medium and communication means). On the other hand, it facilitates the parallel application of existing legal solutions on the basis of functional equivalence. Accordingly, regulation is understood essentially as an enabler, removing technology-non-neutral obstacles and ensuring non-discriminatory treatment to emerging technologies.

Regulation on digital innovation has, to date, pivoted on this enabling principle of technological neutrality. Essentially, the preservation of technological neutrality is a calibrating variable in the equation. Regulatory actions or supervisory interventions on the development of digital financial innovation are discouraged where they are based on a technology-determined rationale. Hence, this variable would block any attempt to regulate or supervise differently only on the basis of the presence of emerging technologies, where the other two variables prove the delivery of similar economic functions and the absence of higher or new risks. In that case, the existing regulatory and supervisory framework maintains the same structure.

The technological neutrality approach has successfully tackled the first-generation technology wave through a seamless process of adjusting legacy legal structures.⁷⁷ Nevertheless, the advent of emerging disruptive technologies ushers digital innovation into a second generation.⁷⁸ The acceleration and accumulation of technological developments pose unforeseen challenges to the modern legal system:⁷⁹ “A systematic,

76. See U.N. COMMISSION ON INT’L TRADE L., UNCITRAL MODEL LAW ON ELECTRONIC COMMERCE WITH GUIDE TO ENACTMENT, U.N. Sales No. E.99.V.4 (1996) [hereinafter UNCITRAL MLEC]; U.N. COMMISSION ON INT’L TRADE L., UNCITRAL MODEL LAW ON MODEL SIGNATURES WITH GUIDE TO ENACTMENT, U.N. Sales No. E.02.V.8 (2001) [hereinafter UNCITRAL MLES]; U.N. COMMISSION ON INT’L TRADE L., U.N. CONVENTION ON THE USE OF ELECTRONIC COMMUNICATIONS IN INTERNATIONAL CONTRACTS, U.N. Sales No. E.07.V.2 (2005).

77. Teresa Rodríguez de las Heras Ballell, *Digital Technology-Based Solutions for Enhanced Effectiveness of Secured Transactions Law: The Road to Perfection?*, 81:1 LAW AND CONTEMPORARY PROBLEMS, DUKE U. SCH. OF L. 33 (2018) [hereinafter *The Road to Perfection?*].

78. *Id.*

79. *Id.* at 33–34.

extensive, and wisely combined application of these (no longer) emerging technologies, such as Artificial-Intelligence (AI) and advanced robotics, Internet-of-Things (IoT), and DLT, offers fascinating possibilities and announces great disruptive effects.”⁸⁰ A conformist technology-neutrality approach might not be enough—nor advisable—to successfully respond to this second wave of technological innovation.⁸¹

A warning must be issued to regulators and supervisors to carefully ponder technological neutrality strategies in dealing with digital financial innovation. A neutral approach, as a general rule, is a safe and prudent way to prevent regulatory actions from distorting the market, interfering in competition, or decelerating the pace of innovation. Nevertheless, future regulation should adapt to specifically address digital financial innovation. An overly strict and inflexible neutral view could yield undesirable and counterproductive outcomes. An overly rigid technology-neutral approach could disregard two important dimensions of digital innovation.

First, digital technology can perform the same economic function as traditional financial intermediaries through a different architecture—blockchain-based settlement systems or trading platforms—providing a valid example of a dimension that would be overlooked by a rigid technology-neutral approach. Thus, neutrality should not be applied to the technology but instead, to the architecture. The principle of architectural neutrality can be seen as an advanced version of technological neutrality. Our proposal is that the traditional principle of technological neutrality should evolve towards a principle of architectural neutrality: rules should remain neutral in the face of different technological architectures—platforms, or decentralized schemes. Yet, architectural neutrality does not entail a total departure from technological neutrality; rather, it represents a proposal to refocus the principle from the technology to the architecture. Accordingly, the regulatory response does not have to be necessarily neutral to DLT technologies in their multiple and varied applications. On the contrary, the regulatory approach must holistically observe the architecture and then assess in each case (1) whether the DLT-based architecture is meant to perform the same economic functions and (2) whether concurring rights and interests are less exposed to risks due to the structural change. In sum, the functional equivalence principle should be applied to competing architectures instead of alternative technologies.

80. *Id.* at 22.

81. *Id.* at 21, 22, 33–34 (assessing that inadequacy of a technology-neutrality approach in relation to secured transactions laws).

Potential applications of blockchain in payment systems and trading and settlements schemes provide helpful examples to test the revisited principle of technological neutrality under the architecture-oriented lens.

From a functional perspective, DLT serves two purposes: the attribution and transfer of interests or shares with increasing irrevocability and immutability, and transparency of registered transactions.⁸² Given those technological functions, DLT—unlike traditional infrastructures for the life cycle of financial market transactions—enables direct transfers of value between participants without the involvement of a central entity entrusted with the management of accounts. Accordingly, financial market schemes involving value transfers, registering transactions, or clearing and settlements, can be potentially reconsidered under DLT models.⁸³

Virtually, shared reference databases could entail significant gains compared to the complexity and costs of bilateral reconciliation between multiple actors in cross-border payment transactions, trading, and the clearing and settlement of securities. In such scenarios, DLT contributes verified information synchronously available to many parties in complex processes where the coordination among actors is needed, costly, and time-consuming. Consequently, DLT offers improved transparency, efficiency, resilience and automation in trading, and clearing and settlement of securities transactions. In that regard, the principle of architectural neutrality should observe the resulting decentralized and disintermediated structure as a potential alternative to existing infrastructures in financial models. Should functional equivalence be confirmed—provided that net effects are positive or neutral—regulators are called on to address new architectures with a neutral perspective. Naturally, such an architectural neutrality could mean the application of existing requirements to new structures, or the adjustment of current concepts or standards to new realities in order to ensure uniform regulatory effects and prevent unfair competitive situations among entrants and incumbents.

82. FEDERAL COUNCIL REPORT, LEGAL FRAMEWORK FOR DISTRIBUTED LEDGER TECHNOLOGY AND BLOCKCHAIN IN SWITZERLAND 31 (Dec. 7, 2018), https://www.mme.ch/fileadmin/files/documents/Publikationen/2018/181207_Bericht_Bundesrat_Blockchain_Engl.pdf [<https://perma.cc/Y72M-UMVG>].

83. Emiliós Avgouleas & Aggelos Kiayias, *The Promise of Blockchain Technology for Global Securities and Derivatives Markets: The New Financial Ecosystem and the 'Holy Grail' of Systemic Risk Containment*, 20 EUROPEAN BUS. ORG. L. REV. 81, 97–98 (2019).

In the case of DLT-based trading venues, options for legal treatment might be official stock exchanges, multilateral trading systems, or other alternative trading venues. The final qualification will depend upon the ability of the DLT system to deliver the core functions and comply with the applicable organizational and standardization requirements corresponding to each structural model.

Second, digital technology applications can generate new risks and reallocate existing ones. Hence, neutrality should only be advocated where the resulting net effect is zero. That is, if the effects are comparable, the legal treatment should be equivalent. So, if the outcome is that fintech activity does not increase risk (net value), there is no reason to regulate the fintech activity differently, or more strictly. Similar effects should lead to similar legal regulations.

In conclusion, the technological neutrality principle is an important recalibrating variable in the equation to temper regulatory and supervisory actions. In the face of second-generation digital innovation, this Article proposes that technological neutrality must be understood as a principle of neutrality in architecture and in risk level. This interpretation of technological neutrality for the second-generation digital innovation is fully consistent with the two other variables in the equation: the functional analysis and the net risk value. This interpretation better explains the correlation among the three variables. On one hand, the conceptualization of technological neutrality as an architectural neutrality is supported by the observation that similar economic functions can be delivered to the market through diverse legal and technological architectures (variable 1 and variable 3). On the other hand, an approach based on the neutrality of the effects (risk level) (variable 1) resulting from the implementation of technological solutions is aligned with the assessment of the net risk values embodied in variable 2.

IV. CHARTING A REGULATORY RESPONSE

The analytical framework of the “layers of digital financial innovation” theory enables us to identify the policy challenges of financial regulation. The impact can be spotted and located in one of the three layers: activity, architecture, or/and players. Thus, the magnitude and dimensions of disruption can be better assessed. Subsequently, the intensity and extent of the regulatory response can be defined as the result of the proposed three-variable function. Well-suited regulatory actions should address the disruptive features of the technologies driving the contemporary digital financial innovation that fintech revolution

embodies. Six strategies should guide the formulation of the regulatory response to digital financial innovation.

A. THE SERVICE-CENTRED APPROACH

The analysis of digital innovation should not be based on business models, but on the nature, attributes, and risks generated by the activity. If the true nature of the activity provided under emerging fintech models is properly assessed, the regulatory action will be correctly focused on the interests to protect and the risks to control. As the systematic use of digital solutions has removed barriers to entry in the market, the contours of traditional financial markets have become blurred, due in part to the enlargement of the scale of activities and the enhancement of the accessibility and affordability of certain services and products. Traditional and non-traditional players, incumbents, and entrants compete and collaborate in the financial markets. Nevertheless, the perimeters of the regulation and supervision sphere should not be necessarily extended. The decision to supervise should be only guided by a service-centred approach, which would lead to the development of activity-based regulatory and supervisory regimes.

Neither the business model nor the incidence of the activity in the realm of financial markets solely suffice. As the technology has the ability to transform the attributes of the activity, the automated or digital provision of a service cannot always be considered a perfect functional equivalent of the traditional financial activity.⁸⁴

B. THE ARCHITECTURE-ORIENTED APPROACH

Digital financial innovation has reshaped the architecture of the market. Therefore, regulatory attention should be paid to how architectures perform functions. Architecture is not only describing emerging organizational models—from platforms to distributed ledgers technologies—but also the internal design of algorithms driving fintech services and regtech compliance applications. In all cases, the core issue

84. Copy trading or social trading services where no transmission or execution of orders takes place, robo-advisors that do not provide personal investment recommendations but operate as a simple tool to assist the user in defining the risk tolerance and the investment profile, or aggregators or comparators that do not enable the conclusion of transactions are illustrative examples of that assertion.

is how architecture and design enable the performance of core functions, and whether they are suitable to meet regulatory requirements. The following three cases exemplify the architecture-oriented approach.

First, digital financial innovation is exploiting the versatility of the platform economy through crowdfunding modes,⁸⁵ trading platforms, and social and copy trading models. Three alternative policies are possible: applying existing legal regimes insofar as the architecture enables performance of the same function (provision of investment services or activities and trading venues); devising hybrid regimes (equivalent or alternative to the multilateral trading facilities); and the no-action choice—based on the fact that the architecture is not performing a regulated activity.

Second, the increasingly popular decentralized models based on DLT intensify the disruptive potential of fintech models in the market. Unlike platform-based models that leverage the trust-generating ability of centralized architectures, decentralized schemes are inspired by the paradigm of distributed trust, consensus methods, and disintermediation. Trading facilities, crowdfunding venues, and platforms for payment services can adopt this decentralized configuration; however, numerous legal issues may arise. Among the many potential legal issues, it is important to consider (1) whether decentralized architectures can be assimilated to centralized architectures and treated accordingly from a regulatory point of view—regulated markets, intermediaries, or multilateral trading facilities; (2) whether decentralized structures can comply with regulatory requirements; (3) whether decentralized architectures can be supervised and if so, what to supervise and how to implement supervision; (4) where to place responsibility for compliance in a decentralized architecture; and (5) how the digital assets (cryptocurrencies, digital tokens) produced and traded or exchanged with

85. CAMBRIDGE CTR. FOR ALTERNATIVE FIN., SUSTAINING MOMENTUM THE 2ND EUROPEAN ALTERNATIVE FINANCE INDUSTRY REPORT 20 (Sept. 2016), <https://eurocrowd.org/wp-content/blogs.dir/sites/85/2016/09/Sustaining-Momentum-Embargoed.pdf> [<https://perma.cc/KG6S-BXUS>] (“Peer-to-peer consumer lending is the largest market segment of alternative finance, with €366m recorded for 2015 in Europe. Peer-to-peer business lending is the second largest segment with €212m, with equity-based crowdfunding in third with €159m and reward-based crowdfunding, fourth, with €139m in 2015. However, invoice trading is the fastest-growing alternative finance model in Europe registering €81m in 2015, up significantly from the low base of just €7m in 2014.”); MASSOLUTION, CROWDFUNDING REPORT 2015, *supra* note 27 (despite European statistics, in global terms, reward and donation based crowdfunding is ranked second in amount \$5.5 billion, behind P2P lending at \$25 billion in 2015).

distributed-ledger venues should be treated, supervised, and regulated.⁸⁶ As proposed below, a standard-based regulatory approach is advisable.

Third, the use of algorithm-driven compliance programs clearly enhances the level of compliance, reduces compliance costs, and ensures monitoring. To assess the compliance with regulatory requirements, the supervision focus must be relocated. In doing so, the design of the algorithm automating checking tasks, processes, and decisions should be spotlighted.

C. THE DESIGN-BASED STRATEGY

The adequacy of automated and autonomous activities to regulatory requirements and the compliance of applicable duties and obligations—including suitability, know-your-client duties, conflicts of interest, and furthering client ‘interests—cannot be verified by simply assessing the outcomes of these processes. The key is the design of the algorithm and its operation in a context of increasing autonomy, machine-learning, and multiple-source data collection. Algorithms should be designed to comply with the applicable regulations and should operate accordingly. Therefore, market players are expected to (1) work closely with regulators and supervisors, and (2) exhibit a high degree of transparency for review of their designs and operations.

Focusing the regulatory attention on design as a “formal assumption” of expected compliance leads to two other derivative proposals: transparency and explainability, and the duty to monitor.

Under this approach, the notion of transparency and the idea of explainability of algorithm⁸⁷ driving processes, systems, and decision-making gain particular relevance. Effective supervision over algorithm-driven systems will likely need to be conducted hand in hand with a new concept of transparency.⁸⁸ Given the increasing complexity and opacity

86. Rosa María Lastra & Jason Grant Allen, *Virtual Currencies in the Eurosystem: Challenges Ahead*, *Monetary Dialogue* July 2018, POLICY DEP’T FOR ECON., SCI. AND QUALITY OF LIFE POLICIES, EUROPEAN PARLIAMENT 17 (July 2018), https://www.europarl.europa.eu/cmsdata/150541/DIW_FINAL%20publication.pdf [<https://perma.cc/PWE2-EB8V>].

87. Bryce Goodman & Seth Flaxman, *European Union Regulations on Algorithmic Decision-Making and a “Right to Explanation”*, 38 *AI MAGAZINE*, Fall 2017, at 55–56.

88. Bundesanstalt für Finanzdienstleistungsaufsicht, Federal Financial Supervisory Authority (BaFin), Big data meets artificial intelligence. Challenges and implications for

of emerging technologies, transparency and explainability have been identified as key tools to address the regulatory and supervisory challenges posed by digital financial innovation.⁸⁹ Disclosure must be enlightened by explanation of functionalities, simulation of operation scenarios, and cyclical tests aimed to verify the regularity of results depending upon the data, the client, or the circumstances of the market.⁹⁰ Such a qualified duty of transparency—in the sense of explaining the design and operation of the underlying processes—from market players to regulators and supervisors would repair the information asymmetry that exists among regulators and market players.⁹¹ Certainly, the limited purpose of that revealing exercise would then be balanced with the sufficient protection of trade secrets and other intellectual property rights in a competitive market. Explanations and revelations of internal design and operational details would be only provided to the competent authorities. Hence, no “black-box-excuses”⁹² in the face of the exercise of supervisory and regulatory powers by competent authorities would be admissible, without compromising the competitive value of proprietary algorithms and big data.

In addition to explainability requirements, a duty to monitor is taking shape as an effective tool to counter the unpredictability innate to AI-driven systems fed by data and fuelled by machine-learning and deep-learning techniques.⁹³ From a regulatory and supervisory perspective, the operator would need to carry out a duty to monitor in an adequate manner—in conformity with regulatory standards—by implementing technical, operational, and institutional measures and processes aimed to trace the functioning of their highly autonomous systems, detect deviations, and correct errors. Insofar as such monitoring mechanisms become increasingly automated, regulations will again be oriented

the supervision and regulation of financial services 32 (2018), available at https://www.bafin.de/SharedDocs/Downloads/EN/dl_bdai_studie_en.html?nn=986614.

89. *Id.* at 25, 36, 172.

90. *Id.* at 81.

91. *Id.*

92. *Id.* at 172.

93. *Commission Staff Working Document, Liability for Emerging Digital Technologies, Accompanying the document, Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, Artificial Intelligence for Europe*, at 22, COM (2018) 237 final (Apr. 25, 2018), <https://ec.europa.eu/digital-single-market/en/news/european-commission-staff-working-document-liability-emerging-digital-technologies> [<https://perma.cc/CJ6D-HSAK>].

towards the setting of design and operation standards for that duty-to-monitor system.

D. THE STANDARD-BASED REGULATORY STRATEGY

Legacy financial institutions, financial market infrastructures, and financial services are defined on the basis of core functions, meanwhile, regulatory requirements are interpreted as performance standards. Neither technology-specific rules nor business-model-specific regulations are advisable regulatory strategies.⁹⁴ Both regulatory approaches jeopardize⁹⁵ technological progress and innovation, distort the market, interfere with competition, and can provoke unfair competitive advantages among entrants and incumbents and/or fintech and non-fintech business models with unjustified differentiated treatment. Therefore, a standard-based regulatory response should be preferred. Under this strategy, new models, actors, products and services, or activities will be legally categorized in accordance with the ability to perform certain core functions. Such a functional profile will allow regulators to categorize them as legacy systems, institutions, and services. However, it is clear that digital financial innovation entails the application of ecosystems of emerging technologies to perform such functions. Hence, the structure, actor, or activity differ from the traditional methods by which incumbents delivered financial services. The use of different architectures (financial market infrastructures) for trading and clearing is illustrative: financial intermediaries, centralized platforms that operate multilateral environments, and decentralized schemes based on DLT to create multilateral environments. Therefore, as models differ, regulatory requirements might be applied differently. If standards are set, diverse models to deliver the same core functions can compete under equal requirements and levels of risks.

Legal standards should be formulated with the aim of encapsulating principles and legal requirements, but at the same time, providing further specific guidance to enable parties to become compliant. Thus, parties

94. Philip Treleaven, *Financial Regulation of FinTech*, 3 J. FIN. PERSPECTIVES: FINTECH, Winter 2015, at 115, 118 (stating that regulation can raise barriers to innovation by discouraging financial institutions and fintech company from adopting or promoting innovative business models).

95. Chris Brummer & Daniel Gorfine, *Building a 21st-Century Regulator's Toolkit*, FINTECH, CENTER FOR FINANCIAL MARKETS, MILKEN INST. 1, 7 (2014) (comparing rule-based and principle-based regulatory regimes).

exercise their autonomy within the contours traced by such guidelines. Legal standards are well-equipped to resist the buffeting of technological advances, as they manage to create predictable models for parties to act accordingly. Legal standards can be formulated as substantive, procedural, or performance—i.e., design standards for algorithm-based systems, substantive standards for legal recognition and enforcement of smart contracts, procedural standards to ensure fairness of self-executed remedies, and performance standards for DLT models.

Setting legal standards based on regulatory requirements complements regulations with auditing duties and certification, which incentivize players to comply with and send signals of reliability, compliance and trust to the market.

E. INTERNALIZING CHANGE IN REGULATORY AND SUPERVISORY PRACTICES

An effective response to digital financial innovation must emulate its innate dynamism. Regulatory and supervisory practices and methods must be conceived, developed, and performed to accommodate continual change. Otherwise, regulatory and supervisory actions will never keep up with digital financial innovation. The development of regulatory and supervisory sandboxes and other test environments reveals a wise understanding of the imperative need to insert change in the core of regulation and supervision.⁹⁶

F. THE STAGGERED STRATEGY

A staggered solution could be implemented to set a reasonable balance between regulatory and supervisory goals and the promotion of innovative business models. In current regulatory models, authorization

96. See U.S. DEPARTMENT OF THE TREASURY, A FINANCIAL SYSTEM THAT CREATES ECONOMIC OPPORTUNITIES: NONBANK FINANCIALS, FINTECH, AND INNOVATION 167–77 (2018), <https://home.treasury.gov/sites/default/files/2018-07/A-Financial-System-that-Creates-Economic-Opportunities---Nonbank-Financi....pdf> [https://perma.cc/SV2Q-WJ98] (report to President Donald J. Trump, on core principles for regulating the United States financial system, giving specific principles guiding “regulatory sandbox” solutions are formulated and to coordinate and expedite “regulatory relief under applicable laws and regulations to permit meaningful experimentation for innovative products, services, and processes”).

models to access the markets are categorized in several legal models.⁹⁷ Hence, authorization comprises a number of financial activities. Fintech entrants tend to utilise underexploited veins in financial markets, niches, or activity gaps. Consequently, these emerging models frequently are exclusively engaged in providing very specific services that complement, contribute, or facilitate the provision of traditional financial activities. If that is the factual scene, a staggered approach could be feasible, by splitting authorization into specific-activity licenses, subject to lightened requirements and supervision thresholds.

CONCLUSION

This Article's starting proposition is that digital financial innovation embodies the challenges posed to financial regulation by the second generation of digital technologies. Unlike the first generation, the second generation proves to be disruptive, multidimensional, and capable of exponential growth. The convergence of those three factors signals that current digital technology represents a point of inflexion in the adaption process of financial regulation and supervision. That point of inflection symbolizes a "point of disruption" that requires a more thorough and courageous reconsideration of regulatory strategies, supervisory methods and practices, concepts, principles, and rules. Such complexity and intensity in scope and pace require the elaboration of an adequately designed analytical framework. The "continuity" approach adopted to incorporate the first generation of digital technologies might fail now to apprehend, understand, and provide solutions for the technological disruption sparked by the second generation of emerging technologies.

Thus, the "layers of digital financial innovation" theory has been formulated in an attempt to understand the true impact of this disruption on financial regulation and to dissect its implications. In accordance with this original theory, this Article explains how challenges are located on

97. For example, in the European Union, the *Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU* (MIFID 2), <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0065> [<https://perma.cc/QB4W-2MRF>], defines different legal models for the provision of financial services and establishes authorisation and operating conditions for each model: investment firms, regulated market operator, and credit institutions, among others.

three layers of financial markets: structures and architectures; market players; and products, services and activities.

The observation of each layer reveals diverse consequences of the fintech impact and announces different challenges. The “layers of digital financial innovation” theory aspires to serve as a theoretical and analytical framework to understand prospective technological advances and to ensure that regulation is well-equipped to face future challenges.

After observing the implications of digital innovation in the three layers of the financial markets, six strategies are proposed to guide the regulatory response to fintech and reinvigorate regulatory strategies to effectively address challenges posed by technological disruption. The adequacy of these strategies is tested by a basic three-variable formula that models the interaction among three variables—a modernised version of the functional equivalence paradigm, a revisited conception of technological neutrality, and a balanced assessment of risks—to assess the soundness and test the resistance of the current system and guide a future-proof legal response to digital dynamic.