DIGITALISATION AND COMPETITION LAW: NEW CHALLENGES

Ioannis Lianos[1]

ABSTRACT

This study explores some of the most significant changes brought about by the emergence of digitalisation from the perspective of competition law enforcement. These structural changes, some of which pre-date, to a certain extent, the beginning of the 'digital revolution' can be summarised as relating to three broader trends: futurity, personalisation and cybernetics. The study explores the practical implications of these changes for competition law enforcement before making suggestions as to the direction of the development of competition law and policy in the era of 'digital' or 'informational' capitalism.

Keywords: digital, ecosystem, digital platform, personalisation, cybernetics, futurity, blockchain, internet of things ('IoT'), gig economy, competition law and policy

[1] Professor of Global Competition Law and Public Policy and Director, Centre for Law, Economics and Society, UCL Faculty of Laws; Academic Director, BRICS Competition Law and Policy Centre, HSE National Research University. The Chapter partly draws on previously published research, in particular that of I. Lianos, "Blockchain Competition" in *Regulating Blockchain: Political and Legal Challenges*, (edited by P. Hacker, I. Lianos, G. Dimitropoulos and S. Eich, Oxford University Press, 2019, Forthcoming) and a research paper on Digital Value Chains. The author would like to thank Meg Cochrane and Riccardo Savona-Siemens for excellent research assistance.

I. Introduction

The rise of the digital economy has been the major economic transformation of our time. 'Digital platforms' relying on network effects and 'Big Data' have been the focus of competition law enforcement activity and have attracted the interest of competition scholars.

The fact that data constitutes the basic input in the digital economy is now well accepted.[2] Although data constitutes the raw material in this era of 'informational capitalism"[3] or "digital capitalism", artificial intelligence (henceforth 'AI'), algorithms, machine learning and automation technologies, among other technologies of the 'fourth industrial revolution', constitute the real game changers as the adoption of these technologies will immensely affect international competition in all the economic sectors affected by the digital revolution.

Most competition law scholars have addressed this process of transformation by focusing on its technological dimension and its impact on business models. Their work usefully explores the ways in which the existing competition law framework may apply in order to address current technological challenges, taking into account the importance of data in the digital economy as the essential raw material. Nevertheless, there has been less work done on the input-output process that ultimately generates value in the digital economy. Indeed, value is generated through the elaborate processes of transformation and monetization, which ultimately take place in both the product and financial markets. This process of value creation is organized along, more or less, elaborate value chains which encompass various input-output steps. These value chains compete with each other in complex ecosystems, where, for example, the firms can be competing with one another in relation to one activity along the chain whilst simultaneously co-operating or producing complementary products in regard to some other activity. Firms operating in each of the different individual layers of a digital value chain face an important dilemma – they want to maximise their market power but they will suffer harm if distinct firms operating in other parts of the chain seek to and succeed in doing such as well. For firms operating in these different layers of a digital value chain, their strategy is to increase competition in other parts of the chain by promoting entry and fragmenting supply whilst maintaining their monopoly position in their segment of the chain and/or cooperating with other

[2] See, for instance, Economist, "The World's Most Valuable Resource Is No Longer Oil, But Data", (*economist.com*, 6 May 2017) <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data>.

[3] See J. Cohen, "Property and the Construction of the Information Economy: A Neo-Polanyian Ontology" in *Handbook of Digital Media and Communication* (edited by L. Lievrouw and B. Loader, Routledge, Forthcoming).

monopolised segments with the aim of sharing the profits, which arise out of the activities undertaken within the chain, between themselves.

The intricate relationships between different segments of the value chain, which in itself can be characterised as an inherently 'complex system', may give rise to issues if intervention or non-intervention is pursued in relation to one or more of its segments; the pursuit or non-pursuit of such may lead to unintended, adverse consequences in other segments of the chain. Therefore, it is necessary to internalise the complexity of the digital value chain as an integral part of the overall business models and organisational structures in the digital economy. It is also necessary to avoid any localised silo-based competition assessment of a particular segment. The important role of financial markets in the development of the digital economy, and the aforementioned monetization process, also helps to shift attention from the traditional focus of competition law on competition within an industry, to competition between industries with capital moving from one industry to another in search of higher profits.

The rapid and revolutionary development of digital capitalism over the last three decades has led to an important 'information overload' and to social paralysis.[4] Competition authorities have reacted slowly. They have tried, unsuccessfully, to deal with the problems that have emerged by applying the framework of competition law, tailored to the era of industrial capitalism, to the 'next generation competition' of the post-industrial informational capitalism era. By applying this antiquated framework, competition authorities have failed to challenge both a considerable number of M&A transactions between emerging Internet giants and start-ups and the potential for markets to tip, whilst, at the same time, they have allowed incumbent firms to harvest a considerable amount of data and to develop the tools to process such data. Competition authorities have failed to focus on the structural changes inherent in the shift towards digital or informational capitalism.

These structural changes, some of which pre-date to a certain extent the beginning of the 'digital revolution', can be categorised into three broad trends.

The first trend is that of *futurity*. This term, originally coined by John Commons, describes the reorientation of economies towards the future. This is linked to the practice of treating businesses as 'going concerns' and measuring their value in terms of their anticipated future value. The most important driver of value creation is based, not on their net cash flows and expected short-term profits, but on "pots of gold" being found far into the future. The

[4] A. Toffler, *Future Shock* (Random House, 1970).

development of blockchain technology and, in particular, the funding of blockchain projects provides an excellent illustration of futurity. Initial coin offerings ('ICOs') emerged as the main source of funding for blockchain projects with outperforming venture capital ('VC') serving as the financing of cryptocurrency and blockchain start-ups since 2017. Developers are attracted to the prospect of potential future profits, which shall be generated by the appreciation in value of the native token, once the ICO has been completed. Swartz provides a good explanation of this fundamental characteristic of blockchain: "as soon as a proposal is offered – whether as a white paper, a slide deck or a blog post – it is treated as though it already exists, ready to go. Indeed, blockchain projects exist in a particular temporality and have their own sense of the past and future, of change. It performatively leans into a future, always just around the corner, which might as well be here already".[5]

The second trend stems from the harvesting and processing of personal data, the trend of *personalisation*. It is increasingly acknowledged that data collection is key in relation to the ability of firms to compete in the future Internet of things ('IoT') or Internet of Services ('IoS').[6] Data analytics connected to the use of software for predictive modelling reinforce and crystallise the competitive and 'architectural' advantages of firms holding substantial portions of this data.[7] Much of the aforementioned data relates to the digital identity of the consumer and, thereby, enables companies possessing such data to draw relatively accurate preference maps for each of their clients. In this era of 'mass personalisation',[8] the focus of firms will not only be on 'attention markets',[9] but on the development of bespoke products that suit the individual preferences of each and every consumer. Once a specific amount of data is harvested about an individual, these personalised markets will likely tip, with the possible outcome being that only one firm has the capabilities to perfectly satisfy the relevant individual consumer's demand function in relation to specific products. The firm that is capable of providing such satisfaction will be able to leverage this power in the financial markets as well as convert it to

[5] L. Swartz, "Blockchain Dreams: Imagining Techno-Economic Alternatives After Bitcoin" in *Another Economy is Possible: Culture and Economy in a Time of Crisis* (edited by M. Castells, Polity Press, 2017), 83.
[6] There is a discussion regarding the definition of 'data' – does it encompass syntactic information, semantic information, or both; and where should one draw the line in reference to protecting 'data'? See J. Drexl, "Designing Competitive Markets for Industrial Data - Between Propertisation and Access", (2016) Max Planck Institute for Innovation and Competition Research Paper, 12; A. Wiebe, "Protection of Industrial Data – a New Property Right for the Digital Economy?", (2017) 12(1) *Journal of Intellectual Property Law & Practice*, 67.
[7] M. Jacobides, S. Winter and S. Kassberger, "The Dynamics of Wealth, Profit, and Sustainable Advantage", (2012) 33 *Strategic Management Journal*, 1386.
[8] Deloitte, "Made to Order: The Rise of Mass Personalisation", (2015) Deloitte Consumer Review (11th edition).
[9] On this concept, see T. Wu, "Blind Spot: The Attention Economy and the Law", (2017) *Antitrust Law Journal*; D. Evans, "The Economics of Attention Markets", (31 October 2017) <https://ssrn.com/abstract=3044858>.

power in other spheres of social activity.[10] Firms may also organise the production process within their own ecosystem become its gatekeepers by providing access to this personal consumer profile to a number of firms they control directly, or which are dependent on them to reach these 'captive' consumers.

The third trend and, arguably, most important is that of *cybernetics*. In the static model of competition applied by competition authorities, prices provide complex information in a condensed way to producers about consumer preferences, thus, enabling conventional markets to work. New data harvesting and processing techniques are revolutionary in multiple ways. Firstly, the use of data serves to improves market matches. As customers continue to shop online, the capability of digital assistants to make ever better recommendations develops. The 'learning' process undertaken by digital assistants takes place completely or largely unassisted by humans, with data being constantly fed into machines that continuously update their algorithms. Algorithmic firms gather comprehensive personal data on their customers and in doing so they remove the need to rely on decentralised markets to acquire knowledge on the preferences of consumers. Secondly, these techniques may more easily discriminate between groups of consumers/users, choosing a price structure that would subsidize some whilst effectively 'taxing' others with higher prices. The economic literature on multi-sided markets has correctly identified this as an issue but more work needs to be done in order to understand the broader implications for competition law because the effect of such techniques in decentralised markets is that 'price' loses its central position as an indicator of consumer preferences. Consumers/buyers are not in the commanding position as they are influenced by both explicit recommendations and the ways in which options are filtered and presented, particularly as their 'trust in machines' may be higher than their trust in humans. Digital platforms may, therefore, replace markets to a certain extent, particularly in a 'winner-takes-most' world in which the presence of strong network effects means digital markets may easily 'tip'. The way these digital platforms regulate their ecosystems, but also more broadly demand, presents some similarities to a private version of a centrally-planned mini-economy, hence my reference to cybernetics.

These considerations lead me to put forward the following points:

[10] See for instance, P. Danziger, "Made-To-Order Clothing Is An Opportunity Tailor-Made for Amazon", (*forbes.com*, 3 May 2017) <https://www.forbes.com/sites/pamdanziger/2017/05/03/made-to-order-clothing-is-an-opportunity-tailor-made-for-amazon/#2a816c336dcb>.

- The increasing complexity of production in the digital era highlights the importance of conducting a careful analysis of the power relations along various digital value chains with the aim being to unveil *value extraction bottlenecks* affecting the distribution of the total surplus value generated by digitalisation. I consider that because of the important social implications of the transition to digital capitalism and the important tensions to social stability these may engender, as well as the limited ability of the tax system and/or regulation to deal with the social costs of this transformation, it becomes important to analyse the distributional implications of competition law enforcement. This analysis cannot always be undertaken by the traditional 'neoclassical price theory' framework, which mainly focuses on horizontal competition and its effects on consumers or total welfare (i.e. economic efficiency) and assesses the competitive interactions between firms within a specific relevant market. Competition law and policy should critically engage with the distributional implications of the transformations introduced by digital capitalism to an already complex economy and should provide a clear theoretical framework to policymakers so that they understand how important changes affecting international competition may impact upon the various stakeholders at the national, regional and global levels, and the subsequent trade-offs to be made.
- It becomes important to integrate a complex economy perspective, considering the broader array of interactions, beyond market exchanges, between the different stakeholders, as these may provide them with resources they may use in their competitive struggles in the digital economy. It is also important to integrate the most recent technological developments affecting the various resources and assets at the disposal of the actors in order to gain strategic *and* architectural competitive advantage in the digital economy. I consider that the effort of designing competition law policy institutions for the digital economy should start with a proper understanding of the value-generation and allocation processes at play in the era of digital capitalism and of the interaction of competition law with other tools and institutions (e.g. digital consumer protection, data protection, intellectual property ('IP') law etc.) in order to understand the role it plays and should play in each BRICS jurisdiction, something which has, crucially, been missing from previous analyses of these markets.
- In understanding the role of competition law in this new environment, one needs to develop a wider understanding of the function of competition law and adopt a broader

reach for competition policy, in particular in relation to developing and emergent economies.[11]

In following these broader principles, competition authorities should no longer solely focus on statically-defined economic efficiency in the relevant market but should include into their considerations the value capture and value generation processes operating in the digital economy, and they should seek to draw lessons from these processes in order to configure the optimal design and enforcement mechanisms required by modern competition law. I consider that to the extent that promoting disruptive innovation, rather than just preserving an efficient allocation of existing resources, becomes the driving principle of modern competition law enforcement, it makes sense to focus on the way the value brought by innovation is captured, shared and generated as these three processes are intrinsically linked.

This Chapter explores some of the challenges the digital revolution presents to competition law. The first section of this Chapter examines the complex issue of the scope of competition law. The second emphasises the need to focus on value chains and, in particular, to map the value capture processes at play in the economy. The third calls for the expansion of the traditional competition law toolkit, which focuses on relevant market definitions, with other tools capable of helping it better analyse 'next generation competition'. The last section concludes by exploring the competition law implications of the centralisation and decentralisation trends that characterise the modern digital economy.

II. Digital Challenges for the Scope of Competition Law

Competition law usually applies to entities exercising an economic activity in an independent (i.e. non-subordinate) way. This may raise difficulties in view of the changing nature of labour relationships in today's 'gig' or 'collaborative' economy and of the collapse of the traditional binary divide between employment and self-employment. The classic example is how competition law addresses the relation between Uber and Uber drivers.

Normally, competition law is seen as applying to 'undertakings' and most competition law systems exonerate themselves from interfering within the boundaries of a relevant

[11] J. Stiglitz, "Towards a Broader View of Competition Policy" in *Competition Policy for the New Era: Insights from the BRICS Countries* (edited by T. Bonakele, E. Fox and L. Mncube, Oxford University Press, 2016).

undertaking, particularly in relation to the way in which workers and management operating within that undertaking interact with one another. Hence, when workers come together and conclude collective agreements with employers in order to fix a rate or price concerning the sale of their labour, competition law systems typically consider these practices as being distinct from the (anti-competitive) price-fixing practices in which undertakings may be engaged. In essence, collective agreements concluded by unions on behalf of their workers typically benefit from an exclusion from the scope of application of EU competition law. Employees/workers cannot be undertakings under EU competition law – they do not exercise an autonomous economic activity, in the sense of offering goods or services on a market and bearing the financial risk attached to the performance of such activity. By the same token, a labour agreement between an employer and an employee will not fall under the scope of Article 101(1) of the Treaty on the Functioning of the European Union ('TFEU') because it is not an agreement between different undertakings.[12]

In *Jean Claude Becu*, the Court of Justice of the European Union ('CJEU') examined a collective labour agreement relating to dock work at the Port of Ghent, made mandatory by a Belgian Royal Decree, which allowed only duly recognized dockers to perform dock work and also made the outcome of collective bargaining between employers' and employees' representatives negotiations binding *erga omnes.* The preliminary question sent to the CJEU by the national court involved the possible application of both Articles 102 and 106(1) TFEU to the Belgian Royal Decree. The CJEU assessed if these dock workers could be considered an 'undertaking'. The CJEU held that:

> "[. . .] the employment relationship which recognised dockers have with the undertakings for which they perform dock work is characterised by the fact that they perform the work in question for and under the direction of each of those undertakings, so they must be regarded as 'workers' within the meaning of [Article 45 TFEU], as interpreted in the case law [. . .].

[12] See Joined Cases 40–8/73 etc, *Coöperatieve Vereniging 'Suiker Unie' UA and Others v Commission* [1975] ECR 1663, [539], which refers to the situation of an agent forming an integral part of the undertaking of a principal. For a discussion, see P. Nihoul, "Do Workers Constitute Undertakings for the Purpose of the Competition Rules?", (2000) *25*(4) *European Law Review*, 408; C. Townley, "The Concept of 'Undertaking': The Boundaries of the Corporation—A Discussion of Agency, Employees and Subsidiaries" in *EC Competition Law: A Critical Assessment* (edited by G. Amato and C.-D. Ehlermann, Hart, 2007), 3.

> Since they are, for the duration of that relationship, incorporated into the undertakings concerned and, thus, form an economic unit with each of them, dockers do not therefore in themselves constitute undertakings".[13]

From the CJEU's reasoning it followed that workers could not be considered as an undertaking if they were acting collectively as an association of workers.

Since *Becu*, the possible application of Article 101 TFEU to collective agreements concluded between trade unions and associations of employers has led to the development of a fully-fledged exception to the application of EU competition law, for reasons of social policy. Provided two cumulative conditions are satisfied, EU competition law, as developed by the CJEU, now provides immunity to collective labour agreements concluded between associations of workers (i.e. labour unions) and employers from the application of competition law. These two cumulative conditions are that: (i) the relevant collective labour agreement is entered into in the framework of collective bargaining between employers and employees, and (ii) the agreement directly contributes towards improving the employment and working conditions of workers. However, the relevant case law does not relate to the concept of 'undertaking' as such but mostly to that of the restriction of competition and is known as the *Albany* exception.

---

[13] Case C-22/98, *Criminal Proceedings Against Jean Claude Becu, Annie Verweire, Smeg NV and Adia Interim NV* [1999] ECR I-5665. It is noteworthy that the situation of employees is dealt differently in the EU than in the US. In US law, all 'persons' are subject to the Sherman Act, unless they benefit from an exemption. Labour benefits from a statutory and a non-statutory exemption. The statutory labour exemption (Clayton Antitrust Act, 15 USC §§ 12–27; Norris-La Guardia Act, 29 USC §§ 101–15) enables workers to organize to eliminate competition among themselves and to pursue their legitimate labour interests, so long as they act in their self-interest and do not combine themselves with a non-labour group. Yet, the statutory labour exemption did not immunise the collective bargaining process or collective bargaining agreements from potential antitrust liability; they only covered unilateral actions undertaken by labour organisations. The US courts, thus, developed the non-statutory basis of the labour exemption in order to remove, from antitrust scrutiny restraints, trade that is the product of a collective bargaining agreement between labour and management (see *Local Union No 189, Amalgamated Meat Cutters & Butcher Workmen of N Am v Jewel Tea Co Inc*, 381 US 676 (1965)). These (i.e. antitrust scrutiny restraints) more typically apply to agreements between employees or their unions and employers when the relevant agreements are intimately related to a mandatory subject of bargaining and do not have the "potential for restraining competition in the business market in ways that would not follow naturally from elimination of competition over wages and working conditions": *Connell Construction Co v Plumbers and Steamfitters Local Union No 100*, 421 US 616, 635 (1975). According to the US Supreme Court, at paragraph 622, of the aforementioned case, "the non-statutory exemption has its source in the strong labour policy favouring the association of employees to eliminate competition over wages and working conditions. Union success in organising workers and standardising wages ultimately will affect price competition among employers but the goals of federal labour law never could be achieved if this effect on business competition were held a violation of the antitrust laws. The Court, therefore, has acknowledged that labour policy requires tolerance for the lessening of business competition based on differences in wages and working conditions". Courts have even extended this immunity beyond the expiration of a collective bargaining agreement: see *Brown v NFL*, 518 US 231 (1996). The non-statutory labour exemption has been frequently applied in the field of professional sports, for instance, exempting a labour agreement between the US National Football League ('NFL') or the National Basketball Association ('NBA') and a national union of student-athletes.

In *Albany*,[14] the CJEU took the view that it was "beyond question that certain restrictions of competition are inherent in collective agreements between organisations representing employers and workers". However, it was also willing to concede that "the social policy objectives pursued by such agreements would be seriously undermined if management and labour were subject to [EU competition rules] when seeking jointly to adopt measures to improve conditions of work and employment".[15] This concession was premised on both various treaty-based textual justifications and on the understanding that the "nature and purpose" of the agreement was, per paragraph 63 of the judgment, that of "improving … working conditions, namely …remuneration". The CJEU found that, (i) the collective agreement at issue was concluded in the form of a collective agreement and was the outcome of collective negotiations between organizations representing employers and workers, and (ii), its purpose, the establishment of a supplementary pension scheme aiming to guarantee a certain level of pension for all workers in the sector "contributed directly to improving one of their working conditions, namely their remuneration".[16] These two factors served to exclude this agreement from the scope of Article 101(1) TFEU.

Pursuit of a liberal profession has often been considered to constitute an 'economic activity' that falls within the scope of application of competition law if such activity is not related to employment.[17] This raises the question of whether the *Albany* exception would apply to exclude, from the scope of Article 101(1) TFEU, collective agreements concluded between members of liberal professions with regard to the fixing of minimum rates or other agreements restricting competition between them, to the extent that self-employed persons are considered to be undertakings?[18] The CJEU has examined the categorization of an association acting on behalf of self-employed persons and has also explored the extension of the *Albany* exception to collective agreements concluded by unions representing both employees and self-employed persons.

Under the current approach followed by the EU courts, an association acting on behalf of self-employed persons is to be regarded as an association of undertakings under Article

[14] Case C-67/96, Albany International BV v Stichting Bedrijfspensioenfonds Textielindustrie [1999] ECR I-5751.
[15] *Ibid*, [59].
[16] *Ibid*, [62] – [63].
[17] See, for instance, self-employed accountants (Case C-1/12, *Ordem dos Técnicos Oficiais de Contas*, ECLI:EU:C:2013:127), pharmacists (Case T-23/09, *CNOP & CCG v Commission* [2010] ECR II-5291), medical doctors (Joined Cases C-180–4/98, *Pavel Pavlov and Others v Stichting Pensioenfonds Medische Specialisten* [2000] ECR I-6451), and musicians (Case C-413/13, *FNV Kunsten Informatie en Media*, ECLI:EU:C:2014:2411).
[18] See Joined Cases C-180–4/98, *Pavel Pavlov* (16); Commission Decision *Belgian Architects Association* (Case 2005/8/CE) [2005] OJ L 4/10.

101(1) TFEU.[19] It has become increasingly clear that a) when self-employed persons seek to bargain collectively in relation to the terms and conditions of their services, or b) where collective agreements concluded by trade unions for subordinate workers also contain minimum labour costs provision that also apply to self-employed workers, then the exclusion from competition law will not apply to such self-employed persons or workers as the competition authorities and/or courts consider them to be 'undertakings'.

More recently, in *FNV Kunsten*, the CJEU held that "insofar as an organisation representing workers carries out negotiations acting in the name, and on behalf, of those self-employed persons who are its members, it does not act as a trade union association and therefore as a social partner, but, in reality, acts as an association of undertakings", and is therefore also exposed to the full application of EU competition law rules. An exception to these rules, the Court said in *FNV Kunsten*, is only possible "if the service providers, in the name and on behalf of whom the trade union negotiated, are in fact 'false self-employed', that is to say, service providers in a situation comparable to that of employees".[20]

Cases such as *FNV Kunsten* raise the crucial question of the scope of competition law in view of the changing nature of labour relationships in today's 'gig' or 'collaborative' economy and the collapse of the traditional binary divide between employment and self-employment.[21] They also raise important questions as to the optimal boundaries between competition law and labour law and the politically sensitive issue of a possible extension of workers' protection to these 'new jobs'.[22] It requires some effort to reconcile the respective domains of application of competition law and labour law, regulation in the digital economy and the possibility of generalising the labour exception beyond the strict confines of trade unions of 'workers', in order to include, for instance, those persons who are 'dependent self-employed' as well.

---

[19] Case C-309/99, *JCJ Wouters, JW Savelbergh and Price Waterhouse Belastingadviseurs BV v Algemene Raad van de Nederlandse Orde van Advocaten,* intervener: *Raad van de Balies van de Europese Gemeenschap* [2002] ECR I-1577. In *Wouters*, the CJEU examined the compatibility, with Article 101 of the Treaty on the Functioning of the European Union ('TFEU'), of a regulation adopted by the Netherlands Bar Association prohibiting lawyers practising in the Netherlands from entering into multi-disciplinary partnerships with members of the professional category of accountants.

[20] Case C-413/13, *FNV*, (16), [28] and [31].

[21] For a useful discussion, from a labour law but also an economic perspective, see M. Freedland and N. Kountouris, *The Legal Construction of Personal Work Relations* (Oxford University Press, 2011); N. Kountouris, "The Concept of "Worker" in European Labour Law: Fragmentation, Autonomy and Scope", (2017) 47(2) *Industrial Law Journal,* 192; A. Stewart and J. Stanford, "Regulating Work in the Gig Economy: What are the Options?" (2017) *28*(3) *Economic and Labour Relations Rev*iew, 420.

[22] See, most recently, European Parliament, "The Social Protection of Workers in the Platform Economy: Study for the EMPL Committee", (2017) Study, 11, which found that "the greater the level of financial dependence [of the labourer] on platform work, the lower the access that workers have to social protections".

Determining the existence of an 'economic activity', and, thus, of an 'undertaking' is not the only challenge in the context of applying competition law rules in the digital economy. It is also important to determine the entity liable for competition law infringements. This also may, for instance, raise concerns with regard to distributed ledger technology ('DLT'). Like the Internet, Blockchain is borderless. However, the crucial factor is that it is decentralised, which makes it difficult, particularly if the relevant activity takes place in the context of public permission-less blockchains, to determine who should bear the responsibility for the social costs and private harms generated by the blockchain-related activity. A distributed ledger may need forms of 'distributed liability', i.e. the notion that "all entities in the system need to consider contingent liability risk".[23] This raises the question of whether such liability should extend to all participants in the blockchain, irrespective of their governance roles, or only to those that exercise a significant influence on the activity that led to the specific social costs or private harm to be compensated? Furthermore, if the option of collective responsibility is selected, how would responsibility be apportioned between the various nodes, to the extent that node owners in a permission-less blockchain may not even be aware of the specific conduct or the identity of the other node owners involved.

Although the concept of 'entity' is less important to determining the existence of an 'economic activity', in view of the functional approach followed by EU competition law, this concept is crucial when it comes to (i) determining, under Article 101 TFEU, the liability of two or more entities that have entered into an illegal agreement or concerted practice, (ii) attributing liability for the illegal conduct and the related issue of determining appropriate remedies/sanctions, and (iii) determining the market shares of the undertaking involved in the infringement of competition law, with this being either in the context of merger control or in the context of abuse of a dominant position, or determining the existence of a single undertaking for the application of a 'block exemption' regulation.

The concept of 'control' plays an important role in the process of defining the scope of the competition law intervention against an 'economic entity'. It determines the tangible or intangible assets that constitute the core of the 'undertaking' and defines its boundaries. Such assets are presumed to be under the authority of the undertaking's agents, who through pursuing anticompetitive strategies, may engage the liability of the undertaking liability.[24] Under the

[23] See Z. Zetzche, R. Buckley and D. Arner, "The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain", (2017) 52 *University of New South Wales Law Research Series*, 9.
[24] Case 170/83, *Hydrotherm Gerätebau GmbH v Compact del Dott. Ing. Mario Andreoli & C. Sas.* [1984] ECR 2999.

'single entity' doctrine, several legal persons may form an 'economic entity' if a control relationship exists between them; the application of the doctrine presupposes the exercise of 'control' or 'decisive influence'.[25]

Should an entity, such as a mining pool, a blockchain intermediary or an intermediary or platform off-blockchain, take control of the blockchain, and the existence of 'control' will have to be determined according to the specific consensus protocol utilised by the blockchain (and if this is based on Proof of Work, Proof of Stake or something else), then it may be considered as reasonable to hold this entity liable for anticompetitive conduct perpetrated in the context of the specific blockchain. The same deterrence reasons that have so far justified the liability of parent companies for the anticompetitive activity of their subsidiaries may also operate in this case.26 However, this expansion of the personal scope of liability has also been criticised.[27] Discussions over the boundaries of the 'single entity' doctrine constitute a specific facet of broader debates over (i) 'enterprise' liability vs. 'business participant' liability and, (ii) when the corporate veil should be pierced.[28]

Such discussions are indirectly related to the debate concerning the boundaries of the 'firm' in economics, with a number of approaches glossing over Coase's seminal, but incomplete from a descriptive perspective, distinction between 'markets' and 'hierarchies'.[29] The discussion over the boundaries of the firm has also caught the attention of blockchain

[25] See, inter alia, Case C-97/08 P, Akzo Nobel and Others v Commission [2009] ECR I-8237; Joined Cases C-628/10 P and C-14/11 P Alliance One International and Standard Commercial Tobacco v Commission and Commission v Alliance One International and Others, ECLI:EU:C:2012:479, [46]-[47], with regard to the liability of a parent company for the conduct of its wholly–owned subsidiary or on which it exercises a decisive influence; Art. 3(2) & 3(3) of Council Regulation (EC) No. 139/2004 on the Control of Concentrations Between Undertakings, OJ 2004 L 24/1, in the context of merger control.

[26] C. Koenig, "An Economic Analysis of the Single Economic Entity Doctrine in EU Competition Law", (2017) 13(2) *Journal of Competition Law and Economics,* 281-327.

[27] For a criticism of this case law, see A. Kalintiri, "Revisiting Parental Liability in EU Competition Law", (2018) *European Law Review*, 145, noting that it may deprive undertakings of the protection afforded to them by the Charter of Fundamental Rights and the general principles of EU law.

[28] For a discussion, see E. Orts, *Business Persons – A Legal Theory of the Firm* (Oxford University Press, 2013).

[29] R. Coase, "The Nature of the Firm", (1937) 4(16) *Economica*, 386. Williamson added 'hybrids': O. Williamson, *The Mechanisms of Governance* (Oxford University Press, 1996). Some approaches explain the emergence of firms, and their boundaries, by transaction costs economics ('TCE') and more broadly contractual theories of vertical integration (see, inter alia, O. Williamson, *The Economic Institutions of Capitalism* (Free Press, 1985); P. Joskow, "The New Institutional Economics: Alternative Approaches", (1995) 151(1) *Journal of Institutional and Theoretical Economics*, 248). Others focus on property rights by identifying the allocation of residual decision rights with the ownership of the assets of the firm (tangible and intangible): O. Hart and J. Moore, "Property Rights and the Nature of the Firm", (1990) 98 *Journal of Political Economy*, 1119. Others take an agency perspective, defining the firm as "a nexus of agency relationships including managerial lines of authority, employment and structures of governance": Orts, (27), 13. A more dynamic perspective views the boundaries of a firm as related to its strategy to leverage its internal capabilities in related markets or to exploit its superior management capabilities and resources: B. Wernerfelt, A Resource-Based View of the Firm, (1984) 5(2) Strategic Management Journal 171.

experts who rightly observe that blockchain technology contributes to the 'hollowing out' of the firm as initiated by the digital revolution.[30] It is expected that blockchain technology will challenge the 'efficiency' justification for establishing centralised islands of authority (as is put forward by proponents of the Transaction Costs Economics (TCE)/contractual theory approach) whilst also enabling a wider distribution of entrepreneurial finance through its distinctive way of attracting finance, the ICO. 'Hollowing out' the firm does not, however, necessarily imply a corresponding growth in the sphere of activities organised through markets to the extent that the dominant strategy of blockchain developers and intermediaries may be to build 'walled gardens' and design eco-systems that could progressively lead to some form of centralisation. In this context, determining the entity that could be found liable for a competition law infringement might be an easier task.

III. Shifting the Focus from Relevant Markets to Value Chains

Thirty years after the PC revolution and the constitution of the PC value chain and twenty years after the introduction and expansion of the Internet, we are now facing new developments such as the rise of smartphones as the principal medium of interaction between consumers and the World Wide Web.[31] The widespread use of smartphones and the development of tablet computers have led to the transition from browsers to apps with mobile broadband subscriptions having quadrupled in the past five years with over 3.5 billion being recorded in 2015.[32] 'Big data' analytics and the massive collection of personal data may enable Internet service providers ('ISPs) and search engines to track with detail the behaviour of consumers (their digital identity), when navigating the Internet, thereby helping companies predict the kinds of products and services in which consumers may be interested. The transition from smartphones to the Internet of Things ('IoT'), where devices such as thermostats, refrigerators, cars etc. will be directly connected to the Internet will increase the types of devices through which companies may gain access to valuable consumer data. The importance of social media may also promote new approaches in understanding the formation of consumer preferences and, in particular, their interdependent character with the idea being

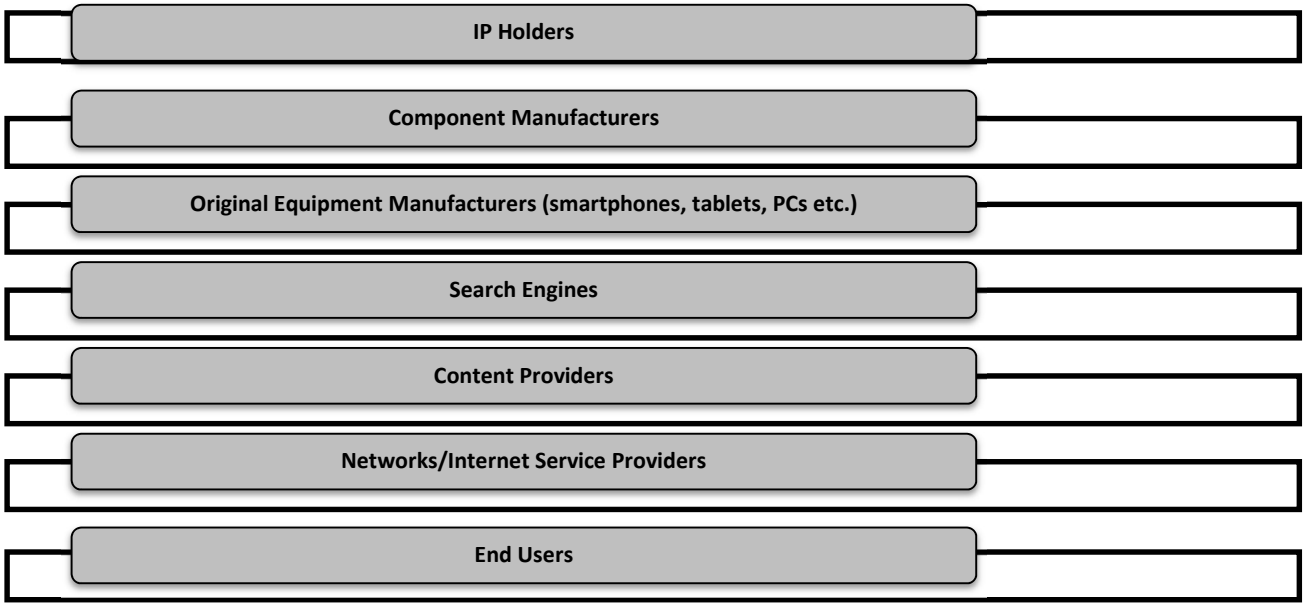
[30] C. Mulligan, "Blockchain Will Kill The Traditional Firm", (*imperial.ac.uk*, 16 October 2017), <https://www.imperial.ac.uk/business-school/knowledge/finance/blockchain-will-kill-the-traditional-firm/>.
[31] Commission Staff Working Document, "Online Platforms", Accompanying the Document Communication on Online Platforms and the Digital Single Market, SWD/2016/0172 final, 10, noting that "the larger proportion of the EU population now accesses the Internet via mobile phones than via laptops or other devices".
[32] Ibid, 10.

that individual preferences are influenced by the preferences of other individuals, an idea that mainstream economic theory has rejected thus far.[33]

One cannot help but notice the strategic position of digital platforms. They often act as gatekeepers for the Internet as they enable direct interactions between groups of users. The significant amount of intellectual property rights ('IPRs') they hold over technology and their control over and possession of data ('big data' and 'smart data'), may enable lead companies to control global digital value chains from which they can extract an important share of the total surplus value generated. These companies benefit from 'network effects' – the value of the services they provide increases with the number of users and this, in turn, contributes significantly to digital value creation, notably through data accumulation. These multi-sided platforms rely on a great variety of business models.

Digital value chains rely on multi-sided platforms that provide a medium through which one set of platform customers delivers value to another set of platform customers. Platforms tend to develop business models that take advantage of these interdependencies of demand between distinct groups of customers.

Figure 1: An Example of a Digital Value Chain[34]



[33] See, for instance, the discussion in S. Drakopoulos, "The History of the Mainstream Rejection of Interdependent Preferences", (2012) 34(4) *Journal of the History of Economic Thought*, 541.
[34] This depiction of the value chain is, of course, simplified for presentation purposes as many more layers can be added depending on the circumstances of the industry.

The concentration of the search engine and web directory segment of the value chain may raise some concerns in view of its gatekeeping role with regard to the access of end users to content on the Internet. Search engines have been monetising search through a variety of different revenue streams, primarily, advertising and providing search results for third party sites. The markets for search-based and online advertising have a number of specific features that set them apart from most markets. These features include network effects, double-sidedness and high levels of R&D and innovation. There are certainly some positive network effects, in view of the improvement of algorithmic results following the increase of end users' searches. It is also possible to advance the existence of indirect network effects as advertisers consider a search engine with a greater number of end-users as being more valuable.

The structure of the search engine market and its pricing/quality strategies have certain distinctive features. The search engine acts as a platform intermediating between content providers (who want users), users (who want content) and advertisers (who want users). Closely related to this interconnected structure comprising these distinct groups is the associated pricing structure in which users enjoy the search service for free whilst advertisers are required to pay positive prices to feature on the results provided by the search engine services (at least with regard to sponsored or paid links) and whilst content providers are subsidised by the search engine. Thus, prices and profits on two-sides are linked. These features of the search engine market call for the application of two-sided market models. Whilst a positive price is only set for one of the three groups, specifically for advertisers, quality competition plays an important role with regard to the relationship between: (i) a search engine and its users and, (ii) a search engine and content providers via the intermediary of users. In relation to (ii) the higher the quality of the search engine, the more users it will attract and, thus, the more valuable it will be for content providers.

Furthermore, search engines are different from other websites because of their crucial gateway role. From the perspective of advertisers, users of search engines are more valuable than users of any other websites because they provide important information about both themselves and their intentions through their search query. Search engines act as information gatekeepers. They not only provide information on what can be found on the web (modern, online equivalent of the yellow pages) but are also an essential first-point-of-call for anyone venturing onto the Internet. Search engines retain an important amount of information about their customers and advertisers.

Utilising this information allows search engines to increase the relevance of their advertisements and this increased relevance, in turn, means increased value to those who wish to advertise. Hence, the quality of matching and the quality and the relevance of search results are valued not only by users of the search engine but also by advertisers. These arguments imply that the quality of the search itself and the relevance of the search results supplied play a crucial role for both consumers and advertisers. Entry into the search engine segment of the value chain is relatively difficult. Some authors contend that search engines present some characteristics of natural monopolies as their cost structure involves important fixed costs, such as hardware, support, updates, monitoring, but almost zero marginal costs on both the user and advertiser side of the market.[35] This reinforces the tendency of this market towards being concentrated. The search engine market is highly concentrated with the pre-eminent player, Google, which is owned by Alphabet, disposing of an important and substantial share (more than 90%) of the search/query volume. However, it is not clear if this, the search/query market, can be defined as the relevant market for competition law purposes as one may also opt for the market encompassing general Internet search or the market for search advertising, in view of the fact that search is free and that the main revenue stream is advertising, or for the market for comparison shopping services, in which case Amazon may compete with Google in the category of 'product search'.

Google has diversified its activities in search-related activities, such as digitising documentary collections of certain university libraries and private editors (Google Books), offering new specialised search engines relating to News (Google News), price comparison websites (Google Shopping), maps (Google maps), videos (YouTube), the Internet browser (Google Chrome), online applications (such as cloud computing) and other services and applications (including technologies for marketing and disseminating advertising, such as DoubleClick).

Possible strategies that might reinforce this trend towards concentration are considered to be exclusionary practices. Such practices include, but are not limited to: discrimination or refusals to deal with competitors downstream (if the search engine is vertically integrated to specialised search or other services/products), anti-competitive capacity building or passive investment in competitors' business, practices reducing multi-homing by advertisers in the form

[35] R. Pollock, "Is Google the Next Microsoft? Competition, Welfare and Regulation in Online Search", (2010) 9(4) *Review of Network Economics*, 1.

of obstacles to the simultaneous use by advertisers of several search-based ads platforms, tying and bundling, among others.

The search engine is not the only 'bottleneck' through which a digital platform may take hold in order to leverage its economic power in relation to other segments of the value chain. In theory and (based on some evidence) in practice, bottlenecks may arise at all possible points of control of the Internet.[36] App store centres constitute the first type of these new points of control, as Internet access through smartphones, rather than browsers, has gained traction thereby enabling "the majority of Internet-mediated practice" to be undertaken "with devices that are either narrowly customizable appliances or controlled on the app store model".[37] The move to wireless cellular networks and cable broadband offers further possibilities in comparison to the old copper network concerning the identification of Internet users and their usage and the development of monetisation strategies in relation to Internet access, which is now controlled by a limited number of players.[38] The rise of cloud computing that emerged in order to provide co-location services for data storage and computation is controlled by a few firms with resources (including control over data) moving away from end-users and towards centralised systems that possess huge processing power and storage capacities.[39]. The shift towards the Internet of Things ('IoT') will further revolutionise the Internet. For the first time, it will make the 'unconscious' use of the Internet possible and will offer a new point of control to the extent that most of Internet use will occur through smart devices taking action on their own without any direct human intervention. Indeed, those that control these devices will control Internet *use*, not just Internet access.

However, that which is most important are the strategies employed by the few players who have come to control the bottlenecks in these points within the chain and the vast amounts of information generated by Internet use.[40] There are various competition law issues that may arise concerning the control of an essential bottleneck for competition law purposes. Traditional

[36] On Internet's various points of control and power, see J. Benkler, "Degrees of Freedom, Dimensions of Power", (2016) 145(1) *Daedalus*, 18.
[37] *Ibid*, 21.
[38] Ibid.
[39] P. de Filippi and S. McCarthy, "Cloud Computing: Centralization and Data Sovereignty", (2012) 3(2) *European Journal for Law and Technology* observes that "cloud services, whether they are infrastructural, platform-based, or software as a service, present a fiction of decentralisation to the user in the form of network effects, while the service is increasingly operated by large companies that leverage their position to limit interoperability. Because of their dominant position, large service providers can exert a degree of subjugation never conceived of by smaller and more local services, and a degree of control that would be impossible in a peer-to-peer network".
[40] This process and strategies are well described in T. Wu, *The Master Switch: The Rise and Fall of Information Empires* (First Vintage Book, 2011) and T. Wu, T*he Attention Merchants: The Epic Scramble to Get Inside Our Heads* (Penguin, 2016).

approaches followed in competition law, for instance, market definition, may fail to adequately map and address such issues.[41] Big data may also constitute a barrier to entry that can be used strategically to exclude competitors and prevent competition in various markets for which data constitutes an essential input.[42] Although there have not been any exclusionary antitrust cases with regard to the exclusionary potential of big data-related conduct by competition authorities in Europe, this likely eventuality should not be excluded.[43]

Furthermore, it is possible that privacy breaches, discrimination and exploitative contracts may be facilitated by the control of big data with companies interchanging individualised offers on the basis of the information they acquire on individuals' willingness to pay based on their past browsing history or other personalising factors, thus, leading to different prices charged to various customers for homogeneous products (i.e. 'online personalised pricing').[44] Certain competition authorities have opened investigations into whether these practices represent an abusive imposition of unfair conditions on users.[45]

It will be crucial to consider the bottlenecks that may emerge in the future, in particular, in the IoT and/or Internet of Services and the Cloud, which are all quite significant, especially given the importance of the transition to Industry 4.0 and the possible strategies that may be adopted by the incumbents controlling digital platforms. It would also be particularly interesting to reflect on the respective role of competition law and regulatory alternatives in this context.

IV. Competition Law, Regulation and Alternatives

Some jurisdictions have been concerned by the transformation of these digital platforms into important gatekeepers for various economic activities in the digital economy[46] and by their

[41] I. Graef, "Market Definition and Market Power In Data: The Case Of Online Platforms", (2015) 38(4) *World Competition*, 473.
[42] D. Rubinfeld and M Gal, "Access Barriers to Big Data", (2017) 59 *Arizona Law Review*, 339.
[43] Autorité de la Concurrence and Bundeskartellamt, Competition Law and Data (16 May 2016), 17–20.
[44] See *Ibid*, 21–22; A. Acquisti and H. Varian, "Conditioning Prices on Purchase History", (2005) 24(3) *Marketing Science*, 367; Office of Fair Trading ('OFT') "Personalised Pricing: Increasing Transparency to Improve Trust", (2013) Report 1489, also found evidence of search discrimination, targeted discounting and dynamic pricing (use fluctuations in demand to change the prices of products depending on availability); A. Ezrachi and M. Stucke, "The Rise of Behavioural Discrimination", (2016) 37 *European Competition Law Review*, 484; A. Ezrachi and M. Stucke, *Virtual Competition* (Harvard University Press, 2016), Chapter 12; M Bourreau, A. de Streel and I. Graef, "Big Data and Competition Policy: Market Power, Personalised Pricing and Advertising", (2017) CERRE Project Report.
[45] The (German) Bundeskartellamt, "Bundeskartellamt Initiates Proceedings Against Facebook on Suspicion of Having Abused its Market Power by Infringing Data Protection Rules", (*bundeskartellamt.de*, 2 March 2016) <www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2016/02_03_2016_Facebook.html>.
[46] See EU Communication on Digital Platforms of 25 May 2016 (COM(2016)288 final), 12, noting that "as online platforms play an increasing role in the economy, the terms of access to online platforms can be an important

ability to leverage their economic power (power which results from controlling resources such as big data, advanced algorithms and artificial intelligence, on which the new model of economic production depends) in various domains of activity, including the capture of an even higher percentage of the total surplus value of the respective value chain. Algorithmic firms may harvest an immense technological and, ultimately, economic power differential vis-à-vis their non-algorithmic rivals. Would domain expertise enable these firms to resist the technological prowess of digital platforms? What would be the appropriate role for competition law in this context? Should competition law be enforced when digital platforms adopt exclusionary practices that may stifle the capacity of non-algorithmic firms to innovate or to develop independent technological capabilities and, thus, limit their technological dependence on them but by doing so improve their own efficiency? Control of (personal) data by these digital platforms may also affect privacy.[47] More generally though control of such data may also have an impact upon the democratic process,[48] thereby leading to the emergence of an entrenched dominant position or oligopolistic market structure over an essential social good, that of information, which is required for the proper functioning of democratic debate. Such control may also provide the 'Big Five' with important economic and/or political and/or cultural power.[49] Should competition law also address these concerns? Or should these concerns be resolved through the use of other tools, such as different forms of regulation on issues such as platform-to-business, net neutrality, interoperability etc.? Or should even more informal ways be employed to deal with the concentration of power held by digital platforms, such as codes of conduct and self-regulation? These questions may explain the recent focus of competition authorities in Europe on leveraging practices; they seek to ensure 'equality of opportunity'

factor for online and offline companies. For SMEs and micro-enterprises, some online platforms constitute important, sometimes the main, entry points to certain markets and data".

[47] See European Data Protection Supervisor*, "*Privacy and Competitiveness in the Age of Big Data: The Interplay Between Data Protection, Competition Law and Consumer Protection in the Digital Economy", (2014) Report; Autorité and Bundeskartellamt, (42); US Federal Trade Commission ('FTC'), "Big Data – a Tool for Inclusion or Exclusion?", (2016) Report. Some public authorities have also looked at these questions when exploring the changes brought by platform competition, see: European Commission, "Online Platforms and the Digital Single Market Opportunities and Challenges for Europe", (2016) Report, COM/2016/0288 final; House of Lords, "Online Platforms and the Digital Single Market"**,** (2016) House of Lords Paper, 129; Organisation for Economic Co-operation and Development ('OECD'), "Big Data: Bringing Competition Policy to the Digital Era", (2016) Report DAF/COMP(2016)14.

[48] See, for instance, the debate about 'fake news' being an 'antitrust problem': S. Hubbard, "Fake News Is A Real Antitrust Problem", (2017) *Competition Policy International*; S. Sacher and J. Jun, "Fake News is Not an Antitrust Problem", (2017) *Antitrust Chronicle*.

[49] These are Alphabet, Amazon, Apple, Facebook and Microsoft.

between economic operators.[50] Competition authorities have also recently focused on ideas to regulate platform-to-business relations from a fairness perspective.[51]

With regard to net neutrality, public authorities have not limited their action in the search engine segment. They have not sought to limit the action they pursue in order to protect content providers regardless of their segment being the most competitive segment of the digital value chain because of its low costs of entry and the absence of natural monopoly characteristics. Rather public authorities have sought to act in the aforementioned segment and have sought to regulate the other segment with which content providers interact, specifically the network segment, in which Internet service providers ('ISPs') operate and which presents some natural, monopoly-like characteristics given the important fixed costs one needs to incur for the last mile service, plant wiring (or fiber) linking the premises with the content delivery network.

Network neutrality policy aims to: (i) regulate ISPs and ensure equal treatment of data traffic being transmitted over the internet, (ii) prohibit ISPs from blocking or slowing down Internet traffic unless this is to comply with a legal order, (iii) ensure network integrity and security, and (iv) manage congestion. The policy is broadly intended to prevent network operators from gaining an advantage because of the structure of the market (i.e. their commercial bonds with downstream operators) to affect competition in either the market of reference or in related markets. The principle of net neutrality was enshrined in EU law by Regulation 2015/2120 (also called the Telecom Single Market ('TSM') Regulation). The TSM Regulation encompasses common EU rules on net neutrality.[52] According to these rules, there can be no blocking, limiting nor discrimination of internet traffic by ISPs; this prohibition effectively denies ISPs the possibility of selecting who wins and who lose on the internet and/or of deciding which content and services should be made available to whom.[53] Given the inherent vagueness of the TSM Regulation, it has been argued that competition law should be used as an interpretative tool in reaching the objectives set out in the regulation.[54] Some authors argue that competition law has the right standards of analysis on how the 'non-discrimination' principle (which stands at the basis of net neutrality) should be enforced while maintaining the

[50] See European Commission, Case AT 39.740 – *Google Search*, [332] and [334].
[51] See European Commission, "Inception Impact Assessment, Fairness in Platform to Business Relation, Ares(2017)5222469", (2017) Report.
[52] Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 Laying Down Measures Concerning Open Internet Access, [2015] OJ L310/1.
[53] For more information on these rules, see European Commission, "Open Internet Policy", (*ec.europa.eu*, 24 July 2018) <ec.europa.eu/digital-single-market/en/open-internet-net-neutrality>.
[54] P. Alexiadis, "EU Net Neutrality Policy and the Mobile Sector: The Need for Competition Law Standards", (2016) 3 *Concurrences Review*, 1.

right level of flexibility with which *ex ante* regulation is not necessarily concerned.[55] *Ex ante* regulatory intervention would be justified if its benefits outweigh its costs. It would be important to avoid a situation in which the inability of network providers to obtain a return would reduce their incentive to invest in the network level and infrastructure. *Ex post* competition law would, instead, allow network providers to gain returns (that can then be reinvested on infrastructure) in whatever way they seek, provided this does not distort competition dynamics. Furthermore, it is argued that *ex post* competition intervention will provide contend providers with greater flexibility to develop application-level innovation without the constraints of an *ex ante*, obstructive non-discriminatory regulation.[56] Other jurisdictions, like the US, have adopted net neutrality regulations only before subsequently abandoning them because of pressure from ISPs, allegedly, concerning the taking advantage of opportunities offered by the IoT to develop new business models, the possibility of discriminating between users and the costs required for funding the transition from 4G to 5G.[57]

Interoperability and open access policies, which may be implemented through competition law and/or sector-specific regulation, may also tame the power of digital platforms and open up bottlenecks thereby enabling the 'open innovation' process to take place. "Interoperability is a characteristic of a product or system, whose interfaces are completely understood, to work with other products or systems, at present or future, in either implementation or access, without any restrictions".[58] With regard to sector-specific interoperability or open access regulation, one may cite the example of financial services, where the UK Competition and Markets Authority ('CMA') paved the way towards 'Open Banking' by implementing a competition law remedy it had imposed in 2016, following the retail banking market investigation.[59] The Open Banking regulatory intervention requires the six largest deposit-taking financial institutions (i.e. banks) in the UK to enable personal customers and

[55] *Ibid*, 3.
[56] N. Garzaro and A. Garzaro, "EU Competition Law and the Telecoms Single Market: Network Neutrality in the Aftermath of the TSM Regulation", (2016) 23(1) *LESIJ*, 44.
[57] This is also explained by the degree of competition in the Internet Service Provider segment of the value chain, which, it is alleged, will increase as 5G wireless will compete with cable.
[58] B. Lundqvist, "Regulating Competition and Property in the Digital Economy – The Interface Between Data, Privacy, Intellectual Property, Fairness and Competition Law", (2018) Stockholm University Research Paper No. 54, 32, discusses the distinction between 'syntactic' and 'semantic' interoperability: "beyond the ability of two or more computer systems to exchange information (i.e. syntactic interoperability), semantic interoperability is the ability to automatically interpret the information exchanged meaningfully and accurately in order to produce useful accurate and neutral results as defined by the end users of both systems. To achieve semantic interoperability, both sides must refer to a common information exchange reference model".
[59] Competition and Markets Authority ('CMA'), "Retail Banking Market Investigation", (2016) Final Report, 441-461.

small businesses to share their data securely with other banks and third parties and to manage their accounts with multiple providers through a single 'digital app'. The regulatory intervention also provides them with more possibilities to compare financial services and products from competing providers, including account information service providers ('AISPs') and payment initiation service providers ('PISPs').

The interoperability of cloud computing services and heterogenous IoT platforms are also an important concern for competition authorities worldwide and has led some jurisdictions to consider specific interoperability and access policies in this context.[60] This, of course, also relates to the broader standardisation debate.[61]

Beyond the simple choice between competition and regulation, one may enhance the development of markets for data and a more active engagement of consumers via general,[62] or sector-specific,[63] policies of data portability. Such an institutional choice may depend on the conducting of a careful comparative institutional analysis for *each* jurisdiction which considers the capabilities of the competition authorities and /or courts in that individual jurisdiction as well as the capabilities of the institutions overseeing other legal fields that may have the potential to help in the regulation of digital platforms.

It has been argued that the return to some form of 'populist' antitrust may provide an adequate response to the current rise in the level of inequalities, particularly those generated by the prevalence of the network effects and 'winner-takes-most' dynamics of the digital economy.[64] Such an approach may be considered adequate for as long as the existence of market concentration, market power and declining labour share are among the principal causes of these inequalities. These inequalities may not necessarily be addressed through more aggressive competition law intervention in markets. Antitrust 'conservatives'[65] may find comfort with

[60] See, for instance, Deloitte, "Emerging Issues of Data Ownership, Interoperability, (Re-)Usability and Access To Data, and Liability", (2016) Study Prepared for the European Commission DG Communications Networks, Content and Technology; Deloitte, "Industry 4.0", (2016) Study for the ITRE Committee, European Parliament.

[61] See, European Commission, "Standardisation to Support Digitisation", (2017) Report from the Workshop; B. Lundqvist, "Standardisation for the Digital Economy – The Issue of Interoperability and Access Under Competition Law", (2017) 62(4) *The Antitrust Bulletin*, 710; W. Kerber and H. Schweitzer, "Interoperability in the Digital Economy", (2017) 8(1) *Journal of Intellectual Property, Information Technology and Electronic Commerce Law*, 39.

[62] In the EU, this is Article 20 of the General Data Protection Regulation (EU) 2016/679 ('GDPR').

[63] See, for instance, the recent proposals for an EU European Commission, Staff Working Document, "Impact Assessment", Accompanying the document Proposal for a Regulation of the European Parliament and of the Council on a Framework for the Free Flow of Non-Personal Data in the European Union, SWD/2017/0304 final - 2017/0228 (COD); European Commission, Staff Working Paper on the Free Flow of Data and Emerging Issues of the European Data Economy, COM /2017, 9 Final, cited by B. Lundqvist, (57).

[64] L. Khan and S. Vaheesan, "Market Power and Inequality: The Antitrust Counterrevolution and Its Discontents", (2017) 11 *Harvard Law and Policy Review*, 235.

[65] By this expression I mean those that fear more Type I Errors (over-enforcement) than Type II Errors (under-

approaches that suggest the expansion of markets and the re-conceptualisation of property rights,[66] in order to deal with the 'complete markets assumption' problem that has always bedevilled equilibrium analysis in economics.[67] Equally, however, other approaches emphasising the role of countervailing bargaining power (specifically of final consumers and/or of other market participants) in order to neutralise economic power and its various sources have also been put forward.[68] The choice of the adequate approach will depend on the political economy of the specific jurisdiction, the comparative institutional analysis performed and the prior beliefs of policymakers. However, there is value in making these complex considerations explicit and providing some transparency as to the decision-making process so to respond to concerns expressed as to the use of competition law strategically and to the perceiving of discrimination against foreign firms.

V. Taking Into Account the 'Next-Generation' Competition in the Digital Economy

enforcement).

[66] See, for instance, the recent book by E. Posner and E. Weyl, *Radical Markets Uprooting Capitalism and Democracy for a Just Society* (Princeton University Press, 2018), which suggests a greater use of Harberger taxes and the end of the monopoly paradigm of property rights perceived as a right to exclude.

[67] The assumption that consumers may access a full set of insurance contracts and, thus, be protected against any possible idiosyncratic risk that may affect their individual consumption (e.g. loss of a job, accident, stock market boom or bust) deals with the inherent uncertainty of a market system, with contingent consumption claims being settled before uncertainty is revealed, and enables economists to assume that individual behaviour coincides with aggregate behaviour, thereby, greatly simplifying economic analysis and, consequently, the lessons that may be drawn for both individual and aggregate analysis just by studying either indifferently. For a critical discussion see, T. Jappelli and L. Pistaferri, "Complete Markets" in *The Economics of Consumption: Theory and Evidence* (edited by T. Jappelli and L. Pistaferri, Oxford University Press, 2017), 46.

[68] See, for instance, M. Gal and N. Elkin-Koren, "Algorithmic Consumers", (2017) 30(2) *Harvard Journal of Law and Technology*, 309, which advances the possibility of consumers to also turn algorithmic and, thus, tame the technological power of algorithmic firms. Other suggestions, which also implement this countervailing power narrative, include the call for wider exceptions for collective bargaining of the self-employed when such persons are economically dependent on digital platforms, in particular, to protect those working in the gig economy who may not be within the protective scope of labour law (for a discussion, see European Parliament Report, (21), which finds that "the greater the level of financial dependence [of the labourer] on platform work, the lower the access that workers have to social protections"). The news media industry has also invoked the countervailing power narrative in order to ask for antitrust exemptions on collective bargaining with digital platforms: The Guardian, "News Media Alliance Targets Facebook and Google in the Fight Against Fake News", (*theguardian.com*, 10 July 2017) <https://www.theguardian.com/media/2017/jul/10/news-media-alliance-targets-facebook-and-google-in-fight-against-fake-news>, which notes that the News Media Alliance, which represents 2000 news organisations, would need an exemption from antitrust law to be able to negotiate as a group with digital platforms, such as Google and Facebook. Another similar suggestion concerns the ability of search engines' users to resort to collective bargaining with digital platforms: see I. Ibarra, L. Goff, D. Hernandez, J. Lanier and E. Weyl, "Should We Treat Data as Labour? Moving Beyond 'Free'", (2017) 1(1) *American Economic Association Papers and Proceedings*.

In addition to the necessary adjustments that need to be made in the implementation of competition law in the digital economy, some express the view that the fundamentals of the competitive game have changed with the advent of the digital economy and that we need a more serious effort to re-conceptualise competition law so that this area of law continues to be relevant from the perspectives of both technology and business.[69] Some authors have referred to the competitive game taking place in the digital economy as 'next-generation competition' or 'turbo-charged competition'.[70] Hence, the question raised is whether we do, in fact, need a 'next-generation competition law' or a 'turbo-charged competition law' to deal with competition in the digital economy? This Section shares some reflections as to what has significantly changed from the competition times of old and the possible implications for competition law and the work of competition authorities.

A. 'Winner-Takes-Most' Competition, Value Capture and Value Chains in the Digital Economy

Strong network effects, which have led to the rise of the digital economy and the multi-sided markets strategies of digital platforms have, in turn, increased the number of instances in which distinct products or services, previously considered to form separate relevant markets, are considered to be a package of complementary products and technologies, which form a system competing with other systems (i.e. 'systems competition').[71] The value of the relevant product does not depend solely on the number of persons who adopt it but also on the adoption of some complementary products that are bundled/packaged with the first product. Network effects lead to collective switching costs and lock-in effects, which reduce competition and may entrench the dominant position of the winner for a significant period of time. Multi-sided effects may transform 'systems competition' to 'platform competition'.

Firms are quite imaginative in their business models, sometimes distributing the product for free to one side of the market, thereby inducing more users to join the network, which, in turn, increases the value of the product for other users situated on the paying side of the market, with the platform facilitating the interaction between two or more different groups of customers

[69] See, for instance, I. Lianos, "Polycentric Competition Law", (2018) UCL CLES Research Paper 4/2018).
[70] D. Teece, "Next-Generation Competition: New Concepts for Understanding How Innovation Shapes Competition and Policy in the Digital Economy", (2012) 9 *Journal of Law & Policy*, 105-106.
[71] M. Katz and C. Shapiro, "Systems Competition and Network Effects", (1994) 8(2) *Journal of Economic Perspectives*, 93.

(referred to as two- or multi-sided market platforms).[72] They may also use various business practices, such as penetration pricing where they charge low prices (even below their costs) to gain market share, or strategically bundling their products in order to gain a foothold in another market which they can then use as a basis for expanding their presence in that market. In these markets, it is possible that firms may incur losses for a significant period of time in order to invest in acquiring market share, either through natural growth or by buying out actual or potential competitors through mergers and acquisitions, or to be considered as constituting one-stop-shop solutions or essential platforms for various groups of customers.[73]

Competition between firms takes unexpected forms, such as competing for consumers' attention and then profiling these consumers and using algorithms in order to predict, and possibly manipulate, their behaviour.[74] It has been alleged that personal data harvesting techniques have enabled digital platforms to create 'digital replicas' of our personalities, that is a "digital representation of an individual, object, or asset" that has been "constructed based on [how] an individual, object, or asset interacts with its environment". These platforms have access to various facets of their users' personality, for instance "how they interact with a whole host of appliances and other objects in their homes", information that 'industrial-age firms' specialising in a specific industry were not able to, or even interested in, use when designing or marketing their product.[75] Other authors have predicted that the harvesting of users' data will be done "during [the] earlier, consumer-oriented stages of development" in order to build artificial intelligence ('AI') capacity, which "once built, this [AI capacity] can be lucratively rented out to governments and companies", thereby engendering competition in relation to the provision of AI services.[76] These developments require a renewal of the theoretical frameworks used thus far used by competition economics for traditional markets as well as a clear

[72] See our analysis in Chapter 3.
[73] For an example of this strategy see, L. Khan, "Amazon's Antitrust Paradox", (2017) 126(3) *Yale Law Journal*, 564.
[74] F. Pasquale, The Black Box Society – The Secret Algorithms That Control Money and Information (Harvard University Press, 2015).
[75] B. Iyer, M. Subramanian and U. Rangan, "The Next Battle in Antitrust Will be About Whether One Company Knows Everything About You", (2017) *Harvard Business Review*. The authors note that access to the digital replicas of consumers will lead to 'new-age' monopolies. They explain that "such new-age monopolies may not be visible through traditional industry concentration measures but they will wield tremendous influence over consumers. Their allure will be their ability to provide unprecedented personalisation based on the information they hold. Yet with such personalisation, customers may be restricted to see only what the provider wants them to see".
[76] See E. Morozov, "Will Tech Giants Move on From the Internet, Now We've All Been Harvested?", (*theguardian.com*, 28 January 2018) <https://www.theguardian.com/technology/2018/jan/28/morozov-artificial-intelligence-data-technology-online>.

understanding of business strategy. The sources of wisdom for competition law need to be widened beyond neoclassical price theory economics.[77]

However, this is not the only implication of the 'winner-takes-most' dynamic of platform competition. As indicated above, competition among platforms mostly takes the form of 'competition for the market', as important network effects lead to' 'winner-takes-most' competition, with the outcome being only one platform controlling a market or being the significant player on the relevant market (resulting in them being capable of restricting horizontal competition) or dominating the value chain (resulting in them being capable of restricting vertical competition). Thus, markets marked by platform competition are horizontally concentrated, sometimes to such an extent that the second or third player in the market may not offer a viable competitive alternative to the established platform with the result that inter-platform competition remains weak and that there is *significant inequality in the distribution of market shares* among horizontal competitors.

At the same time, the centralised platform forms a 'bottleneck' with the power to determine the allocation of the surplus generated by the value chain between the various contributors and the power to keep an overwhelming portion of this surplus, thereby, accumulating significant profits and exercising vertical economic power. In view of the anchoring and lock-in of users and the low levels of switching to competing platforms, platform operators can be confident that any reduction of vertical competition between the different segments of the value chain with regard to the allocation of the total surplus value generated by the value chain, will not lead to a significant number of applications developers deserting their platform. Hence, value chains dominated by digital platforms are also marked by a very unequal distribution of profits between the established platforms and participants in their ecosystem and the emergence of 'superstar' firms.[78]

Users are also unable to identify how much value they add to the platform's operations as one's transactional history is not public; this information is collected and stored by, and only accessible to, the relevant platform or online intermediary. This practice raises issues concerning fairness, issues which may influence the enforcement activity undertaken by some competition authorities. In this Chapter, I attempt to define the various dimensions of fairness

[77] On the importance, for instance, of other fields than economics see, among others, the special issues of the (2016) 61(4) *Antitrust Bulletin on Entrepreneurship and Antitrust*; and (2014) 59(4) *Antitrust as a Multi-Disciplinary Field*.

[78] D. Autor, D. Dorn, L. Katz, C. Patterson and J. van Reenen, The Fall of the Labour Share and the Rise of Superstar Firms", (2017) NBER Working Paper No. 23396.

and how this may be considered in competition law enforcement, particularly within the context of the digital economy.[79]

As the focus shifts to considering the processes of value creation and value sharing, new tools need to be developed in order to map out the complex horizontal and vertical competitive interactions between firms. The value chain approach enables us to better understand the different steps of value generation and to explore whether such an appraoch is efficient, in the sense of promoting innovation and productivity, and whether it is fair, in the sense of rewarding economic productivity and investment.[80]

B. The Changing Dynamics of Competition: From Competition to Co-opetition, from Competitive Advantage to Architectural Advantage

Traditional (i.e. 'old-generation') antitrust perceives competition as taking place in markets with the concept of the 'relevant market' being a hallmark of 'modern' competition law analysis. Competition can be 'in the market' or, in the context of a 'winner-takes-most' or 'winner-takes-all' scenario (like in case there is a natural monopoly), competition can be 'for the market'. The fact that the concept of 'relevant market' has been criticised in recent times by economists,[81] who favour the direct assessment of assessment market power and consumer harm, such does not bring into question this fundamental tenet of competition law and its focus on rivalry on a marketplace nor does it bring into question the need to define a 'relevant market' for the purposes of a competition law assessment.[82] The idea is that the process of competition

[79] This may relate to: political fairness, vertical fairness (relating to the split of surplus between firms on the one hand - in the form of profits- and consumers on the other - in the form of consumer surplus), horizontal supply-side fairness (relating to the extent to which firms compete on a level playing field – think of interoperability and open access standards), horizontal demand-side fairness (relating to the distribution of surplus between different consumers (personalised markets) or different categories of consumers (vulnerable and old consumers) etc. For a discussion of these different dimensions of fairness, see M. Trebilcock and F. Ducci, "The Multi-Faceted Nature of Fairness in Competition Policy", (2017) *CPI Antitrust Chronicle October*.

[80] I. Lianos, "Regulating Digital Value Chains in Europe and Competition Law", (2019) UCL CLES Research Paper 1/2019.

[81] Professor Kaplow called into question the practice of 'market definition' arguing that it would be preferable to dispense with it altogether and instead try to measure firms' price-cost mark-ups directly: L. Kaplow, "On The Relevance of Market Power", (2017) *Harvard Law Review*; L. Kaplow, "Market Definition, Market Power", (2015) Harvard Law School, Discussion Paper No. 826; L. Kaplow, "Why (Ever) Define Markets?", (2010) 124 *Harvard Law Review*, 437.

[82] G. Werden, "Why (Ever) Define Markets? An Answer to Professor Kaplow", (2013) 78(3) *Antitrust Law Journal*, 729.

and free markets, whether in product or technology (in case an IP right is involved) markets, rewards people according to their individual efforts/initiatives and economic productivity.

Competition may take different forms. The most common form is the acquisition of a cost-advantage vis-à-vis other undertakings in the same relevant market. Focusing on costs makes sense if the dominant facet of competition in the relevant market concerns price, which is often the case in most traditional markets. Conversely, in the digital economy, competitive interactions are quite complex. The notion and distinction between an 'established' or 'potential' competitor becomes blurred in the context of the digital economy because economic entities are actively pursuing strategies to alter the relevant industry's structure in order to alleviate competitive pressures to its own benefit; this involves positioning the firm where competition, horizontal and/or vertical, is the weakest.[83] In traditional strategy analysis, competing entities (most often corporations) seek a competitive advantage, either by imitating successful competitors while lowering their costs or by differentiating themselves from their competitors by developing idiosyncratic resources and capabilities and designing strategies to exploit these differences.

Competition economics has largely focused on horizontal competition from established competitors producing substitute products and on the threat of entry of potential competitors. Rivalry between established competitors is often measured by reference to the market share of the largest producers in a specific market in order to determine the level of market concentration, which is often measured by a concentration ratio. In contrast, vertical competition has rarely been the focus of competition economists despite its potential to play a significant role with regard to the allocation of the total surplus value generated by a value chain. The relative bargaining power of a supplier upstream or of a customer downstream have been considered to be less important than issues arising in horizontal competition because it is assumed that, in most cases, vertical competition-related issues do not affect the overall economic efficiency of transactions. Thus, in mainstream competition economics, the objective of which is to achieve economic efficiency rather than fairness in the distribution of the total surplus value, the exercise of relative bargaining power is not considered to be problematic for competition law unless such would harm economic efficiency (e.g. the rather confined case of monopsony or buyer power). Vertical competition may, however, become an important concern, if one focuses on the productivity and ability of 'superstar' large digital platforms to

[83] R. Grant, *Contemporary Strategy Analysis* (Wiley, 2013), 74-76.

pull away from competition and enjoy tremendous levels of profitability, without these accumulated profits being used for productive investments.

Furthermore, to fully understand the competitive strategies pursued in the digital economy in this era of financialisation, one must consider the product and technology markets in which these strategies are employed alongside the financial markets dimension inherent in these competitive strategies. Valuation by financial markets plays a significant role in determining the competitive strategies pursued by digital platforms; the most important driver of value creation is not based on net cash flows and expected short-term profits but on there being "pots of gold" found far into the future.[84] This section engages with the financial markets dimension more fully in order to better understand the competitive strategies of firms in the digital economy and develop operational concepts that might be useful for competition law analysis. The important role of financial markets in the development of the digital economy and the monetization of digital inputs also shifts attention from the traditional focus of competition law on competition within an industry, to competition between industries with capital (in the sense of value-enhancing activity, which does not constitute labor) moving from one industry to another in search of higher profits.

In addition to these competitive strategies taking place in product, technology or financial markets that engage directly with the actual and potential sources of competition, a firm may also acquire a durable competitive advantage if it holds a position that enables it to reshape the 'industry architecture' to its own advantage. The concept of 'industry architecture' follows Teece's seminal contribution on who profits from innovation and how the various governance arrangements between the innovator and other vertically-related firms may influence the distribution of these innovation gains.[85] According to Jacobides et al., "the concept of industry architecture describes how labour is typically organized and structured within an industry ('who does what') and which firms capture value and profit as a result ('who takes what')".[86] Being in a position to influence the way in which the industry is organised/structured and the value allocation between the industry (or ecosystem) actors provides a firm with an 'architectural advantage'. Such an advantage may serve as important

[84] See The Economist, "Are Technology Firms Madly Overvalued?", (*economist.com*, 23 February 2017), <https://www.economist.com/business/2017/02/23/are-technology-firms-madly-overvalued>.
[85] D. Teece, "Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy", (1986) 15 *Research Policy*, 285.
[86] M. Jacobides, "Industry Architecture" in *The Palgrave Encyclopaedia of Strategic Management* (edited by M. Augier and D. Teece, Palgrave Macmillan, London, 2016).

source of sustainable yet abnormal profits. This is most likely the reason underlying the 'architectural fights' which have characterised the development of all industries .

Industry architecture is framed by the various economic actors at the birth of a new industry. These new players define the interfaces (technological, institutional and/or social) that allow different entities to co-specialise and divide labour.[87] Competition to become the industry architect has played a crucial role in periods of profound technological transformation, such as the development of new general purpose technologies in which new technologies that confer significant advantages, such as reducing costs or increasing productivity, are progressively integrated into the production processes employed in a specific industry.[88] These technologies offer a higher rate of return on investment. Furthermore, in the context of the inter-industry competition, these technologies often attract capital from other industries, which is one of the primary characteristics of financial capitalism.[89] As the industry matures, it is possible to observe the emergence of 'winners', i.e. actors who strive to frame the industry architecture in their own advantage by developing complex strategies. The objective of these strategies is to capture a disproportionate amount of the surplus value created by the innovation. This may happen by acquiring a bottleneck and converting it to abnormal profits. However, as the focus shifts from competition concerning prices to the more complex issue of capturing value, the competitive strategies of firms may also change. Value may not only be captured from other (weaker) members of the value chain but it may also be created through a process of 'co-specialisation', a process which very much characterises the way in which the digital economy operates.

Focusing on the appropriation of value from other value chain participants is sensible if one conceptualises competition, whether it be horizontal or vertical, as essentially a process that occurs on product or technology markets and focuses on capturing value through the protection and/or leveraging of innovation. However, value may also be created by "investing in assets that will appreciate"[90] and will, thus, increase the market value of the firm from the perspective of financial markets. There has been a "subtle shift of mindset from profit (and isolating mechanisms) to wealth creation (and the potential for asset appreciation)", which explains why an industry architect may sometimes favour imitation by competitors – even if

[87] Ibid.
[88] C. Ferguson and C. Morris, "How Architecture Wins Technology Wars", (1993) 71(2) *Harvard Business Review*, 86.
[89] See A. Shaikh, *Capitalism: Competition, Conflict, Crises* (Oxford University Press, 2016).
[90] M. Jacobides, T. Knudsen and M. Augier, "Benefiting From Innovation: Value Creation, Value Appropriation and the Role of Industry Architectures", (2006) 35 *Research Policy*, 1201.

imitation reduces profitability, an industry architect may permit this provided that such increases the value of the underlying assets.[91]

In situations where a system of 'open innovation' is considered to be the most effective way to generate higher value in the relevant industry, the optimal strategy to adopt will be to opt for one that promotes 'open architecture' and seeks to nurture complementarity through an open eco-system. In other situations, firms may prefer to opt for a 'walled garden approach'; they may opt for a closed architectural system, with regard to firms with competing assets and capabilities entering the value chain, whilst maintaining an open one for firms with complementary assets. Finally, in other situations, firms may opt for a strategy that is wholly closed architecture-centric; that of 'vertical integration'. By pursuing a strategy of vertical integration, firms can take full control over the rents generated by the complementarities brought by the innovation and can maintain the possibility of excluding or marginalising any new entrant, for instance, by denying interoperability with regard to some indispensable technological interfaces.

In this 'co-opetition framework',[92] business is neither a 'winner-takes-all' game nor a 'winner-takes-most' game, as the industry architecture should be conceived by all economic actors as being 'fair' in order for them to maintain their incentives to participate in it and for the relations between the various firms forming the eco-system to maintain some form of stability[93].

This raises interesting questions as to the space in which competitive interactions take place to capture or create value, which, in view of the complexity of the competitive strategies that I highlighted above, cannot be solely limited to the relevant market. It will be important to think of these other spaces of competition and consider whether competition authorities should adopt new operational concepts that are capable of accounting for these new competitive spaces.

C. From Markets to Platforms and to Eco-systems

[91] *Ibid*, 1212.
[92] B. Nalebuff, "Co-opetition: Competitive and Cooperative Business Strategies for the Digital Economy", (1997) 26(6) Strategy and Leadership, 28.
[93] For the importance of fairness in order to keep stable a social equilibrium, see K. Binmore, *Natural Justice* (Oxford University Press, 2005), 3-14, which takes an 'evolutionary' approach to social contract theory, advancing that a social contract may be "internally stable" if it combines efficiency and fairness.

The Internet era gave rise to many online intermediaries and digital platforms controlling and orchestrating value-generating ecosystems that not only offer products and online services but also provide the infrastructure and tools on which other platform businesses are built. At the same time, the development of Big Data and multi-sided markets strategies have raised questions and cast doubt on the sole focus of the assessment undertaken by competition law concerning the definition of the relevant market. How could one proceed to delineate a market in a world in which the possible personalisation of production means that consumers can themselves become the designers of the individually-customised products they consume with the products being produced by 3-D printing and robots? Will firms be competing mainly on the market for personal information? What will serve as the raw material on which personalised production will be based? Competition law analysis needs to consider, when assessing competitive constraints, the type of competition taking place in the specific 'field'. Competition can be *for* the market as well as *in* the market. Platform or system competition characterises a lot of competitive interactions in the network economy. The shift from competition and value capture to mixed strategies of value capture and value creation, involving strategies of co-opetition, indicates that an additional 'field' of competition-related activity should also be added: that of the 'eco-system'.

Developed in the early 1990s,[94] the concept of an 'ecosystem' has been defined in broad terms as "a group of interacting firms that depend on each other's activities".[95] Teece notes that a characteristic of eco-systems is their 'co-evolution' in the sense that the "attributes of two or more organisations become more closely complementary", "the system being typically reliant on the technological leadership of one or two firms that provide a platform around which other system members, providing inputs and complementary goods, align their investments and strategies". Teece also notes that 'co-creation' is a characteristic of eco-systems as two or more organisations "combine forces to pioneer new markets".[96] Adner observes that "the ecosystem is defined by the alignment structure of the multilateral set of partners that need to interact in order for a focal value proposition to materialise". Adner proceeds to define this 'alignment structure' as "the extent to which there is mutual agreement among the members regarding positions and flows".[97] The concept of 'eco-system' has emerged as the dominant idea for

[94] J. Moore, "Predators and Prey: A New Ecology of Competition", (1993) 71(3) *Harvard Business Review*, 75.
[95] M. Jacobides, C. Cennano and A. Gawer, "Towards a Theory of Ecosystems", (2018) 39 *Strategic Management Journal*, 2255.
[96] Teece, (69), 105-106.
[97] R. Adner, "Ecosystem as Structure – An Actionable Construct for Strategy", (2017) 43(1) *Journal of Management,* 42.

depicting the competitive environment in the modern digital economy. The 'eco-system manager' determines the elements of the value chain that will need to be internalised and those which will be supported externally so as to capture value. Most studies on eco-systems focus on the role of the eco-system as a 'hub' of inter-firm relations taking place within the context of a platform, often referred to as the 'lead firm' or 'ecosystem captain', which "defines the hierarchical differentiation of members' roles and establishes standards and interfaces, a number of formal mechanisms, such as the management of standards and interfaces, platform governance, IP rights etc. forming the 'key tools that hubs use to discipline and motivate ecosystem members".[98] However, from a theoretical perspective, a platform eco-system has never been the only option even if, in practical terms, the platform model has become dominant – it is possible to imagine an eco-system in which power is neither concentrated in a hub nor governed by a platform but is distributed among various economic actors and stakeholders who will take decisions by consensus.

The essence of this new insight comes from the realisation that competition analysis should engage with the 'value capture' strategies put in place by economic actors competing for strategic or architectural advantage.[99] These should form the starting point of competition analysis, rather than the relevant market concept which no longer constitutes the sole reference point firms consider when devising their strategies and identifying the competitive constraints to which they are subject. Abandoning solely focusing on the relevant market concept also stems from the relatively more limited role of price competition in the digital economy. Firms often compete for customers in order to (i) enlarge their customer base, and/or (ii) take advantage of network effects and be perceived by financial markets as holding a 'bottleneck', even if such trade, from a price-cost perspective, may not be profitable. This struggle for a large customer base explains why firms continue to offer 'free goods', even if the gains in market share they obtain or their ability to harvest consumer data (personal data being the 'price' to pay for these 'free goods') may not be immediately monetised in data markets. However, capturing a large customer base at reduced or negative profitability is not the ultimate aim of these strategies. This strategy makes sense if, by acquiring a large customer base, firms are able to develop dynamic capabilities (for instance, the firm may use consumer data to enable it to

[98] Jacobides et al, (94), 2258-2259 and the literature review provided.
[99] D. Teece, "Business Models, Value Capture and the Digital Enterprise", (2017) 6(8) *Journal of Organizational Design*.

improve its algorithms). These benefits do not only materialise in the long-term but may also be enjoyed through a higher market valuation by the financial markets in the short-term.

D. Beyond 'Attention Markets' – Towards 'Personalised' Markets?

It is increasingly acknowledged that data collection is fundamental to firms' ability to compete in the future Internet of Things ('IoT'), Internet of Services ('IoS') and/or Internet of Everything. The firms that have obtained access to the largest amounts of data will benefit from a competitive advantage.[100] Data analytics connected to the use of software for predictive modelling, will also reinforce the competitive advantages of such firms, with this ultimately being crystallised in architectural advantage because of their control of 'idiosyncratic rent-earning resources' (i.e. in the form of superior algorithms) or, more generally, by their development of capabilities that cannot be imitated by competitors (because of increasing returns to scale).[101] With the advancement of the IoT and IoS and the possible emergence in the near future of the Internet of Everything, the amount of data that will be collected will increase immensely, including in industries that were not previously digital.

Much of this data will relate to the digital identity of the consumer and will enable companies to draw a pretty accurate individual preferences map for each of their clients. More than just an 'attention market',[102] firms will be able to develop bespoke products that suit the individual preferences of their consumers without incurring prohibitive costs as they will be able to achieve economies of scale by developing various series of products that could satisfy the entire demand function of the specific consumer in various product categories. In this era of 'mass personalisation',[103] these new conglomerates will not just control markets in the traditional sense but they will control the personalised markets of individual consumers on whom they hold a level of data superior to that held by other firms. This, in turn, will permit them to cater for the entirety of demands and needs of that individual, for instance, in consumer goods or entertainment.[104] Once a specific amount of data is harvested, these personalised markets will tip with the result that only one firm will have the capabilities to perfectly satisfy the individual consumer's demand in an array of products. Indeed, consumers will economise

[100] There is a discussion regarding the definition of 'data': does it encompass syntactic information, semantic information, or both; and where should one draw the line in reference to protecting 'data'? See Drexl, (5); Wiebe, (5).
[101] Jacobides et al, (6), 1386.
[102] On this concept, see Wu, (8); Evans (8).
[103] Deloitte, (7).
[104] See, for instance, Danziger, (9).

their time if they rely on the personalised made-to-order and customised-to-their-preferences offer of one digital platform or reseller that has been able to harvest their personal data and, from that, gain a greater understanding of their individual preferences map. Firms may then be able to organise the production process within their ecosystem. They may do this by limiting access to an individual consumer's profile to a number of firms that they control, either directly or indirectly, and such access will be dependent on this latter firm ensures their products fit the relevant consumer's specific preferences. Even assuming that consumer preferences may evolve and that the process of their formation is complex, and that some degree of competition may still be possible, it is clear that mass personalisation will increase demand stickiness and the ability of firms to exploit consumers whilst simultaneously reducing consumer surplus, product variety and consumer choice.

Some of these 'personalised markets' may well appear in the pharmaceutical industry through the development of personalised healthcare, precision medicine and smart healthcare. Changes brought about by developments in digital technology will transform the pharmaceutical and the medical services industries. Data and algorithms are important game-changers as they will enable the development of new 'beyond-the-pills' solutions. Firms will be able to combine drugs, sensors collecting information on the patient's condition and different sorts of data (early R&D data, digital medical records, including diagnostic results, medication history, genomic or gene-expression data, lifestyle data) to develop such solutions. Future medical service providers may be able to 'personalise' patient care, better identify optimal therapies, better predict the patient's response to treatment, as well as engage more fully with physicians, in particular, enabling them to draw from superior insights when making decisions.

The digital revolution will likely transform the pharmaceutical and health service industries beyond recognition in the same way the media, retail, transport and banking industries have been reshaped in recent years. The role of 'personal data', in particular 'genetic data' (such as gene expression data) and 'lifestyle data', in the delivery of personalised medical services and personalised medicine will change the current paradigm, which is very much based on the development of therapies that target an entire population. New digital and/or data-based business models will certainly develop on the basis of competitive advantage in accessing this pool of personal data. This, in turn, will enable the development of health and medical solutions tailored to the characteristics of a specific individual. Hence, it might be expected that the main industrial actors in this area in the future will not only be the pharmaceutical industry and biotechnology companies but also digital intermediaries, which may rely on their superior

technological (e.g. algorithms, specialised human resources etc.) and data-gathering capabilities in order to move to the centre of this new emerging health services ecosystem. This move may be based on their own initiative or be done in combination with other firms benefitting from expertise in a specific domain.[105]

In view of the 'intermediary power' some digital platforms may enjoy, to the extent that intermediaries dispose of privileged access to consumer data and/or of 'a significant ability' to steer consumers,[106] such platforms may acquire a unique level of access to and control over personalised data. This raises concerns over them being the sole source and controller of it in relation to further processes of data monetisation and commercialisation; or of multiple firms being the individual controllers over different sources of data, thus constituting 'data thickets'. The right of access to the data (i.e. through a request to the manufacturer, maker or generator of the data) will certainly constitute an important element in devising the public policy aim that should frame the principles that would apply in each regulatory framework. However, conceiving access to data as a right that any actual (and/or potential) business participant may stumble across raises considerable theoretical and practical difficulties, such as the issues of:

- ownership of this data (i.e. if data may be 'owned'),
- the business practices of firms holding the data limiting or conditioning access to it (i.e. hold-up situations in cases of split ownership),
- this information being subject to moral rights,
- this information being subject to rules concerning inalienability,
- regulatory prohibitions or limits to the sharing of personal data,[107] and

[105] Jacobides et al, (89), 1200.

[106] H. Schweitzer, J. Haucap, W. Kerber and R. Welker, "Modernising the Law on Abuse of Market Power", (2017) Report for the (German) Federal Ministry for Economic Affairs and Energy. For example, the German Competition Act was amended in 2017; it states that "access to relevant data is a potential source of market power". See also W. Kerber, "Digital Markets, Data, and Privacy: Competition Law, Consumer Law and Data Protection", (2016) *Gewerblicher Rechtsschutz und Urheberrecht Internationaler Teil*, 639-647. There are several authors who purport that holding big data does not equate to market power: G. Colangelo and M. Maggiolino, "Big Data as Misleading Facilities", (2017) Bocconi Legal Studies Research Paper No. 2978465. Generally, they argue that big data does not create a significant barrier to entry and they base their claims, inter alia, on the non-exclusive and non-rivalrous nature of data and a claimed ease of collecting it, while disregarding many potential entry barriers. Other scholars argue that the harm created by big data pertains mainly to privacy. Yet, these conclusions are based on the limited existing economic studies on big data, which often focus on one specific market (most commonly on search engines or personal data markets). See, for example, Rubinfeld and Gal, (41), 339; D. Tucker and H. Wellford, "Big Mistakes Regarding Big Data", (2014) 6 *Antitrust Source*, 10; M. Ohlhausen and A. Okuliar, "Competition, Consumer Protection, And the Right [Approach] To Privacy", (2015) 80 *Antitrust Law Journal*, 121; J. Cooper, "Privacy and Antitrust: Underpants Gnomes, the First Amendment and Subjectivity", (2013) 20 *George Mason Law Review*, 1129.

[107] This is particularly the case for "genetic data", which forms a "special category" under Article 9 of the GDPR. According to Recital 34 of the GDPR, "genetic data should be defined as personal data relating to the inherited or acquired genetic characteristics of a natural person which result from the analysis of a biological sample from the

- the technical means and way in which access to the specific data will be implemented and the transaction costs inherent in such (these costs are likely to be considerable).

One should expect that many of the actors operating in the digital pharmaceutical and health services industry will engage in extensive long-term collaborations in reference to the creation, the exchange and trade of data. These collaborations will likely be based on the high level of transaction costs and specificity of data and technological capabilities required by this industry in order for it to flourish. It should also be expected that various industry players will seek to control bottlenecks and, thus, preserve their ability to gain abnormal profits, even after the superior technological capabilities of which they currently dispose have dissipated in view of the diffusion of any necessary and relevant technologies among all players in this new ecosystem.

Indeed, pharmaceutical firms, especially the so-called 'Big Pharma' ones, have traditionally focused on "taking drugs to the market" whilst having, as the basis for their business model, a large patent portfolio consisting of substance and/or process patents. They have traditionally been at the forefront of controlling and driving the (downstream) procedure of obtaining marketing authorisations whilst also managing the (upstream) R&D procedure by purchasing or licensing-in potential successful R&D results from often smaller R&D firms. Now health data and the control of health data will challenge that traditional value chain of taking drugs to the market.

Effectively, the digital transformation has caused both a need and opportunity for pharmaceutical firms to explore new business models, i.e. the logic or framework they use to create and capture value.[108] Business model innovation can be particularly challenging in the context of disruptive change especially when there is a lack of clarity as to what the new business model would or should look like,[109] and its organisational structure.[110] Moreover, the

natural person in question, in particular chromosomal, deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) analysis, or from the analysis of another element enabling equivalent information to be obtained". However, this is not the only type of personal data of interest. There is also ample discussion on the issue of the ownership of databases containing such type of data, in particular if this is generated by sensors or machines/algorithms for the purposes of the 'Database Directive' 96/9/EC (i.e. Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases, [1996] OJ L 77/20) in view of Article 1(3) of the Directive, which provides that "protection under this Directive shall not apply to computer programs used in the making or operation of databases accessible by electronic means". For a discussion, see Joint Institute for Innovation Policy and Technopolis Group, "Study in Support of the Evaluation of Directive 96/9/EC on the Legal Protection of Databases", (2018) Study for the European Commission DG Communications Networks, Content and Technology.

[108] A. Afuah, Business Model Innovation: Concepts, Analysis and Cases (New York, NY, Routledge, 2014).

[109] H. Chesbrough, "Business Model Innovation: Opportunities and Barriers", (2010) 43(2-3) *Long Range Planning*, 354-363.

[110] K. Sund, M. Bogers, J. Villarroel and N. Foss, "Managing Tensions Between New and Existing Business

complexity involved in emerging technologies, in terms of both potential problems and solutions, gives rise to a need to connect disciplines and organisations. This will likely lead to there being more open business models[111] that focus on joint value creation with complementary partners operating within larger ecosystems.[112]

Future product markets will likely face a paradigm shift when data becomes the starting point of the value chain as pharmaceutical products and medical services will likely be framed according to the genetic and lifestyle data of an individual patient.[113] The vast amounts of collected data will also enable producers to understand what consumers and/or patients value in the pharmaceutical products and medical services they purchase. This will influence the way in which products are designed and developed thereby increasing product quality, which, in turn, should help generate products that, in accordance with preferences revealed by their data, match the relevant buyer's expectations. This could fundamentally alter 'old economy' markets. They would no longer be solely focused on marginal cost and price. Instead, firms would compete on a wider range of variables. The knock-on effect of the possible personalisation of offers and the dependency of patients on one specific firm, may provide said firm with further sources of monopolistic rents thereby reducing the percentage of the surplus going to consumers.

Health data could, for example, enable the creation of new human health services solutions. The organisation of health services and the production of pharmaceutical products within the same digital eco-system would allow for feedback loops feeding health information back to pharmaceutical companies. These companies would then be able to develop business processes that could respond in real-time in order to improve the effectiveness of the relevant drugs or medicinal products. Such improvements would not be done on the general level of populations but on the specific level of individual patients. Patients would also be given the possibility of becoming more engaged with their health through an array of digital tools that provide them with the possibility of being better informed about their health and making lifestyle changes accordingly and of monitoring their own health and constantly sharing this information with medical experts. Data would become part of a "digital ecosystem that constantly monitors a patient's condition and provides feedback to the patient and other

Models", (2016) 57(4) *MIT Sloan Management Review*, 8-10.

[111] H. Chesbrough and M. Bogers, "Explicating Open Innovation: Clarifying an emerging paradigm for Understanding Innovation" in *New Frontiers in Open Innovation* (edited by H. Chesbrough, W. Vanhaverbeke and J. West, Oxford University Press, 2014), 3-28.

[112] Adner, (96), 39-58.

[113] See OECD, (46); Autorité de la Concurrence and Bundeskartellamt, (42), 7, 10 ff.

stakeholders",[114] and tailors any treatment or therapy required to the patient's clinical and lifestyle needs.

In the health sector, several firms (claimed 'proprietors') hold different types of data. For, example, we have clinical (i.e. patient) data, which is normally held by physicians, and we have clinical trial data held by pharmaceutical firms. Pharmaceutical firms also hold early R&D data. We have public health authorities, insurance firms and specific health data firms (e.g. IMS Health), which hold data regarding the cost and consumption of pharmaceuticals. Further, ewe have Internet firms like Google, or specific vertical medical search engines, may hold much data about patients' behaviour, their fears and conduct. If the data collected by these bodies could be anonymised, pooled and combined, that might prove very useful in the fight against all kind of diseases. It may substantially decrease the time currently required for identifying outbreaks of diseases, for developing new drugs or health solutions, for understanding the impact of new drugs, side-effects etc.[115] Personal health solutions can thus be developed. Indeed, data pools may be very successful in the human medical products and healthcare industry.

Generally, the current situation on data-driven markets is that there are a number of *de facto* data holders, each with a limited set of data. This situation has the potential to lead to market failure because to achieve the best results from any analysis undertaken, either all the relevant firms would need access to all this data or there would need to be one sole firm/provider that would be responsible for such. This is where the need for a federated 'data commons' becomes clear; it is necessary to enable interoperability between the various systems put in place by the participants in this ecosystem so that they provide an effective solution for patients. Borrowing the concept of 'integrated care' from health law,[116] the importance of ensuring that data is shared and relied upon so that care becomes responsive to the specific person's needs and genetic characteristics is crucial. Investigations should be undertaken to see whether dynamic efficiencies of 'data aggregation' exist in specific sectors and whether the market is capable of dealing with such. Investigations should also be undertaken to consider whether a

[114] D. Champagne, A. Hung and O. Leclerc, *The Road to Digital Success in Pharma* (McKinsey & Co, 2015).
[115] See, for example, P. Groves, B. Kayyali, D. Knott and S. van Kuiken, "The 'Big Data' Revolution in Healthcare", (2013) McKinsey & Company Report for the Centre for US Health System Reform Business Technology Office.
[116] UK Government, "Complying with Monitor's Integrated Care Requirements", (*gov.uk*, 27 March 2015) <https://www.gov.uk/government/publications/integrated-care-how-to-comply-with-monitors-requirements/complying-with-monitors-integrated-care-requirements>.

federated data commons may be organised in the context of 'data pooling' or organised and closely-supervised in the context of markets for 'data trading'.[117]

A federated data commons provides a discrete possibility, which for reasons related to the efforts of limiting the diffusion of personal data, a policy aim for data protection legislation (which creates an artificial scarcity), and for reasons related to the important economic value of this data (may be as a consequence of this scarcity) may not provide an adequate governance regime for 'genetic data' or lifestyle data. Hence, the need to establish a form of conditional or permissioned access to this data, the condition being that the harvesting and the sharing of this data complies with the letter and spirit of the constitutional protections of privacy and data protection legislation. This conditional or permissioned access could be organised in the context of a federated data commons. Such could be organised, either on the supply side, with a number of industry players forming a data consortium or a data pool sharing access, or on the demand side, with a number of users' based data commons, societies and/or trusts providing a conditioned access to this data and managing the data commons. The likelihood of practically achieving these various options requires an in-depth analysis of their adequacy with regard to the specific nature of the data to be pooled and of the legal implications of each federated data commons design with regard to the various areas of law that regulate these economic activities.

For instance, there are various benefits to data pools. However, it is important to remember, as discussed below, that there are also competition law concerns linked to such practices. Data pooling may create barriers to entry and could also facilitate collusion between competitors. Why and how would this anticompetitive behaviour occur? The firms agreeing to pool data must agree on the method for gaining access to get access, the technology to be used for the collection, the processes concerning the storing and exchange of data, the type of data to which access will be provided etc. It is possible that the pool may exclude non-participating firms from access to the data; such a practice would raise concerns about anticompetitive foreclosure. Furthermore, the sharing of information in the context of this pool may also facilitate collusion or the pool may serve as a support-mechanism for a pre-existing cartel. Equally, the large amount of data in a pool connected to smart pricing algorithms may render it difficult to judge innovative pricing schemes. Firms connected to the pool may seek to unilaterally employ discriminatory pricing algorithms that enable them to charge each customer

[117] See D. Burk, "Patents as Data Aggregators in Personalised Medicine", (2015) 21(2) *Boston University Journal of Science and Technology Law*, 233–255; N. Duch-Brown, B. Martens and F. Mueller-Langer, "The Economics of Ownership, Access and Trade in Digital Data", (2017) 1 JRC Digital Economy Working Paper.

the maximum price; firms would be exploiting patients. The counter-argument would be that if you have all data about certain customers, you would seek to tailor and personalise the price in reference to each and every one of them. However, these exemplary anticompetitive disadvantages of federated data commons can be offset by the benefits a federated data commons brings with regard to access to data.

Conclusion

The Internet era gave rise to many online intermediaries and digital platforms controlling and orchestrating value-generating ecosystems that not only offer products and online services but also provide the infrastructure and tools on which other platform businesses can be built. The developments of the last decade and the more recent rise of the cloud computing model indicate a growing trend towards centralisation, which, in conjunction with the development of Big Data, behavioural profiling and online manipulation, let us contemplate a future where a small number of digital platforms will hold immense power in all sectors of the digital economy. The threat of these digital platforms holding power in both the digital economy and beyond, specifically in the political and cultural spheres of society, have led some legal scholars to plead for specific regulation and law for the platform economy, to plead for the introduction of some form of democratic control and accountability.[118]

This rather gloomy prediction for our shared Internet future may not become reality if blockchain or DLT delivers on its promises. Blockchain is set to become the 'Internet of value',[119] that will complement the current Internet architecture, albeit on very different principles. Blockchain constitutes a technology that facilitates the exchange of value in a secure and decentralised manner without the need for an intermediary. Its main components are a distributed ledger that records all transactions or assets that are part of its domain, an encryption that protects this ledger from tampering and a distributed storage of all data through the sharing of excess drive and network capacity on PCs and in data-centres. While in the 'digital platform' model only the centralised online platform collects information about past transactions, blockchain offers a distributed decentralised ledger, which keeps a complete record of all past transactions on the network. This enables all participants to have access to information about

[118] J. Cohen, "Law for the Platform Economy", (2017) 51 *UC Davis Law Review*, 133.
[119] See, https://www.mckinsey.com/industries/high-tech/our-insights/getting-serious-about-blockchain .

past transactions and, thereby, ensures that no single participant on the network enjoys a position of superior bargaining power due to informational asymmetries. This equality is furthered by the transparency of the process – each new transaction is broadcast to the entire network and each participant has the power to determine its authenticity. This breaks with the centralised data silos model of the platform economy in which only some actors have access to this information as all interactions between the network participants happen through them, thereby, enabling them to accumulate data, which, in turn, can help them to increase their bargaining power and to erect barriers to entry. Of course, blockchain is not a monolith. There exist various types of blockchain, some of which are closer to the centralised ledger model of digital platforms. It is customary to distinguish 'private' or 'federated' blockchains from 'public' blockchains.

However, the essence of the 'blockchain dream' is that the decentralisation and disintermediation it enables will challenge the current centralised architecture of the Internet and will accomplish the expectations of the original Internet dream for a borderless and radically democratic space. Blockchain technology sets out numerous challenges to competition authorities and brings forward the need to implement conceptual innovations in the way competition law enforcement is envisioned in this area (this is examined in-depth in a separate paper).[120] However, more importantly, at the symbolic level, blockchain is often opposed to the centralised paradigm of digital platforms that dominate different segments of the digital economy and often reduce consumer choice and privacy. The entities controlling these digital platforms now constitute the largest companies in the world.[121] An essential component of the blockchain dream is that it would finally fulfil the aspiration of a competitive space for the Internet, where peer-to-peer exchange without intermediaries would provide immense opportunities to establish alternative communities of economic, social and political exchange whilst also resolving the difficulty of combining this with the respect of privacy and digital autonomy. But is this more than just a 'dream'? Does blockchain lead to disintermediation of trust, or is it merely the development of new forms of intermediaries and intermediation?[122]

[120] I. Lianos, "Blockchain Competition – Gaining Competitive Advantage in the Digital Economy and Competition Law Implications", (2018) UCL CLES Research Paper 3/2018.
[121] The five largest companies in the world are tech platforms, see A. Wilhelm, "Big Tech Goes Five for Five" (*techcrunch.com*, October 2017) <https://techcrunch.com/2017/11/06/big-tech-goes-five-for-five/>.
[122] Lianos, (119).

In the upcoming IoT paradigm, firms, at least small- and medium-sized enterprises ('SMEs'), will likely use e-platforms for e-retail services and marketing whilst simultaneously storing their data in the cloud and purchasing cloud services and storage from the large e-platform providers doubling as cloud providers. However, often the contracts linking these cloud platforms with third party sellers may oblige them to agree to not assert any of their intellectual property rights vis-à-vis the provider or the provider's network.[123] Moreover, the providers may, under certain circumstances, seek to access and make use of the users' data created on the platforms or in the cloud in order to give themselves a competitive advantage vis-à-vis third party sellers since providers will have access to far greater levels of data; they may even have access to data originating from the third party sellers' competitors, suppliers, customers etc.[124] Providers will be able to use all the data available to them to obtain fuller picture of whole industries and they may use their advantage in terms of data as leverage for them to enter into specific customer markets. Indeed, they may use said data to pursue data-driven business strategies that enable them to enter the core market of the firms that provided them with the relevant data in the first place.

A further example of decentralisation that could be of relevance for the IoT, is the possible shift from 'cloud computing' to 'fog computing'. The concept of 'cloud computing' comprises a group of computers and servers that are connected together over the Internet to form a network. Today, as many enterprises and large organisations are beginning to adopt the IoT, the need for large amounts of data to be accessed more quickly and locally is growing exponentially. The concept of 'fog computing' may bring a decentralised infrastructure to power the IoT which may change the traditional centralisation dynamics. The concept of 'fog computing', or 'fogging', is defined as a distributed infrastructure in which certain application processes or services are managed at the edge of the network by a smart device whilst other processes or services remain managed in the cloud. In essence, it is a middle layer between the cloud and the hardware in order to enable more efficient data processing, analysis and storage

[123] B. Lundqvist, "Data Collaboration, Pooling and Hoarding Under Competition Law", (2018) Stockholm University Research Paper No. 61.

[124] See the recent investigation into Amazon Marketplace initiated by the European Commission and the German Bundeskartellamt, see: S. Rolland, "After Attacking Google, Vestager Now Turns to Amazon", (*euractiv.com*, 5 October 2018), <https://www.euractiv.com/section/competition/news/apres-google-vestager-attaque-amazon/>; Bundeskartellamt, "Bundeskartellamt Initiates Abuse Proceeding Against Amazon", (*bundeskartellamt.de*, 29 November 2018) <https://www.bundeskartellamt.de/SharedDocs/Publikation/EN/Pressemitteilungen/2018/29_11_2018_Verfahrenseinleitung_Amazon.pdf?__blob=publicationFile&v=2>.

by reducing the amount of data that needs to be transported to the cloud. This may also add to the decentralisation dynamic brought about by blockchain technology.

One of the possible uses of blockchain technology and associated cryptocurrencies will be to become the backbone of the machine-payable web, i.e. machines communicating, sharing processing power and exchanging value with each other and serving as the base layer connecting the different industries. IOTA[125] is the first cryptocurrency designed to power the IoT revolution. It enables the secure sharing of resources between smart devices with zero transaction fees. IOTA has also been used as the underlying ledger for transferring information during the production process, while also leading to a tamper-proof audit trail.

It is important to closely engage with these technological developments and to invite industry actors to provide their take on the centralisation and decentralisation dynamics of the digital economy and on the competitive strategies employed by various economic players in the different business eco-systems. Competition authorities should be open to new sources of learning. Their reaction should depend on the meta-regulatory paradigms that influence their approach to market intervention: (i) an 'imperfect competition' one, which expresses concern over the increasing trend towards concentration observed in these markets and the fact that solid quasi-monopoly positions are generated and entrenched by 'network effects', which last for a considerable period of time, absent 'disruptive innovation', and (ii) a 'Schumpeterian' conception of the role of State authorities in nurturing and/or facilitating the innovation process in these industries, which is perceived as being accomplished by the development of large technology firms that dispose of the necessary dynamic capabilities to generate and introduce innovations. Resorting to these prior beliefs becomes necessary in the absence of incontestable empirical evidence as to the role of competition for innovation, the debate among economists still going on.[126]

[125] S. Popov, "The Tangle", (2018) White Paper.

[126] The Schumpeterian view alleges that large firms and monopolists may be more innovative than firms in competitive markets in view of their head start and them having a dominant position on a market and the resources to fund large research and development ('R&D'). In contrast, economist K. Arrow has challenged the incentives of a monopolist to invest in R&D in view of the fact that the new products may displace, partially or totally, the monopolist's products from the market, thereby, leading the monopolist to competing with himself. Recent empirical economic studies have examined these claims attempting to link market concentration in an industry (on the basis of the Lerner index, thought of as a proxy for product market competition) to R&D expenditures in the same industry. They found the existence of an 'inverted-U' relationship –the level of innovation rises in industries with oligopolistic market structures whereas it is more modest in industries having a more competitive market structure and in industries dominated by monopolists. See P. Aghion, N. Bloom, R. Blundell, R. Griffith and P. Howitt, "Competition and Innovation: An Inverted U Relationship", (2005) *Quarterly Journal of Economics*, 701. However, some other economists find these studies unconvincing. See the discussion in J. Baker, "Beyond Schumpeter vs. Arrow: How Antitrust Fosters Innovation", (2007) 74 *Antitrust Law Journal*, 584–587, which suggests some alternative measures of innovative activity.

The tension between these paradigms of intervention (or non-intervention) is particularly intense in periods of technological change when regulators have to make clear choices about either taking a hands-on or hands-off approach. In relation to the hands-on (and possibly prophylactic) approach, regulators would need to address all the possible social costs following the implementation of this technology, even if these have not yet materialised. They would need to implement the principle of precaution but would need to do so in a way that limits the risk of stifling innovation. Conversely, regulators could adopt a hands-off approach, an approach of 'permission-less innovation', in which they would effectively accept that the 'public good' may be better pursued if entrepreneurs are left undisturbed in their effort to develop new business models and to explore new ways of implementing general purpose technologies. One may also advance a third approach, which would offer the possibility of a compromise that would both permit the continuance of regulating as usual whist also allowing for there to be open spaces for monitored experimentation that, if they are proven to be successful, may be generalised and lead to structured regulatory change. These meta-principles of regulatory action form the broader institutional context that economic actors riding the wave of new technology consider when they shape their strategies in order to gain architectural advantage, although it is still unclear, from an empirical perspective, how these may impact upon improving economic performance and/or upon increasing the equality of opportunities in the digital economy.