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Governing the Digital Finance Value-Chain in the EU: MIFID II, the Digital Package, and the Large Gaps between!

Abstract: The emergence of the complete digitization of the financial services value chain has gathered pace due to the advent of the Covid-19 pandemic. It is mainly premised on automation of the investment process through the use of algorithmic tools and remote delivery of services via integrated platforms and apps. During the same period, we have witnessed the emergence of decentralised finance, cryptocurrencies aside, and the increased use of blockchain technology. Together these developments promise radical changes in market structure and microstructure. The digitization of the finance value chain could cause respectively more market concentration or conversely radical democratisation of investment markets. For this reason, the choices of policy-makers will be of cardinal importance. At the same time, digitisation is the best opportunity so far to create a fully integrated EU market for new listings and secondary trading in securities, and to further SME access to finance, thus making reality the vision of an EU Capital Markets Union. While these developments raise critical challenges for EU policy-makers in the post-Brexit era, the regulatory landscape in the EU is still dominated by the older MIFID II approach to market regulation. Reform attempts seem over-cautious and unwilling to unleash the powerful forces of technology and innovation to avoid upsetting settled industry practices (and incumbent oligopolies). EU Regulation has to become more proactive fostering regulatory experimentation in tandem with technological one to make sure that consumers interests are safeguarded, competition is furthered, and essential finance infrastructure is not dominated by a tight rent-seeking oligopoly. Therefore, the EU Digital Finance package in its present form is a welcome yet timid step forward. A number of further reforms are required to accelerate the pace of regulatory adaptation to the challenges and opportunities of the new digital era for European markets strengthening post-Covid 19 economic recovery.

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1 Introduction

For some time now the value chain[1] in financial services is being disrupted and reconfigured due to outside developments such as restrictive regulation, the evolution of information communications technology (ICT) and financial innovation in the form of development of new products.[2] Moreover, ICT and tolerant regulators have allowed financial services firms to disaggregate the financial services value chain into front, middle, and back offices. Back-office functions ranging from client on-boarding to transaction processing/verification and storage of cli-

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1 Value chain analysis is a business management concept which was first coined by Michael Porter in his famous 1985 book *Competitive Advantage*. It is a process view of business organisations and is used to explain the organizations as a system comprising different sub-systems each with inputs, transformation processes, and outputs involved in the acquisition and consumption of resources (money, labour, raw or processed materials, stock of capital assets such as land and building) business management and administration. Value chain theory has had a profound influence on the management of the modern corporation, since it explains how the different types of relationships or 'linkages' within or outside a firm can be managed, leveraged, or commodified to create value to make a firm more competitive/profitable than its peers. See *Michael E. Porter*, Competitive Advantage: Creating and Sustaining Superior Performance, 1985.
2 PWC, Financial Services Technology 2020 and Beyond: Embracing disruption https://www.pwc.com/gx/en/financial-services/assets/pdf/technology2020-and-beyond.pdf (last accessed 29 January 2021).

ent data are often outsourced on the basis of contract to maximise savings through the use of highly specialised firms that offer infrastructure services.

This was more or less the model of internal business and industry-wide organisation in the global financial services sector for the past 30 years. But with the widespread use of technologies supporting automation such as Artificial Intelligence (AI) and Machine Learning, the infinite expansion of cloud storage, and the emerging popularity of Distributed Ledger technology (DLT), the finance value chain is now increasingly and irreversibly disrupted. Furthermore, the period post-covid 19 is the first that product development, market infrastructure, service supply and trade execution is moving towards a complete digital value chain.

There are five areas where financial technology has already had or is bound to have an appreciable impact: retail banking infrastructure, payments, capital markets infrastructure, investment advice and asset management. As regards retail banking and payments, both outside the scope of this article, transformation has come through the advent of open banking (data sharing to facilitate banking transactions)[3] and in payments where, cryptocurrencies aside, we see a plethora of new instruments under development. Similarly, the field of investment advice and, to some extent, asset management have undergone radical transformation mostly via the development of algorithmic devices that can ascertain customer's investment preferences including risk tolerance and return goals and accordingly recommend specific investment or generalized asset allocation strategies.

It is, thus, not surprising that the transformation of the marketplace and of the finance value chain is manifested today through two radically opposing models of financial services infrastructure integration. The first, is represented by the increasing domination of the financial services infrastructure by very large institutions like the American investment Black Rock that operates the infrastructure service Aladdin[4] and the Chinese powerhouse Ant Financial[5]. Furthermore, the

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3 Directive (EU) 2015/2366/EU on payment services in the internal market (PSD II). Open banking refers to a banking system where third-party financial service providers are given secure access to financial data through APIs. This enables the networking of accounts and data between banks and non-bank financial institutions. Essentially, it allows new types of products and services within the traditional financial system. DeFi, however, proposes a new financial system that is independent of the current infrastructure. DeFi is sometimes also referred to as open finance.
4 See https://www.blackrock.com/aladdin
5 Ant Financial is an affiliate of Alibaba Group and before the recent pulling off of its floatation it was widely lauded as the world's biggest IPO. As early as 2018 Ant exceed in terms of valuation that of Goldman Sachs by 50 % ($150 billion, compared to Goldman Sachs' $99 billion). The key to Ant's growth lies in its platform business model which starts with payments, the Alipay service, and ends with offerings of money market funds. Ryan McMorrow, Nian Liu and Sherry

widely expected entry into the market for wholesale and retail financial services of Google, Facebook and other big technology companies, so-called Big Tech, will lead to further centralization of financial markets infrastructure due to network effect,[6] since the new technology sector shows a tendency to foster the domination of the market by a very small number of large firms.[7]

The second is represented by the strong emergence of DeFi even if for now it is operating in the alternative finance space and is mostly fueled by peer-to-peer lending or financial contracting that uses cryptocurrencies as collateral.[8] Besides, trade finance and other business and commercial banking activities (e.g., payments processing) are increasingly moving to a decentralised model that is, in fact, championed by big financial institutions.[9] The weak profitability of fintech start-ups may act as an accelerator for the adoption of the DeFI model. For example, it is only a matter of time for fintech firms that operate on very thin margins and are threatened with extinction once they have burn their seed cash to forge cooperate and compete relationships marketing and selling their products on decentralized platforms.[10] Moreover, the emergence of Decentralised Finance (DeFi) employing blockchain protocols is the first step towards a market infrastructure leap that will merge financial contract trading and trade settlement and possibly at a later stage investment advice and order execution which are today independent market functions/services.

Each of these developments in the financial services digital value chain presents a distinct challenge for financial regulation. The centerpiece of European

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Fei Ju, "The Transformation of Ant Financial", FT.com, 26 August 2020, https://www.ft.com/content/c636a22e-dd3f-403e-a72d-c3ffb375459c (last accessed 30 January 2021). For more detailed analysis of the Ant Financial business model see section II.

6 The FT reports on Biden Administration's new SEC chairman: "That background will make him even more useful as a regulator at a time when the largest tech platform companies – from Google and Facebook to Amazon and Apple – are moving into the financial industry." Rana Foroohar, "Wall Street's Sheriff is on a Mission", FT.com 17 Jan. 2021, https://www.ft.com/content/7884afc4-6e8c-4b2f-910e-adff489f12b6 (last accessed 29 January 2021).

7 See *Eleanor Fox/Harry First*, "We Need Rules to Rein in Big Tech", NYU Law and Economics Research Paper No. 20–46 2020, 2–3.

8 Consensys, "Q3 Ethereum DeFi Report", available at https://consensys.net/insights/q3-defi-report/ (last accessed 29 January 2021).

9 M. Huillet, "HSBC: Blockchain Platform Will Keep Trade Finance Smooth Despite Coronavirus", 5 March 2020, CoinTelegraph.com, https://cointelegraph.com/news/was-2020-a-defi-year-and-what-is-expected-from-the-sector-in-2021-experts-answer (last accessed 29 January 2021).

10 See *Emilos Avgouleas/Aggelos Kiayias*, "The Architecture of Decentralized Finance Platforms: A New Open Finance Paradigm", Edinburgh School of Law Research Paper No. 2020/16, 2020.

legislation dealing with financial markets is the so-called MiFID II regime.[11] MiFID II, which replaced the original MiFID regime adopted in 2004 came into effect in the aftermath of the financial crisis.[12] MiFID II seeks to enhance investor protection and promote efficiency and transparency in financial markets. MiFID II focuses on both the micro-and-macro level.[13] On the micro-level, MiFID II at aims to reduce transaction costs reducing transaction costs and promote the liquidity of markets. On the macro-level, it seeks to tackle systemic risk and allow regulators to better monitor and supervise financial markets. But it is a complex piece of legislation that is not fit for the new digital era. Moreover, automation is already expanding into compliance with the regulatory framework through a number of applications, so-called RegTech,[14] that can be used from monitoring and tracing of illicit money flows to detection of "fake" information.

As the way value chain activities are carried out (e.g., manually or automated) determines costs and impacts on profits, the different paths of digitization of the finance value chain have profound implications both for market structure, namely the number of players competing in the market and their market share and market microstructure. The latter refers to market mechanics, including the process and outcomes of exchanging assets under explicit trading rules.[15]

A good example of the size of the challenge is presented by BlackRock/Aladdin type of infrastructure providers. While each of the services they supply is probably distinctly regulated and subject to different contractual arrangements between the supplier and the user firms, it is hard to understand in terms of internal systems' set up and configuration where the unbundling starts or ends. They are, in practice, one stop-shop platforms cosmetically divided in terms of internal systems configuration and business organisation in different segments in order to appear compliant with financial services regulation. An even bigger issue is what happens to all the data that goes through the system. Even with the highest data filters and controls in place the fact remains that colossal

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11 The MiFID II regime comprises of Directive 2014/65/EU on Markets in Financial Instruments (MiFID II) and the Regulation (EU) No 600/2014 on Markets in Financial Instruments.

12 See generally, *Danny Busch/Guido Ferrarini* (ed.), Regulation of the EU Financial Markets: MIFID II and MIFIR, 2017.

13 *Guido Ferrarini/Paolo Saguato*, "Reforming Securities and Derivatives Trading in the EU: from EMIR to MIFIR", Journal of Corporate Law Studies 2013, 324–325.

14 *Eva Micheler/Anna Whaley*, "Regulatory Technology: Replacing Law with Computer Code", European Business Organization Law Review 2020, 349.

15 Thus, market microstructure studies, a branch of finance theory, concentrate on "how specific trading mechanisms [such as the order book, continuous auctions, the dealer market impact on market conditions, e.g., liquidity and] affect the price formation process." *Maureen O'Hara*, Market Microstructure Theory, 1995.

amounts of financial data are daily concentrated into the privately operated systems of one infrastructure provider.

None of this is a new problem. Broker-dealers faced in the past the issue of controls of information flows between human agents and management of conflicts of interest within the same business, first, with regards to client advice and portfolio management and the impact on it of own corporate finance advisory function and related transactions, and, secondly, with regards to interactions between client order execution and management of the proprietary order book. These concerns informed the prohibition of front-running in the first EU Market Abuse Directive, now expanded in its successor regime introduced by the Market Abuse Regulation (MAR).[16] The same applies to the expansion of the Conduct of Business (COB) and conflict of interests regime of MiFID I.[17] The few general principles contained in Investment Services Directive (ISD)[18] for the purpose of regulating investment conduct[19] were replaced with a detailed rulebook, which was further expanded in MiFID II and extended to include rules on product governance[20] to broaden customer protection. But today as data circulation processing is automated it can prove futile to just suggest ever more detailed and complex regulation when technology itself might, in fact, provide the desirable checks, controls, and remedies.

DeFi platforms also present challenges for the existing regulatory framework. It is hard to see how the different functions of such platforms can be disaggregated to be regulated as distinct investment services. For example, mining a new token via the platform, storing it in an individual digital wallet and using the wallet to trade on the platform, entrusting platform apps with asset alloca-

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16 Regulation (EU) No 596/2014 on market abuse (market abuse regulation) OJ L 173/2014, 1–61, Art. 7(1). Articles 21 to 30 MiFID II as well as Article 24 MiFIR also apply to front running behaviour. They include the obligation for investment firms to act honestly, fairly and professionally and in a manner that promotes the integrity of the market (Article 24 of MiFIR), to act in accordance with the best interests of their clients (Article 24 MiFID II), to execute orders on terms most favourable to the clients (Article 27 MiFID II the client order handling rules (Article 28 MiFID II) and the obligation to identify and prevent or manage conflicts of interest (Article 23 MiFID II).
17 Directive 2004/39/EC on markets in financial instruments (MiFID I), Ch. II (Operating Conditions for Investment Firms).
18 Directive 93/22/EEC on investment services in the securities field OJ L 141/1993, 27–46, Art. 11.
19 The high-level approach was leaving very serious gaps for rule conflict in the internal market and led to an increase rather than decrease in transaction costs. See *Emilios Avgouleas*, "The Harmonisation of Rules of Conduct in EU Financial Markets: Economic Analysis, Subsidiarity and Investor Protection" 6 European Law Journal 72–92 (2000).
20 Articles 16(3) and 24(2) MiFID II.

tion advice and carrying execution function can create a real conundrum for the regulatory framework given also the fact that all the above activities might take place real time in an automated mode. How to unbundle a token that incorporates the service and the investment at the same time? Is the platform collectively a provider of financial services? Is a counterparty that is active in the in the platform on a regular basis a professional (albeit unregulated) investor? Or if the trade is continuous, is the counterparty a provider of an (unregulated) investment service in the same way that broker-dealers might act as MiFID II regulated systematic internalisers?[21]

Of course, most of today's DeFi activity is outside the regulatory perimeter (see Section II below), but this is a situation that is no longer tenable. Thus, the EU commission has recently proposed a digital finance package that aims to foster Europe's competitiveness and innovation in the financial sector.[22] The package includes a Digital Finance strategy, a Retail Payments Strategy, legislative proposals on crypto-assets and digital operational resilience and a pilot regime for market infrastructures powered by distributed ledger technology.[23] But the Digital Package that is still under consideration is only the beginning. EU financial services regulation will soon require a wholesale overhaul in order to keep pace with the digital transformation of the financial value chain both within the EU and globally.

This article will provide a critical evaluation of the EU financial services regime focusing on MiFID II and the EU Commission's Digital Finance Package. It highlights the gaps that have emerged in the oversight and regulation of the digital value chain in financial services. It will also explain the opportunities DeFi presents for achieving the key goals of the Capital Markets Union blueprint[24] such as EU retail market integration, SMEs access to finance, and democratization of investment markets, provided that key parts of DeFi are brought under the regulatory umbrella. For that to happen EU financial regulation must strike the right balance between the idiosyncrasies of DeFi and a rigid financial services

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21 Article 4(1)(20) of MiFID II.

22 European Commission Press Release, Digital Finance Package: Commission sets out new, ambitious approach to encourage responsible innovation to benefit consumers and businesses, Brussels 24 September 2020.

23 Proposal for a Regulation on a pilot regime for market infrastructures based on distributed ledger technology. Distributed ledger Technology (DLT) is a secure database or ledger that is replicated across multiple sites, countries, or institutions with no centralized controller. The shared ledger keeps track of asset ownership and any recent iterations, automating asset transfers and storage on the chain and attendant records.

24 For the revamped blueprint of September 2020 see EU Commission Communication, A Capital Markets Union for people and businesses – new action plan COM/2020/590 final.

regime which, in its pursuit of a high level of investor protection, has also enabled incumbent operators to reap substantial rents through oligopolistic structures which have been solidified by regulation. And in this respect the proposed Digital Finance package is open to criticism. It ignores important aspects of the DeFi business model such as automated trading and execution through smart contracts that eliminates the need for intermediaries in the custodial chain. Then, it shows a total unwillingness to consider regulatory models that could integrate the most challenging aspects of DeFi such as permissionless access to trading and anonymous transacting (see Section II.2).

The article is organized in four sections with the present introduction. Section II offers an analytical view of the change digitization brings to the financial services value chain and the opportunities and risks that it poses. In this context it discusses in depth the platform-based business model in financial services and how this has created two entirely opposite trends, on the one hand, centralization / clusterisation of market/business functions and customer and data networks and, on the other, the largely unregulated model of decentralization. Section III explains the how these changes challenge MiFID II as the centerpiece of EU financial services legislation. It also considers the impact of the EU Commission proposals for a digital finance package. Section IV offers a few directions for reform including the widening of the EU pilot regime and brings the different stands of the present discussion to a comprehensive conclusion.

2 The Digitization of the Financial Services Value-Chain: Opportunities and Risks

When analyzing the effectiveness of a value chain model, Michael Porter introduced 10 cost drivers that help identify areas for improvement.[25] According to Porter risk management, research and development, human resources and

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[25] These are: (1) *Economies of Scale* identified via cost analysis for the size of the demand, (2) *Learning,* which refers to activities that change the environment for efficiency or improvement, (3) *Capacity Utilization*, which refers to procedures that keep capacity at efficient levels to prevent under-utilization or the addition of unnecessary capacity, (4) *Linkages among Activities*, which involves identification of areas of cross-functional improvement through coordination and optimization, (5) *Interrelationships among Business Units*, which refers to opportunities to share information and resources, (6) *Degree of Vertical Integration*, (7) *Timing of Market Entry* which may be riven by economic or world conditions and competitive position in the marketplace, (8) *Firm Policy of Cost or Differentiation*, (9) *Geographic Location*, and (10) *Institutional Factors* such as taxes, unions, and regulations. *Porter* (fn. 1), Ch. 1.

firm infrastructure are among the key components of a firm's value chain. This is entirely true in the case of financial services providers and all these areas are disrupted or transformed by the advent of the complete digitization of the financial value chain. However, the form a business is organised itself to extract the highest efficiencies from its value chain to fulfil its business objectives is equally very important. The paragraphs below examine the two opposing forms of the platform model that in itself drives the digitization of the finance value chain, namely the centralised and the decentralised platform model. Arguably, each form of platform organisation can have profound implications for the MiFID II regulatory paradigm.

2.1 The Centralised Platform Model and Network Effects

The platform-based model is used to mean a business model[26] that creates and harnesses value by facilitating exchanges between two or more interdependent groups which lead the creation of large and scalable networks of users and resources that can be accessed on demand.[27] For instance, businesses like Facebook, Uber, or Alibaba claim that exchange facilitation and user matching – ownership of the means of connection – is their only business and they don't directly create and control inventory via a supply chain the way linear businesses do, namely, they do not own the means of production. Arguably, these businesses are today much more than that as they are the monopolistic providers of the new products they have created, with the market for Internet search listings and market advertising[28] being the principal example. Therefore, the platform-based business model in finance should be understood as an integrated model of busi-

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26 Inter alia, *Karl Taeuscher/Sven M. Laudien*, "Understanding platform business models: A mixed methods study of marketplaces", European Management Journal 2018, 319–329.

27 In simpler terms it means a digital locus or a fixed digital meeting point, which users access to interact, share interests, and multiply their networks substituting in the process older markets or creating new ones whose success, in turn, depends on the length and density of the network (network economies of scale).

28 The United States Justice Department filed a lawsuit against Google on 20 October2020 accusing the company of abusing its position to maintain an illegal monopoly over search and search advertising. In specific, Google has been accused of locking up deals with giant partners like Apple to fend off competition through exclusive business contracts and agreements to make its search engine the default option for users. Such agreements accounted for most of its dominant market share in Internet search (a figure that the US Justice Department put at over 60 percent. See Complaint, U.S. Department of Justice v Goggle LLC, https://www.justice.gov/opa/press-release/file/1328941/download (last accessed on 31/01/2021).

ness organization and management of customers that repackages and commoditizes for commercial purpose both platform generated user activity and relationships and data generated in this process.

It would be anachronistic for today's policymakers to adhere to older understandings of platform based business models and not recognize two undisputable market realities. The first relates to the domination of relevant distribution channels/networks by specific platforms as is, for example, the case with Ant Financial. Ant operates a platform business model that combines the very popular service Alipay[29] with lending, insurance and investing with its linear micro-lending and micro-investing. Ant's hybrid approach has created a financial services ecosystem of unparalleled breadth. Ant claims that through Ant Fortune which offers a platform to China's 116 mutual fund managers and reaches 180 million users it has democratized asset management and retirement planning. In reality, the platform's algorithm recommends funds based on each user's financial profile and goals, thereby closing financial literacy gaps that in the past may have prevented many users from investing. Also, given its very large pool of users, financial service providers can't resist joining its network. In addition, Ant has leveraged the network to introduce new financial (and proprietary) products, like the very popular money market fund Yue Bao. [30] An account with Yue Bao can be opened for as little as 1 yuan ($0.15).[31]

The second relates to the ability of applications connected to the platform to harness through data searching tools vast amounts of information about user so-

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29 Similar to Paypal, Alipay processes payments between any two users, whether they're shoppers and small businesses, roommates, or street performers and commuters. Alipay has over 700M active users and completed over $8 trillion in transactions in 2017 – that's equivalent to 65% of China's GDP. Tero Ojanpera, "5 Steps- How Ant Financial Built a 200 billion platform business", 19 August 2020, https://intelligentplatforms.ai/5-steps-how-ant-financial-built-a-200-billion-platform-business/ (last accessed on 31/01/2021).

30 Emilie Valentova, "Yu'E Bao turned 185M e-commerce customers into financial investors", Harvard Business School Blog, 19 October 2015, https://digital.hbs.edu/platform-digit/submission/yue-bao-turned-185m-e-commerce-customers-into-financial-investors/ (last accessed on 31/01/2021).

31 It should be noted that in a supreme example of the risks that lie ahead if the centralised platform model is allowed to dominate the market for digital financial services Yue Bao was able to use Alipay data to identify users who left a positive balance in their Alipay digital wallet. Any users with a balance would be contacted, educated on the benefits on a money market fund, and invited to open an account. In a market starved for consumer financial products, Ant's investment platforms were an instant hit. Ant Group, "How Alipay changed the way China invests and helped a fund grow 400+ times over", 2 April 2019, https://medium.com/alipay-and-the-world/how-alipay-changed-the-way-china-invests-and-helped-a-fund-grow-400-times-over-9c13f77af4b6 (last accessed on 31/01/2021).

cial interests and socio-economic preferences, spending habits and spending power, political leniencies, conjectured disposable income, and so on. Thus, it is hard to believe that the Big Tech firms like Google and Facebook plan to enter the market for financial services markets without intending to exploit the aforementioned data tools, which alongside the existing user network would offer them a distinct advantage over other financial services providers. On the contrary, it is quite common to attribute the domination of Big Tech over their markets due to the size of the network and misuse of client data. [32] Accordingly, regulators will have a Herculean task in their hands to prevent Big Tech dominating the financial services infrastructure.

At the same time, the risks of manipulating users' understanding and preferences is ever present, especially in retail markets. Similar to all other markets the power of framing in dictating consumer choices in financial services remains undiminished. The same applies to other cognitive limitations of individual investors and lay financial services users due to bounded rationality and other cognitive biases.[33] Deep learning neural networks[34] steeped in a wealth of informa-

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32 The network effects of Big Tech platforms are so great (everyone wants their friends on the same platform, suppliers want their buyers on the same platform, etc.) "that barriers to entry are very high, and even the most promising prospective entrants have trouble finding the critical mass of users necessary to enter. There are periods of competition for the market; thereafter the market may tip to one dominant firm. A critical element of this new platform economy is data. The platforms vacuum up huge amounts of data from users of the platforms, and use the data not only for efficiencies but also for exploitations and exclusions . . . The platforms take much more data than they need to service the platform's users. Often, they take data without asking . . . The platforms take and combine." *Fox/First* (fn. 9) 2–3.

33 See for analysis Emilios Avgouleas, "Cognitive Biases and Investor Protection Regulation an Evolutionary Approach", Working Paper 2016, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1133214 (last accessed 29 January 2021).

34 Deep Learning Neural Networks (DLNN) are a subset of AI science and are the backbone of learning algorithms. In specific, the Artificial Neural Networks (ANNs) are the basis for deep learning. ANNs mimic the human brain through a set of algorithms which at a basic level comprise four main components: inputs, weights, a bias or threshold, and an output. Due to the fact that they are programmed to act on a continuum they do not, however, possess important capabilities of human brain such as the power to pause and reflect between a number of possible options. At the same time, DLNNs are used to allow information systems to train themselves to process and learn from data, namely, unlike older generation ANNs, DLN systems are self-teaching, learning as they go by filtering information through multiple hidden layers, in a similar way to a human agent. Thus, they are very effective in identifying hidden synapses and meanings due to their ability to use atypical logic that does not search for causal outcomes. For full analysis see *Charu C. Aggarwal*, Neural Networks and Deep Learning – A Textbook, 2018, p. 4–20.

tion about users can easily detect what makes consumers "tick". Subsequently consumer choice can be manipulated through the use of the right algorithms.[35]

The automation of retail investment management (asset allocation) via so-called robo-advisors presents the biggest risk in this context. It is often said that the rise of robo-advisors relates to the fact that these systems bring the benefits of expert investing to the retail markets at very affordable rates.[36] While this assertion is very accurate three other developments that have made possible the rise of robo-advisors should not be overlooked. The first relates to the robot's ability to perceive, understand, plan and navigate in the real world. Better cognitive ability means robots can work autonomously in diverse, dynamic and complex environments.

Relating to the first breakthrough is also the increased ability of robots to exercise precise control and dexterity in understanding the environment and manipulating objects. Technological improvements in this area allow robots to discharge tasks of greater diversity of tasks and be employed in a greater number of use cases. Finally, via natural language processing programmes robots' ability to learn from and collaborate with humans is greatly enhanced and even goes beyond verbal communications. Namely, the enhanced ability of robots to engage in verbal and non-verbal communication makes robots increasingly capable of working alongside human agents.

In the future, it will be very difficult to detect if the machine learning algorithm that powers the robo-advisor has not identified areas where human choice can be "legally" manipulated, by, for instance, restricting the number of recommended investments. Unless operating in a decentralized environment where this data could be stored in a cryptographic hash and be easily traced afterwards, *the ex post* use of explainability[37] techniques may not suffice to detect ir-

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35 Natural language processing (NLP) is a branch of AI that helps computers understand, interpret and manipulate human language. NLP draws from many disciplines, including computer science and computational linguistics, in its pursuit to fill the gap between human communication and computer understanding. See Dr. Dataman, "Looking into Natural Language Processing (NLP)", 1 Nov. 2018, https://towardsdatascience.com/natural-language-processing-nlp-for-elec tronic-health-record-ehr-part-i-4cb1d4c2f24b (last accessed 29 January 2021).
36 *Benjamin P. Edwards*, "The Rise of Automated Investment Advice: Can Robo-Advisors Rescue the Retail Market?", Chicago-Kent Law Review 97 (2018), 106–108.
37 The OECD AI principles provide that AI actors must provide meaningful information, appropriate to the context, and consistent with the state of art: to foster a general understanding of AI systems . . . to enable those affected by an AI system to understand the outcome, and, to enable those adversely affected by an AI system to challenge its outcome based on plain and easy-to-understand information on the factors, and the logic that served as the basis for the prediction, recommendation or decision. OECD, "Recommendation of the Council on Artificial Intelligence"

regular and ad hoc instances of manipulation of user decisions via restricted choice as opposed to systematic algorithmic bias.[38] Auditing the entire robo-output at all times for sporadic bias is a task that goes beyond the capabilities of even advanced techniques used to interpret black-box behaviour.

2.2 Decentralised Finance: Can It Unbundle the Network Effect?

DeFi refers to an ecosystem of financial applications that are built on top of blockchain networks. As this is a generic definition, the term will be used in this article to specifically mean the movement that aims to create an open-source and transparent financial service ecosystem that operates without any central authority. DeFi platforms may be permission-based or permissionless with the latter being much more popular than the former. The users maintain full control over their assets and interact with this ecosystem through peer-to-peer (P2P), decentralized applications (Dapps). DeFi applications do not need any intermediaries or arbitrators. The code specifies the resolution of disputes that can be predicted in advance. Essentially, the Code is law among users and thus in the context of blockchain platforms it has been given the name *Lex Cryptographia*.[39]

2019, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449 (last accessed 29 January 2021). Also, G20 Ministerial Statement on Trade and Digital Economy, https://g20trade-digital.go.jp/dl/Ministerial_Statement_on_Trade_and_Digital_Economy.pdf (last accessed 29 January 2021). A similar principle has been proposed by the EU High Level Group on AI. "AI systems and their decisions should be explained in a manner adapted to the stakeholder concerned. Humans need to be aware that they are interacting with an AI system, and must be informed of the system's capabilities and limitations". See EU high Level Group on AI, "Ethics Guidelines for Trustworthy AI" 2019, https://ec.europa.eu/digital-single- market/en/news/ethics-guidelines-trustworthy-ai (last accessed 29 January 2021).

38 There are broadly speaking two different groups of explainable AI techniques in development: AI methods that are inherently interpretable, "meaning the complexity or design of the system is restricted in order to allow a human user to understand how it works" and methods that deal with the more complex and challenging issue of how the 'black box' system works. The latter may involve a re-run of the initial model with some inputs changed to provide information about the importance of different input features. See Royal Society, "Explainable AI", Policy Briefing, November 2019, p. 11, https://royalsociety.org/-/media/policy/projects/explainable-ai/AI-and-interpretability-policy-briefing.pdf (last accessed 29 January 2021).

39 See generally *Primavera De Filippi/Aron Wright*, Blockchain and the Law – The Rule of Code, 2018 and *Georgios Dimitropoulos*, "The Law of Blockchain", Washington Law Review 111 (2020).

Whereas the mainstream financial system runs on centralized infrastructures managed by regulated, in the main, institutions, and intermediaries, decentralized finance is powered by code, runs on the decentralized infrastructure of the Ethereum blockchain or other blockchain models, where users are free to deploy immutable smart contracts. In addition, as the modular framework on which DeFi is built upon interoperable DeFi applications on public blockchains, users are able to design and operate entirely new financial markets, products, and services.[40] The configuration of DeFi inevitably leads to paradigm shifts in financial infrastructure and in the investment value chain. Simply put DeFi distributes risk, trust, and opportunity in an entirely different way, given the nearly total absence of intermediaries. But this does not mean elimination of all risk. On the contrary, in some cases risk becomes greater and risk distribution less predictable than in mainstream finance markets.

Since the eruption of the Covid-19 pandemic DeFi has experienced explosive growth that was more due to the fact that a new speculation avenue has opened up and less to the explosion of the price of key cryptocurrencies such as bitcoin and Ethereum.[41] Nonetheless, this explosion of speculative activity is also leading to a constant upgrade of the DeFi infrastructure.[42] It is reasonable to expect that DeFi platforms will soon emerge as a clear alternative to the centralised platform model.

Big financial institutions are already pioneering decentralised trade finance platforms where activity is taking place in a permissioned environment and within the framework of regulated institutions.[43] It is suggested that large financial

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40 Because DeFi financial services and products are deployed on top of blockchains, single points of failure are eliminated. The data is recorded on the blockchain and spread across thousands of nodes, making fraud, censorship, or the potential shutdown of a service a complicated venture.

41 "DeFi's monumental rise in total value locked – starting this summer and surpassing $16 billion this month – has undoubtedly made the sector one of the most discussed topics of 2020". Max Yakubowski, "Was 2020 a 'DeFi year,' and what is expected from the sector in 2021? Experts answer", 23 Dec. 2020, CoinTelegraph.com, https://cointelegraph.com/news/was-2020-a-defi-year-and-what-is-expected-from-the-sector-in-2021-experts-answer (last accessed 29 January 2021).

42 "The DeFi ecosystem has launched an expansive network of integrated protocols and financial instruments. Now with over $13 billion worth of value locked in Ethereum smart contracts, decentralized finance has emerged as the most active sector in the blockchain space, with a wide range of use cases for individuals, developers, and institutions." Consensys (fn. 8).

43 The use of blockchain in trade finance by larger financial institutions, in a permissioned yet decentralised environment, is now an accepted and well tested use case. The first venture was the platform eTradeConnect launched in 2018 in Hong Kong and was backed by HSBC, BNP Paribas, Standard Chartered and nine other banks. This venture has now been replicated by consor-

institutions have an interest in being involved with DeFi in order to assume a leadership role in the forthcoming transformation of the finance business modus operandi and the ways financial services will be accessed and delivered in the future.[44]

Moreover, given the current popularity of DeFi platforms and the natural pull they present for start-up firms who wish to operate in an innovation intensive environment reaching a younger generation of investors who are more receptive to innovative and ethical investment offerings, and their structural advantages,[45] these platforms will inevitably prove an opportunity too great to be missed by struggling start-up fintech firms. These are, in any case, so flexible as to already operate on decentralized business models or adapt one to their needs. Therefore, it is not far into the future that we will see financial infrastructures, whether centralized or decentralized, that will integrate previously distinct investment service functionalities such as automated advice, portfolio management, underwriting, execution, reconciliation and settlement within a single platform.[46]

The move of DeFi into mainstream markets will represent in the view of many the replacement of regulation by (smart) contracting, so-called Lex Cryptographia. Nonetheless, to the extent that existing DeFi models will gradually crop up the mainstream finance space this view is false. In practice, regulation

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tia of other big global financial institutions such as Deutche Bank, Santander, Rabobank etc which have collaborated with the Hyperledger Fabric-powered IBM blockchain to complete live operations. See Huillet, (fn. 11).

44 "Legacy behemoths such as JP Morgan and Goldman Sachs are notable proponents of DeFi, with a number of banks and financial institutions in financial verticals consortia testing decentralized systems to improve, inter alia, processing times for payments, trade finance, and interbank transfers. For these legacy financial institutions, embracing DeFi is as much as testing the new technologies for streamlining and enhancing their current processes as it is about being part of a potentially transformative movement that recognizes their leadership role and includes them." *Leon Perlman*, "Regulation of the Financial Components of the Crypto-Economy", Columbia School of International and Public Affairs Entrepreneurship and Policy Working Paper Series 2019, p. 21.

45 The structural benefits are, inter alia, low transaction costs, generation of distributed trust, and interoperable, borderless, and transparent business loci, and the broadening of financial inclusion via decentralized financial services which strongly appeal to younger entrepreneurs. Clearly, "[the] new area of financial technology [and] decentralized finance may reshape the structure of modern finance and create a new landscape for entrepreneurship and innovation, showcasing the promises and challenges of decentralized business models." See Yan Chen and Cristiano Bellavitis, "Blockchain Disruption and Decentralized Finance: The Rise of Decentralized Business Models", Journal of Business Venturing Insights 2020.

46 See *Avgouleas/Kiayias* (fn. 10).

of DeFI marketplaces and financial products would be a key factor in product evolution. Investor protection needs to point towards simplified regulatory rule-books that will direct in a top-down approach the modalities of contract trading and transaction execution in the "smart contract's" code. Naturally, the said regulatory approach ought to take into account market practice, technological advantage, and participant preferences. This is a point of particular importance with respect to the way COB rules will develop in decentralised finance networks.

As already mentioned, DeFi is not without its risks and the only reason that its explosive growth has so far gone virtually unnoticed by regulators is the fact it is still only a tiny fraction of the overall volume of transactions conducted by global finance on a daily basis. Permissionless systems create incentives to the underworld to use them to transfer, invest or launder money that are either the proceeds of crime or tax evasion or can be used to finance terrorism. On the other hand, key crypto-operators claim that while permissionless DeFi platforms do not police and monitor identities and individual accounts they still operate effective systems to police the integrity of the market by monitoring activity. namely that they have transitioned from Know Your Customer (KYC) systems to Know Your Transaction (KYT) as a more effective way to detect suspicious transactions.[47] It is, however, a claim that has not been subjected to any outside scrutiny. In any case, given the threats the integrity of the financial system faces from many sources, KYT might have merit as a supplement of existing KYC and Anti-Money Laundering laws but not as a substitute.[48] Therefore, we do not regard mandating compliance of DeFI with KYC and money laundering checks as a significant barrier in any regulatory attempts to reap DeFi's most distinct advantages, summarised below, especially in the context of creating and integrated EU market for retail financial services.

DeFi infrastructures can, first, offer *flexibility and transparency in contract design* as well as a high level of *record security.* These stem from the fact that

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47 "[K]now-your-transaction (KYT) . . . is privacy-preserving by evaluating behaviors of participating addresses rather than the identity of the participants. By providing KYT monitoring designed for blockchain-based assets with the highest quality on-chain data [KYT] provides AML checks to ensure transactions can remain anonymous while complying with regulations." Press release, "ConsenSys Launches Codefi Compliance", 8 June 2020, https://consensys.net/blog/press-release/consensys-launches-codefi-compliance/ (last accessed 31 January 2021).
48 In any case the view expressed here increasingly gains traction among crypto-exchanges as well, e. g., the Dutch Bitstamp traders cryptoexchange. We expect KYC to become the norm if not for accessing DApps and DEFexs at the very least in the context of taking funds out of them. Osato Avan-Nomayo, "Dutch crypto exchange users bemoan additional KYC requirements" 26 January 2021, CoinTelegraph.com

blockchain inherent properties of record immutability facilitate fraud-proof data coordination across the distributed ledger that is operated by decentralised platforms. The easy programmability of Ethereum blockchain allows the design and employment of highly programmable smart contracts with automated execution to create new financial instruments and digital assets.

Unlike earlier blockchain protocols Ethereum's composable software stack ensures that DeFi protocols and applications are built to integrate and complement one another. As a result, DeFi infrastructures enjoy a high level of *interoperability* offering developers and product teams the flexibility they need to build on top of existing protocols, customize interfaces, and integrate third-party applications.[49] In addition, DeFi platforms boost *market and trade transparency*. On the public Ethereum blockchain, every transaction is broadcast to and verified by other users on the network, although Ethereum addresses are encrypted keys that are pseudo-anonymous, which can still preserve trader privacy. Namely, network activity is visible to all users. This level of transparency around transaction data allows for uninhibited data analysis making orders and transactions highly auditable. Finally, substantial gains come from the elimination of the custodial chain, since DeFi platforms allow digital wallets to interact with other DApps and protocols while, market participants always keep custody of their assets and control of their personal data.

2.3 Market Microstructure, DeFI, and EU Financial Market Integration

Revamped permission-based and regulated DeFi platforms could offer distinct market channels for the implementation of EU plans with respect to the creation of liquid pan-European retail capital markets and market integration, widening access of SMEs and start-ups to capital markets finance, and fostering capital market innovation. These goals are some of the pillars of the revamped EU Commission strategy for the attainment of an EU Capital Markets Union, including a single EU brand for primary market listings.[50]

Simply put, EU regulators should closely scrutinize the aforementioned characteristics of DeFi platforms such as their ability to operate an open finance

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49 For this reason DeFi protocols are called "money legos".

50 On the advantages of creating a single EU brand for securities listings see Emilios Avgouleas, Guido Ferrarini, "The Future of ESMA and a Single Listing Authority and Securities Regulator for the CMU: Costs, Benefits and Legal Impediments" In Busch, Avgouleas, Ferrarini (eds), Capital Markets Union in Europe (OUP, 2018), Ch. 4.

system on the basis of distributed trust enabled by cryptographic integration,[51] increased transparency, and amelioration of transactions costs.[52] If the DeFi properties are eventually verified, then market decentralization for, especially, smaller cap issuers should be embraced. In specific, tokenisation[53], which is one of the key properties of DeFi, and the ability of decentralised exchanges on blockchain to boost liquidity through pre-committed asset pools that act as market-makers could offer credible market solutions to many of the market microstructure obstacles that have prevented the EU from creating an integrated market for small cap (low capitalisation) stocks.

On the one hand, tokenization fuels tradability and thus it boosts liquidity due to positive network externalities. On the other hand, tokens, which are designed to be secure and instantly transferable, can also be programmed to carry as in-built properties a range of other functionalities. Thus, tokenization could help liquid markets to emerge for previously illiquid assets as, for example, a market for social market stakes or stakes in green economy SMEs.[54] This way not only access to market funding is broadened but also access to new types of investments and instruments that serve better sustainability objectives and the impact economy might emerge.[55]

Decentralized exchanges (DEXes)[56] seem to operate in a stable and unproblematic mode in a series of market contexts. Setting aside market interest that comes from the underworld, in taking a more fundamental view of DeFi it is very hard to see why what works for permissionless unregulated networks could not work for permissioned regulated networks operating decentralised markets where information discovery and investment education is also the responsibility of the user. And with every user building up a higher level of understanding of investments and investment expertise as well as expertise in information acquisition the higher the level of efficiency on which a decentralised

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51 *Avgouleas/Kiayias* (fn. 10).

52 For arguments about the integrative properties of DLT markets in the context of the National Market System in the USA see *David C. Donald/Mahdi H. Miraz*, "Multilateral Transparency for Securities Markets through DLT" The Chinese University of Hong Kong Faculty of Law Research Paper No. 2019 – 05, 2019.

53 Simply speaking, a token is a digital asset that is created, issued, and managed on a blockchain. Tokenization represents a cornerstone of decentralized finance and a native functionality of the Ethereum blockchain.

54 See for further analysis *Avgouleas/Kiayias* (fn. 10).

55 Ibid. where this possibility was first suggested.

56 A DEX is defined here as a platform that allow users to trade digital assets directly between user wallets with the help of smart contracts and without the need for a trusted intermediary (the exchange) to hold their funds.

market operates.[57] This is of course an argument in favour of simpler or standardised investment instruments like stocks or bonds. For those instruments that require a higher level of investment sophistication and expertise or high information acquisition costs it is natural for centralised exchanges to dominate, especially if they are popular with investment intermediaries.[58] Furthermore, regulators could allow market players to carry experiments with respect to the operation of permissionless platforms where anonymity walls could be breached ex post at the behest of regulators. Arguably, what makes DeFi attractive to a large number of traders is the anonymity of permissionless platforms. Conversely, it is unknown whether there will be appreciable liquidity falls in the case of permissionless platforms with ex post controls.

Infrastructure services offered by DEXes tend to be cheaper in terms of trading and "listing" fees than centralized exchanges. This means that decentralised exchanges can be employed for the development of an EU listing brand for SMEs and start-ups. The existence of mechanisms that can offer automated market-making and other liquidity solutions is a very strong argument in favour of the above assertion.

On the other hand, issues of market microstructure like willingness of big institutions to make a market in the stock of smaller companies and the low levels of liquidity in relevant markets and consequently the appearance of higher mark-ups and bigger bid-ask spreads as well as higher volatility[59] can serve as a serious barrier to the entry of retail investors in these markets. As DEXes do not provide trading through an order book, liquidity problems could easily be exacerbated compared to centralised exchanges. However, the device automated market-markets (AMMs), which has recently been tried in DEXes, may offer an effective solution to the liquidity problem. AMMs trade from a pool of market players' pre-committed assets. They make a price algorithmically and stand ready to trade with interested buyers and sellers in the decentralised network resolving liquidity shortages.

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57 *Vincent Glode/Christian Opp*, "Can Decentralized Markets Be More Efficient?", Jacobs Levy Equity Management Center for Quantitative Financial Research Paper, 2016.
58 Ibid.
59 On the liquidity premium see *Yakov Amihud*, "Illiquidity and stock returns: Cross-section and time series effects" (2002) 5 Journal of Financial Markets 31–56; *Yakov Amihud/Haim Mendelson/Lasse Heje Pedersen* "Liquidity and Asset Prices" (2005) Foundations and Trends in Finance 269–364; *Emilios Avgouleas/Stavros Degiannakis*, "Trade Transparency and Trading Volume: The Possible Impact of the Financial Instruments Markets Directive on the Trading Volume of EU Equity Markets" (2009) 1 International Journal of Financial Markets 96–123.

The AMMs may have two drawbacks. As a DEX does not provide an order book the price offered may not be a full reflection of supply and demand. On the other hand, with algorithms fixed on blockchain to monitor relevant trades the AMM can easily be fully informed of the trading volume that is going through the DEX or other markets and make uninformed predictions about incoming volumes based on past record. The second is that the AMM has to protect itself from aggressive arbitrageurs. In return for placing their assets with the AMM, liquidity providers are typically entitled to a pro-rata share of the transaction fees paid by traders for exchanging assets on the AMM. Returns in the form of transaction fees is the main incentive for agents to act as liquidity providers. These fees can be gradually adjusted by AMMs to make arbitrage costly and unprofitable.[60] Conversely it should be noted that since the expressions of interest to trade arrive sequentially in a DEX, the algorithmic system powering an uninformed AMM can adjust its prices and fees to what the overall market picture is. This replaces the price equalization function of centralised exchange's order book. In this case the AMM will just adjust its quotes in the same way operating more or less an extension of the application of the Glosten and Milgrom model.[61]

Enhanced transparency, the need to validate transactions using nodes, automated market-making and liquidity provision mechanisms in decentralised markets can protect these less than mature markets from the risk of illiquidity or from excessive insider dealing and market manipulation activity that is always evident in centralised markets on which SME and start-up issuers are traded. Finally, the elimination of clearing and settlement costs for tokenised stocks and bonds traded in DEXes and the streamlining of the stock-lending process and the ability to integrate stock collateral with corporate lending makes these markets ideal especially for the paper of smaller issuers and for those investing in them.

The inherent inability of DLT infrastructures to handle High Frequency Trading (HFT) will make the market more stable avoiding any wild price swings due to excessive speculation and volatility without losing in terms of market and in-

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60 See *Vuay Mohan*, "Automated Market Makers and Decentralized Exchanges: A DeFi Primer, 30 October 2020.

61 See *Lawrence R. Glosten/Paul .R. Milgrom*, Bid, Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders. *Journal of Financial Economics*, 14:71–100, 1985; *Sanmay Das*, "A Learning Market-Maker in the Glosten-Milgrom Model" (2005) 5 *Quant. Finance* 169–180. See also *Yakov Amihud and Haim Mendelson*. Dealership Market: Market-Making with Inventory. Journal of Financial Economics, 8:31–53, 1980.

formation efficiency, since short selling[62] will, presumably, still be allowed. Absence of HFT will also reduce the possibility of algorithmic collusion in a very transparent market environment with robust trade validation mechanisms in place absent HFT. Moreover, HFT and algorithmic trade techniques that might end up distorting or event manipulating the market prices, as is for example, spoofing[63] are inherently impossible in decentralised markets. Any orders entering the system are self-executable limiting the possibility of cluttering the network with "spoofing" orders meant to mislead the market.

The selling of order flow by commission-free brokers like the Robinhood platform, recently implicated in the GameStop controversy, to new HFT market making intermediaries such as Citadel Securities[64] who run state of the art algorithms, makes an interesting example of the perils of continued intermediation in the liquidity space. While such intermediation in times of low volume low volatility may show the value of specialization in the value chain, it can be a source of major risks in the event of volume and volatility surges as it happened in the recent case of GameStop. DeFi platforms disrupting these practices can add a further stabilization mechanism in the market discouraging highly speculative HFT activity that also takes advantage of relatively long T+2 or longer settlement cycles.[65] Therefore, the shortening of the settlement cycles to T+0 in DLT markets would have market stabilization consequences dampening volatility and boosting user confidence in the marketplace.

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62 On the possible efficiency benefits of short selling but also of the risks see *Emilios Avgouleas*, "A New Framework for the Global Regulation of Short Sales: Why Prohibition is Inefficient and Disclosure Insufficient" 376 Stanford Journal of Law, Business, and Finance (2010).

63 On how investors can strategically "spoof" the stock market see *Kyong Shik Eom/Kyung Suh-Park*, "Microstructure-based manipulation: Strategic Behavior and Performance of Spoofing Traders", Journal of Financial Markets 2013, 227–252. On trade-based manipulation see Emilios Avgouleas, The Mechanics and Regulation of Market Abuse: A Legal and Economic Analysis, 2005, Ch. 5.

64 On the tangled web of commission-free broker apps and liquidity brokers like Citadel see Nikhilesh De, "What Really Happened When Robinhood Suspended GameStop Trading", Coin-Desk.com, 16 February 2021, available at https://www.coindesk.com/what-really-happened-when-robinhood-suspended-gamestop-trading (last accessed on 27 March 2021).

65 We are indebted to Dr Heikki Marjosola for pointing out this possibility. See also *Michael McClain*, "Why Shortening the Settlement Cycle Will Benefit the Industry & Investors", 4 February 2021, DTCC.com Mr Mcclain is Managing Director and General Manager of Equity Clearing and DTC Settlement Services of Depository Trust and Clearing Corporation (DTCC), one of the biggest FMI providers in the world. Available at https://www.dtcc.com/dtcc-connection/articles/2021/february/04/why-shortening-the-settlement-cycle-will-benefit-the-industry-and-investors (last accessed on 27 March 2021).

Potential advantages including substantial transaction cost savings can come from the operation of decentralized derivatives markets.[66] Ethereum-based smart contracts enable the creation of tokenized derivatives whose value is derived from the performance of an underlying asset and in which counterparty agreements are hardwired in code. DeFi derivatives can represent real-world assets such as fiat currencies, bonds, and commodities, as well as cryptocurrencies. Given the problem created by post-2008 regulations of over-the-counter derivatives markets (OTC) whereby large quantities of systemic risk are concentrated within central counterparties (CCP). DLT platforms can offer an alternative decentralized model for OTC derivatives trading and settlement with multiple points of failure, which can alleviate the pressure on CCPs and market derivatives markets more accessible and more efficient.[67]

Thus, it is incumbent on proactive regulators to run regulatory experiments and learn lessons from such experiments within DeFi in the secure environment of a sandbox. This would enable them to harvest the benefits of DeFi and curb its risks. The implementation of the Digital Finance package should be seen as being only the beginning in this process of EU market and regulatory transformation.

3 The Digital Value-Chain in Finance and MiFID II

MiFID II governs the provision of investment services in financial instruments.[68] MiFID II does not directly regulate platforms, but the different functionalities offered by platforms do fall under the ambit of MiFID II. For instance, both robo-advice services and trading venues are regulated by MiFID II. Furthermore, MiFID II imposes a series of product governance requirements on firms manufacturing or distributing financial instruments.[69] We undertake below a review of the existing regime to identify potential gaps that have already arisen through

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66 *Emilios Avgouleasi/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" European Business Organization Law Review 2019, 81–110.

67 *Ibid.*

68 The definition of investment services and activities encompasses a wide range of activities, including the reception and transmission of orders, execution of orders, investment advice, dealing on own account, portfolio management, underwriting and the operation of trading venues that are multilateral trading facilities and organized trading facilities.

69 Articles 16(3) and 24(2) MiFID II, Articles 9 and 10 MiFID II Delegated Directive; ESMA Guidelines on MiFID II product governance requirements (ESMA35 – 43 – 620/5.02.2018).

the digitization of the finance value chain and the regulatory dilemmas that will arise in the future, especially in the context of DeFi platforms.

3.1 The Ambit of the MiFID II Regime for Robo-Advisors

The definition of investment services under MiFID II encompasses investment advice and portfolio management irrespective of whether they are automated or not. [70] Depending on the services provided by robo-advisors, their investment services could amount to investment advice or portfolio management. In case of a robo-advisor which solely provides advice with the client subsequently making the investment decision, the robo-advisor is offering investment advice pursuant MiFID II, defined as the provision of personal recommendations to a client.[71] If the robo-advisor also manages financial instruments on behalf of the client, then its service will fall within the definition of portfolio management. Portfolio management involves managing portfolios in accordance with mandates given by clients on a discretionary client-by-client basis where such portfolios include one or more financial instruments.[72] Robo-advisors offering investment advice or portfolio management must be authorized as investment firms.

An interesting twist here is the fact that under article 3, Member States may choose not to apply MiFID II to firms, which do not hold client funds and are not allowed to provide any investment service except the reception and transmission of orders in transferable securities or units of collective investment undertakings and/or the provision of investment advice in relation to such financial instruments.[73] As a result, robo-advisors that fulfil these conditions can remain outside the scope of MiFID II and be subject to the respective national regulatory regime. It should be noted that pursuant to article 3, the national regulatory regime must impose conditions for authorization and supervision and conduct of business obligations, but firms so regulated do not enjoy the MiFID II passport.

MiFID II introduces stringent authorization and conduct of business rules for robo-advisors, which qualify as investment firms. Apart from obtaining an authorization from competent authorities, the Directive requires investment firms to comply with strict capital requirements.[74] Furthermore, the Directive imposes

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70 *George Ringe/Christopher Ruof*, "A Regulatory Sandbox for Robo Advice", European Banking Institute Working Paper Series 2018 no. 26, p. 29.
71 Art. 4(1)(4) MiFID II.
72 Art. 4(1)(8) MiFID II.
73 Art. 3 MiFID II.
74 Art. 15 MiFID II.

on regulated firms an overreaching duty to act honestly, fairly and professionally in accordance with the best interests of the clients.[75] Investment firms must manage and avoid conflict of interests between the different activities of the firms and the interests of clients.[76]

MiFID II introduces substantial and prescriptive disclosure requirements and establishes an overreaching duty to provide fair, clear and not misleading information to clients or potential clients.[77]. A cornerstone of MIFID's conduct of business regime is the requirement for investment firms, which provide portfolio management or investment services, to conduct a suitability assessment.[78] Firms must provide suitable recommendations for investment services and financial instruments based on relevant client information. To comply with these requirements robo-advisors ask clients to complete questionnaires and take other steps to explain their investment goals and risk appetite. Still, an interesting question arises in this context vis-à-vis robo-advisors that offer automatic rebalancing of client portfolios after the initial questionnaire and assessment. Are the investments comprising the rebalanced portfolio also suitable and appropriate?

3.2 MIFID II and Trading Venues

As far as trading venues are concerned MiFID II has imposed new regulations and introduced a new category of platforms, the so-called organized trading facilities. Pursuant to MiFID II, there are three categories of platforms, regulated markets, multilateral trading facilities (MTF) and organized trading facilities (OTF). In addition, MiFID II imposes regulatory requirements on systematic internalizers (SI). Regulated markets and MTFs are multilateral systems, which bring together or facilitate the bringing together of multiple third-party buying and selling interests in financial instruments in accordance with their non-discretionary rules.[79] An OTF is a multilateral system which is not a regulated market or an MTF and in which multiple third-party buying and selling interests in non-equity instruments, such as bonds, structured finance products, emission allowances or derivatives are able to interact in the system.[80] Furthermore, OTFs carry out execution on a discretionary basis. Instead of routing client orders to an RM,

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75 Art. 24(1) MiFID II.
76 Art. 23 MiFID II.
77 Art. 24(3) MiFID II.
78 Art. 25(2) MiFID II.
79 Art. 4(1)(21) and (22) and Art. 19(1) MiFID II.
80 Art. 4(1)(23) MiFID II.

MTF or OTF firms may execute orders internally by acting on one side of the transaction on their own account. SIs are firms, which operate a bilateral system and deal on their own account when executing client orders outside a regulated market, an MTF or an OTF.[81]

Depending on the instruments traded and the mode of execution of orders, decentralized platforms may fall under the category of regulated markets, MTFs or OTFs. Since integrated platforms neither operate on a bilateral basis nor deal on their own account, they cannot take the form of SIs. On the other hand, it is possible that in the event that DeFi platforms offer trading services in MiFID II financial instruments, as is the provision under the proposed DLT pilot regime, then the aforementioned AMMs may be regarded as SIs. But this would place serious limitations to the function of AMMs on DeFi platforms. Therefore, the hope is that the present SI regime will not apply to automated market makers if they are dealing with low cap stocks and it can be shown that the AMM is offering prices through objective market learning algorithms to facilitate liquidity for a fee and not to leverage a proprietary book for profit, if the pre-committed pool of assets that AMMs operate can be paralleled to a proprietary trading book.

Furthermore, MTFs and OTFs exhibit certain important differences.[82] Most notably, while OTFs may only trade non-equity instruments, MTFs can trade both equity and non-equity ones. Moreover, OTFs carry execution on a discretionary basis. In contrast, MTFs apply non-discretionary rules when it comes to order execution. Fintech platforms and apps, which offer customers trading on a wide range of instruments, are more likely to be organized as MTFs deploying multilateral systems and carrying execution based on non-discretionary rules. Similarly, DeFi platforms are very unlikely to act as OTFs offering discretionary services. At the same time, the EU pilot regime makes room for the operation of DLT MTFs. Clearly, permissioned DeFi platforms could qualify as DLT MTFs under the pilot regime, discussed in section 5 below.

Another issue that might arise here is in connection with primary market listings. Regulated markets are subject to more prescriptive rules regarding the admission of financial instruments for trading.[83] Furthermore, issuers of financial instruments on regulated markets must comply with initial, ongoing ad-hoc disclosure obligations.[84] Overall, the operation of a regulated market entails considerable costs for a Fintech platform.

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81 Art. 4(1)(20) MiFID II.
82 See generally *Danny Busch*, "MIFID II and MIFIR: Stricter Rules for the EU Financial Markets", Law and Financial Markets Law Review 2017, 126–128.
83 Art. 51 MiFID II.
84 Art. 51(3) MiFID II.

The operation of a MTF or an OTF is considered to be investment activity and therefore the operator is considered an investment firm and subject to transparency and organizational requirements.[85] Apart from the general organisational requirements applicable to all investment firms, such as the management of conflicts of interest, MTFs and OTFs are subject to additional specific organisational requirements. For instance, MTFs must establish non-discretionary rules for execution.[86] Moreover, they are prohibited from trading for their own account.[87] Furthermore, MTFs are not subject to client-facing rules, such as best-execution requirements.[88] In contrast, OTFs have discretion at execution and order level but are subject to client-facing rules, such as best-execution requirement.[89] What is more, they are allowed to trade for their own account in certain circumstances.[90]

As far as RMs are concerned, the operation of an RM is not considered to be investment activity under MiFID II.[91] Instead, the operator must be licensed as a regulated market and subject to a different set of rules, which even though bear similarity with the rules applicable to RMs, they are not identical. For example, the proportionality approach, which is adopted for investment firms, does not apply to RMs.[92] It is unlikely, however, that a DEX trading MiFID II financial instruments will ever seek such authorization. The principal advantage of RMs apart from the prestige and seal of approval that their listings convey is the depth of their order book. However, as DEXes do not operate on the basis of a trading book they do not have any incentive to ever seek authorization as RMs.

3.3 Fintech Platforms and the MIFID II Product Governance Regime

Integrated one-stop-shop fintech platforms may also become distributors, when offering or recommending an investment product, or even manufacturers of financial products, when creating, developing, issuing or designing their own investment products. In this scenario, the platform will also be subject to MiFID II

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85 Art. 4(1), Art. 4(2) and Annex I, Section A MiFID II.
86 Art. 19(1) MiFID II.
87 Art. 19(5) MiFID II.
88 Art. 19(4) MiFID II.
89 Art. 20(6) MiFID II.
90 Art. 20(3) MiFID II.
91 Art. 44 MiFID II.
92 See Art. 16(4) MiFID II.

rules regarding product governance. The Directive imposes a wide range of strict product governance rules on investment firms distributing or manufacturing financial instruments. Product manufacturers are required to have in place a product approval process, which includes the identification of a potential target market for the product and assessment of all relevant risks to such target market.[93]

Furthermore, MiFID II subjects product manufacturers to product governance arrangements, which address conflicts of interest, threats of market integrity and financial stability.[94] Moreover, firms are required to conduct periodical review of the products they manufacture.[95] Pursuant to MiFID II, distributor firms must identify the actual market for the investment product.[96] What is more, they must ensure that adequate product governance arrangements are in place so that the products and services they offer or recommend are compatible with the needs, characteristics, and objectives of the target market.[97] In case the distributor is not the manufacturer of the product, it must obtain from the manufacturer all relevant information regarding the product and the product approval process.[98] Distributors must also regularly review their product governance arrangements and the products they offer or recommend.[99]

Clearly if DeFi platforms started acting as "distributors" of MiFID II financial instruments they would find it hard to comply with the product governance regime and both platform members and regulators would have to show willingness to evolve the regime without diluting investor protection. We suggest that one way to do that is if DeFi platforms have an onboarding process for new financial products who are approved and validated only if it can be shown that the "manufacturer" of the product and the "distributor" have already complied with the MiFID II requirements. In any case this is a wider problem that will have to be resolved at some point if DeFi products are to come under the MiFID II regulatory umbrella, since some of these products may not even have an identifiable "manufacturer".

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93 Art. 16(3) and Art. 24(2) MiFID II, art. 16(3)&24(2).
94 Art. 16(3) MiFID II.
95 *Ibid.*
96 Art. 16(3) and Art. 24(2) MiFID II.
97 *Ibid.*
98 Art. 16(3) MiFID II.
99 *Ibid.*

3.4 Evaluation of MiFID II

Overall, integrated fintech platforms and their different functionalities are subject to a host of MiFID II rules. Platforms are required to comply with MiFID II as firms offering robo-advisory services, operating trading venues and manufacturing and/or distributing investment products. As a result, they are caught by a complex web of conduct and client protection rules. The rules differ depending on the category to which the client belongs and the type of investment service. Overall, fintech platforms are subject to different licenses and rules depending on the type of trading platform they are operating.

On the other hand, the hurdles are much higher for decentralized Fintech platforms. We have already noted the matter of AMMs and the SI regime and the challenge of bringing a DeFi platform under the product governance regime. Another major challenge is compliance with COB rules on a DeFi platform. For example, there is the question of who discharges COB duties under the MiFID II regime if neither the platform nor the counterparty is authorized as an investment firm.[100] Therefore, ingenuous solutions must be found to allow the aforementioned advantages of DeFi platforms to materialize without sacrificing consumer/investor welfare or vice versa.

For instance, decentralized integrated platforms provide direct access to retail investors willing to trade in the platform. However, trading venues do not offer direct access to investors. Instead, investors obtain access via financial intermediaries. Trading venues accept as members or participants only investment firms, credit institutions and other institutions, which possess an adequate level of trading ability and sufficient organizational standards and resources. Moreover, MiFID II was adopted before the rise of digital finance and does not account for the problems posed by new technological developments. As a result, its rules are unable to deal with the new conduct, operational and financial stability issues posed by integrated decentralized platforms, such as aggravated conflicts of interests caused by the integration of functions and operational and cyber-security risks.

4 DLT Platforms and the New EU Pilot Regime

The proposed EU pilot regime on DLT seeks to facilitate the use of distributed ledger technologies in the issuance, trading and settlement of a narrow set of

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100 See for further discussion *Avgouleas/Kiayias* (fn. 10).

MiFID financial instruments: "transferable securities".[101] It removes, on the one hand, regulatory obstacles and, on the other, it closes regulatory gaps especially with respect to market integrity, transparency and investor protection.[102] Thus, the pilot regime allows DLT market infrastructures to obtain temporary exemptions from constraining requirements imposed by EU financial services legislation. At the same times, it purports to bolster financial stability and investor protection by targeting specific risks posed by DLT platforms.

The Commission's proposal creates an EU-wide regulatory sandbox for DLT market infrastructures. It should be noted that the regime introduced by the Proposal is optional and time limited. The permission to operate under the pilot regime and the exemptions are granted for a period of up to six years from the date of the specific permission.[103] Furthermore, after a five-year period from the entry into application of the Regulation, ESMA and the Commission would be required to make an assessment of the pilot regime, including the costs and benefits of extending the regime for another period of time, making the regime permanent with or without modifications or terminating it.[104]

The pilot regime introduces two new categories of DLT market infrastructures, the DLT Multilateral Trading Facility (DLT MTF) and the DLT Securities Settlement System (DLT SSS).[105] Market participants, which are authorized as an investment firm or a market operator under MiFID II or as a Central Securities Depository (CSD) under CSDR[106] can apply for permission to operate a DLT MTF or a DLT SSS under the pilot regime and obtain specific permission to be-

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101 Art. 3 Proposal for a Regulation on a Pilot Regime.

102 For a discussion on regulatory obstacles to the widespread adoption of DLT see *Alexandros L. Seretakis*, Blockchain, Securities Markets and Central Banking in: Philipp Hacker, Ioannis Lianos, Georgios Dimitropoulos and Stefan Eich (ed.), Regulating Blockchain. Techno-Social and Legal Challenges, 2019.

103 Art. 7(4) and Art. 8(5) Proposal for a Regulation on a Pilot Regime.

104 Art. 10 Proposal for a Regulation on a Pilot Regime.

105 According to article 2(4) of the Proposal 'DLT multilateral trading facility' or 'DLT MTF' means a multilateral trading facility , operated by an investment firm or a market operator, that only admits to trading DLT transferable securities and that may be permitted, on the basis of transparent, non-discretionary, uniform rules and procedures, to: (a) ensure the initial recording of DLT transferable securities; (b) settle transactions in DLT transferable securities against payment; and (c) provide safekeeping services in relation to DLT transferable securities, or where applicable, to related payments and collateral, provided using the DLT MTF. Article 2(5) defines a DLT securities settlement system as a securities settlement system, operated by a 'central securities depository', that settles transactions in DLT transferable securities against payment.

106 Regulation (EU) No 909/2014 on improving securities settlement in the European Union and on central securities depositories (CSDR).

come temporarily exempt from certain rules. In order to strike a balance between the need to safeguard financial stability and the need to promote innovation and experimentation, the Proposal places limits on the type of transferable securities that can be admitted to trading on a DLT MTF or recorded in a CSD operating a DLT SSS.[107]

Recognizing that the current regulatory regime is unfit for tackling some the risks that may be posed by DLT technology, the Proposal includes strict safeguards aimed at protecting investors, consumers and the financial system.[108] Operators of DLT infrastructures are required to establish a detailed business plan including a description of the technical aspects and use of DLT technology. In addition, the rules under which the DLT market infrastructure operates, including the legal rights, obligations, liabilities of the operators, members, participants, issuers and clients, must be in writing and publicly available. Moreover, the operators must establish rules governing risk management, access to the infrastructure, the participation of validating nodes, the management of conflicts of interest. The operators of DLT market infrastructures shall also ensure that they have in place adequate IT and cyber arrangements. Furthermore, operators must safeguard the integrity, security and confidentiality of any data stored. In addition, the Proposal subjects operators to strict rules regarding the safekeeping of funds, collateral and DLT transferable securities. Finally, the operator of a DLT market infrastructure shall establish a publicly available strategy for transitioning out of or winding down a particular DLT market infrastructure.

The national competent authorities are responsible for administering the pilot regime and granting specific permission to operate under the pilot regime. Applicants must furnish competent authorities a variety of information, including the business plan, the overall IT and cyber security arrangements, the exemptions requested and the justification.[109] The authorities can refuse to grant permission to operate under the pilot regime if they consider that there are risks to investor protection, market integrity or financial stability or there is

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107 Only shares and certain categories of bonds are eligible for trading on a DLT MTF or DLT SSS. In the case of shares, the market capitalization or the tentative market capitalization of the issuer must be less than EUR 200 million while in the case of convertible bonds, covered bonds, corporate bonds or public bonds (other than sovereign bonds), the issuance size must be less than EUR 500 million. Sovereign bonds cannot be admitted to trading on a DLT market infrastructure. Furthermore, the total value of securities recorded on a DLT infrastructure cannot exceed EUR 2.5 billion. Art. 3 Proposal for a Regulation on a Pilot Regime.

108 Art. 6 Proposal for a Regulation on a Pilot Regime.

109 Art. 7(2) and Art 8(2) Proposal for a Regulation on a Pilot Regime.

the danger of regulatory arbitrage.[110] The permission to operate under the pilot regime shall be valid throughout the European Union.[111]

DLT market infrastructures can request exemptions from certain rules that are incompatible with the use of DLT in the trading and post-trading of securities. DLT infrastructures requesting such exemptions will have to comply with specific conditions attached to each exemption and any additional conditions that may be imposed by national competent authorities. Accordingly, while Regulation (EU) No 909/2014 requires intermediation by a CSD as regards the recording of a transferable security and the settlement of related transactions, this could potentially take place on a distributed ledger as part of the same activity. To avoid replication of the recording on both the distributed ledger and the CSD, which would impose a functionally redundant overlay to the trade lifecycle of a financial instrument handled by DLT market infrastructures, a DLT MTF should be able to request an exemption of the book-entry requirement and the recording with a CSD set by Regulation (EU) No 909/2014. This applies when the DLT MTF complies with equivalent requirements to those applying to a CSD. In particular, a DLT MTF may request exemptions to perform activities that are currently performed by intermediaries, such as a CSD. Pursuant to article 4(2) of the Proposal, a DLT MTF may be permitted to admit to trading DLT transferable securities that are not recorded in a CSD but are instead recorded on the DLT MTF's distributed ledger. A similar exemption is introduced for DLT SSS, which are also subject to an intermediation obligation. [112]

Moreover, the pilot regime allows applicants to seek exemption from MiFID rules, which require traditional trading venues to give access to retail investors through financial intermediaries such as investment firms or credit institutions.[113] These rules are incompatible with DLT systems, whose business model is premised on peer-to-peer trading. Similarly, article 40 of CSDR provides for the settlement of payments in central bank money, if available and practicable, or otherwise in commercial bank money.[114] Cutting off DLT platforms within the sandbox from decentralised forms of payment used in DLT ecosystems that would bolster the number of market participants may prove counter-productive and a different approach should be considered in this context, including connec-

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110 Art. 7(4) and Art. 8(4) Proposal for a Regulation on a Pilot Regime.
111 Art. 7(5) and Art. 8(5) Proposal for a Regulation on a Pilot Regime.
112 Art. 5(4) Proposal for a Regulation on a Pilot Regime.
113 Art. 4(1) Proposal for a Regulation on a Pilot Regime.
114 The Proposal will allow, however, a DLT SSS to request an exemption allowing thus the settlement of payments in commercial bank in a token-based form, or in the form of a e-money token. Art. 5(5) Proposal for a Regulation on a Pilot Regime.

tivity with permissionless platforms whose anonymity could be breached ex post. [115] Furthermore, a DLT SSS may also be exempted from certain other requirements applicable to traditional settlement systems that are incompatible with DLT systems, such as requirements with respect to dematerialized form of securities, securities accounts, recording of securities, segregation of assets, extension and outsourcing of activities and services and standard link access between CSDs and to other market infrastructures.[116]

5 Conclusions and Recommendations

The advent of digitization means that the value chain of global finance is irreversibly transformed. This transformation is so far manifested in the context of two radically opposing trends. The first trend is that of total vertical integration and industry concentration both with respect to wholesale and retail markets. The other trend is represented by DeFi infrastructure. The common characteristic of both market organization models is integration of the supply of financial services into one-shop platforms. Already key financial markets are dominated by platforms like Blackrock's Aladdin (offered to large western asset managers) and Ant Financial (geared towards the Chinese retail markets). DeFi platforms powered by DL technology could also offer an integration of functionalities such as automated advice, portfolio management, underwriting, execution, conciliation and settlement within a single platform in the model offered by Avgouleas and Kiayias.[117]

Both types of one-shop customer-driven multi-asset platforms could combine full connectivity between asset markets with easy access. Users will be able to access automated investment advice at any asset market. Robo-advisory services and the platforms where trading happens will be combined. Robo-advisors will decide on the direction of trades while also being part of the underlying platform where trade happens. At the extreme, the platform can become the advisor, distributor and manufacturer of products. The combination of robo-advisory services, settlement, custody and trading within a single platform poses a challenge to the current paradigm, which is premised upon a silo-based approach to the regulation of financial markets and participants.

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115 Ibid.

116 Art. 5(2) and (6) Proposal for a Regulation on a Pilot Regime.

117 See (fn. 10).

While DeFi today is inextricably linked with cryptocurrencies of dubious value and risky lending as well as ad hoc transactions in the permission-less crypto-space, the promise of its infrastructure may not be discounted. Especially for financial regulators there are distinct benefits in the form of system resilience due to multiple points of failure, transaction auditability, market transparency, and ability to augment automated compliance and improve oversight.

Any lingering doubts about the resilience, functionality, scalability, and connectivity of this technology have been ameliorated by the massive explosion of DeFi activity without any reports about critical disruptions or system failures. The volume of uninterrupted transactions on DeFi platforms after the outbreak of Covid-19 – albeit of the kind discussed above – is in itself proof of the functionality and resilience of DeFi infrastructure. Therefore, there is a degree of justification in any regulatory attempts to try to co-opt the advantages of this technology and attendant business in the framework of mainstream finance and its regulation.

If brought within the regulatory perimeter under a flexible regime that understands the advantages and perils of automation and increasingly automated compliance, permissioned DeFi platforms powered by DLT can accelerate EU market integration and the realisation of the vision for an EU Capital Markets Union. DeFi infrastructures would, first, help to widen access to finance for SMEs and bigger firms, reducing the dependence of the EU economies from bank-funding. Secondly, they would undercut the rents of the big institutions relaxing the grip that BigTech can easily develop on retail markets. In addition, DeFi infrastructures would offer a higher level of protection to investors/consumers by enabling the operation of efficient (low-cost/high transparency) and reasonably liquid EU-wide markets for small cap stocks which could help the development of a *made in the EU* global brand for SME listings. Finally, it could help align consumer investment preferences and investment horizons with the composition of their portfolios due to the enhanced control they offer to end users.

EU financial regulation wrapped in the MiFID II concepts of investment services firms that hold a single point of entry license and distinct centralized trading and settlement venues is in need of a rethink, including from a model of a single firm authorization to authorization of multi-firm collaborative platforms. This is the only way to counter the eminent threat of control of EU financial market infrastructure (FMI) by dominant one-shop platforms owned by Big Tech or Big Finance. But it would place a considerable challenge to MiFID's approach and innovative solutions will have to be found including substantial automation of compliance.

However, the reconfiguration of EU financial regulation to meet the challenges in the mode of delivery of financial services in the EU and the transformation

of FMI is poised to face formidable obstacles. First, incumbent firms may wish to maintain the status quo in order to preserve market shares and rents. Secondly, regulators will have to perform a hard balancing act since any reform that is not incremental is bound to have profound implications for the current EU model for the regulation of FMI.

Reform will have to weigh, on the one hand, the welfare benefits that furthering digital transformation may bring – given the fact that market digitization has become the official EU industrial policy – and, on the other, the fact that segments within the government and industry will present vertical integration and the transformation of the value chain as an opportunity to build European champions. Allegedly, these would be able to compete with US and Chinese financial services giants such as Blackrock and Ant financial services.

This is a false promise. As the EU financial services and data protection framework is much more restrictive than that under which US or Chinese big institutions operate, centralized finance platforms may lead to structural changes making the EU financial markets even more oligopolistic. Therefore, a policy favouring "EU champions" would boost rent-seeking, thus increasing rather than decreasing market cartelization.

In practical terms, EU policy-makers will have to reconsider the proposed DLT pilot regime. In particular, they will have to consider the widening of the proposed DLT pilot regime to include DeFi platforms which would not hold an authorization as a MiFID investment firm. This would place a considerable challenge to MiFID's approach and innovative solutions, such as substantial automation of compliance, will have to be found.

While a major step forward, the EU pilot regime in its present form is also a step backwards. As it is also argued by other authors in this volume (Giudici and Ferrarini, Marjosola), the pilot regime is informed by the expectation that new market trends centered around the new technology could fit into the existing disclosure and licensing based regulatory paradigm for EU financial markets. This is, however, an unfounded expectation reinforced by incumbent industry interests who wish to avoid a wholesale disruption of existing industry practices and the tight-knit oligopoly built on the back of a very complex and cumbersome rulebook. It looks towards the past and ignores the future both in terms of challenges for investor protection and market development and internal market opportunities.

DeFi poses in itself considerable challenges for regulators. It is, nonetheless, a route worth experimenting with and sanctioning as EU markets are being rebuilt in the post-Brexit era. DeFi platforms have the potential to provide the missing part in the EU Capital Markets Union jigsaw. Widening the proposed DLT pilot regime is also the best way to foster further digitization of the finance value

chain in the EU and the materialization of attendant efficiencies without the undesirable consequences of market domination by large centralised fintech platforms. Conversely, properly regulated DeFi infrastructures can become a safe passage to the democratization and further integration of EU capital markets under the open finance paradigm.