Blockchain and competition law

Threats and opportunities of the new disruptive technology

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Abstract

Blockchain has been considered the most revolutionary innovation since the Implementation of the Internet. As it has started to penetrate into various industries, many foresee that this information technology has the ability to change the way business is carried across the globe. The thesis aims to address the compatibility of agreements or concerted practices between undertakings by the usage of blockchain technology in relation to article 101 of the Treaty of the Functioning of European Union. Analysing the technical mechanism of the technology and providing legal provisions relevant to the subject, the thesis demonstrate how it is not possible, a priori, to qualify the blockchain as an intrinsically pro-competitive or anti-competitive technology, without incurring in ambiguity and errors. Nevertheless, it is possible to draw conclusion on the anticompetitive opportunities that blockchain could potentially offer to its participants and the parallel enormous benefit that it could provide to society which would imply cases exemptions resulting from art 101.3 of TFEU.

Abbreviations

EU	European Union
R&D	Research and Development
TFEU	Treaty of the Functioning of the European Union
DLT	Distributed Ledger Technology
IoT	Internet of Things
EC	European Commission
TEU	Treaties of the European Union
FTC	Federal Trade Commission

1. Introduction

"It's no good blaming the mirror if the mug's crooked."
N. Gogol, The General Inspector

1.1 Background

In 2008, the bitcoin was introduced to the world - a financial product under the category of cryptocurrency or digital currency able to substitute Fiat[1] currency in the field of values exchange. Bitcoin is innovative in the sense that it allows free of charge transactions without the need for financial intermediaries or so-called middlemen. Instead, it guarantees the parties involved through a coding transmission which is impossible to hack, solving the typical issue of double spending[2], a typical phenomenon of fraud within the digital currency exchange, that result from using a single unit of currency for two transactions rather than one. Since then, this financial product has surprisingly and enormously increased in value due to the interest from investors that have entered the platform and purchased bitcoins[3]. Nevertheless, the real revolution hides not in the bitcoin per se but in the platform of trust where bitcoin is traded: the blockchain, an open digital ledger that keeps track of all the transactions between users through a peer-to-peer network[4]. The power of this innovative general ledger of transaction has revealed to be applicable not only in the value exchange of transactions but in many other fields.

[1] Fiat money is government-issued currency that is not backed by a physical commodity, such as gold or silver, but rather by the government that issued it. The value of fiat money is derived from the relationship between supply and demand and the stability of the issuing government, rather than the worth of a commodity backing it as is the case for commodity money. Most modern paper currencies are fiat currencies, including the U.S. dollar, the euro, and other major global currencies.

[2] Sebastien Meunier, *Blockchain 101: What Is Blockchain and How Does This Revolutionary Technology Work?* (Elsevier Inc 2018) <http://dx.doi.org/10.1016/B978-0-12-814447-3.00003-3>.

[3] ibid.

[4] ibid.

where approval from the parties is required in order to realize the transaction: copyright protection, real estate acquisition, supply chain and many other fields of society for which its applicability remains unexplored[5]. Functioning exactly as an open digital ledger where everyone can access to sensitive commercial information, undertakings could potentially make usage of this transparency to structure their commercial strategies and enter into anti-competitive agreements and concerted practices between each other. Competition authorities have started questioning the need of intervention in order to prevent anticompetitive practices within blockchain. Monitoring, ex ante or ex post regulations has become the dilemma of competition authorities both in European Union and globally who are in conflict between the idea of being too unprepared to manage the competitive process of blockchain once fully evolved, and the concern of the "do not harm"[6] approach, by representing an obstacle to the full development of this new complex field of players' interaction which could be of great benefit to society[7].

Being merely a platform means that blockchain represent in itself a digital market, where players access and exchange information or enter into some form of agreement. Here is where the complex problematic of competition policies and competition authorities come into action, assuring that the coordinates of interaction between these parties guarantee competitive behaviours and prevent anticompetitive conduct. Being highly technological and new - blockchain platforms represents a big threat for competition as the players involved could take advantage of this unregulated and mysterious interactive system to use collusive behaviours as cartels. This become even more evident when the collusive practices are vailed by the spirit of collaboration of undertakings, within the form of horizontal and vertical cooperation particularly for the purpose of research and development (R&D).

[5] Michael Milnes, 'Blockchain: Issues in Australian Competition and Consumer Law by Michael Milnes 1' [2018] Australian Journal of Competition and Consumer Law, Forthcoming.

[6] Marco Dell'Erba, 'Initial Coin Offerings. A Primer' [2017] SSRN Electronic Journal 1.

[7] Sean Ansett, 'Mind the Gap: A Journey to Sustainable Supply Chains' <http://www.gapinc.>.

1.2 Aim and research question

The purpose of this thesis is to describe and analyze the compatibility of agreements or concerted practices between undertakings in the area of research and development by the usage of blockchain technology in relation to article 101 of the Treaty of the Functioning of European Union (TFEU).

The purpose will be fulfilled by answering the following research questions:

1. What is blockchain Technology?
2. Under which circumstances may the use of blockchain technology, as part of agreements and concerted practices between undertakings in the area of vertical and horizontal cooperation, be prohibited on the basis of article 101.1 TFEU?
3. To which extent may the use of blockchain technology, as part of agreements and concerted practices between undertakings referred to in question 2, be permitted on the basis of 101.3 TFEU?

1.3 Scope and constraints

For the purpose of this research, will be taken in consideration only the legal challenges based on art 101 of the TFEU, excluding other form of anticompetitive practices under the provision of Art. 102 of the TFEU. The immaturity of the times does not allow us to rely merely on empirical legal cases specifically resulting from the infringement of art 101 in regard to the usages of blockchain technology. Additionally, the interest from scholars has been significantly focusing on blockchain technology in light of digital currency and the impact on monetary transactions in the financial sectors[8]. This has limited the spectrum of investigation only to a particular perspective of blockchain eluding other perspectives which would have been relevant to answering the subject research question.

[8] Meunier (n 2).

1.4 Materials and method

To fulfill the purpose of this thesis and to answer the research questions, a legal scientific (dogmatic) method will be applied. The main legal sources that will be used are article 101 TFEU as well as legal literature and legal provisions such as the block exemption regulation relating to horizontal and vertical cooperation of undertakings. In addition, other sources such as official documents, reports and newspaper articles etc. are used. These additional sources are relevant because they provide a thorough picture on the topic in relation to the potential legal challenges. Art 101 of the TFEU and the block exemption regulations together with other legal provisions, define the legal framework in which the undertakings involved in blockchain operate while the different articles from official journals, reports and newspapers allow an analytical discussion which is precious in order to answer to the research question. The sources providing relevant information on blockchain technology have been selected based on the specificity of the description of the mechanisms of interaction within the blockchain platforms. This has been judged relevant if linked to the third chapter of the thesis in which is developed the framework of competition law in EU and the situation of anticompetitive practices under art. 101 of the TFEU by analysing different legal provisions (regulations and articles of the TFEU). The final session of the paper enters into a vivid discussion based on selection of articles that highlight the complex association of blockchain technology to anticompetitive practices resulting from the participation of undertakings, particularly in the economic framework of horizontal and vertical cooperation.

1.5 Structure

After having introduced on a large scale the blockchain technology and the legal challenges that this may generate, the thesis is structured in two main session

(chapters 2 and 3) and the final session (chapter 4) that provides the conclusions. In chapter two the thesis describes and analyses the blockchain technology in details to better understand the functioning and the technicalities of the platform. Elucidate how firms enter in relations with each other, what information are shared and how the transactions are handled and verified throughout the blockchain. In this chapter it is also described how the different structures of blockchain technology may result in relevant concerns within the light of competition law. In chapter a general framework of competition law is presented followed by a more detailed presentation of the application of art 101.1 and art 101.3 of the TFEU. The second half of chapter three enters in a more specific level of analysis where the aim of the thesis is developed. Finally, in chapter four the conclusions from the investigation conducted throughout the thesis are presented and a clear answer to the research question is provided.

2. The Blockchain Technology

2.1 Introduction

Other than describing what blockchain is, the explanation of the different dimensions of the technology is helpful when analyzing the possible relation with anticompetitive practices. In fact, to evaluate the potential collusive interaction of undertakings within the blockchain, it is necessary to understand what are the mechanisms and characteristics that make this technological innovation so disruptive to be comparable to the internet revolution[9]. In the following section all components and functionalities of blockchain will be assessed and introduced, in order to support the purpose of the thesis.

2.2 Characteristics and functioning of Blockchain

Blockchain has become the most disruptive innovation that everyone has heard of but only the most experienced have understood all potential areas of application[10]. The term “disruptive” in relation to a technological innovation was first used by C. Christensen and J. Bower in their article "Disruptive Technologies: Catching the Wave" published in Harvard Business Review in 1995. By this term they referred to those revolutionary technologies that anticipate the needs of a market, and which evolution result in creating new ones.[11] Following this article, the term disruptive has abandoned the exclusivity of the field of technology, extending its boundaries to more contexts. The disruptive technology starts in a niche market not promptly up to date. The niche market of the blockchain was the one of Bitcoin, meaning the

[9] Campbell R Harvey, Christine Moorman and Marc Toledo, ‘How Blockchain Will Change Marketing as We Know It’ (2018) <https://ssrn.com/abstract=3257511> accessed 16 April 2021.

[10] Meunier (n 2).

[11] https://hbr.org/1995/01/disruptive-technologies-catching-the-wave

market of cryptocurrency, used to secure decentralized payments. This however was only one of the many possible applications of this new disruptive technology as we will see later in the paper[12].

Blockchain technology was first proposed in 2008 in a major article titled "Bitcoin: A Peer-to-Peer Electronic Cash System", published by Satoshi Nakamoto. In January 2009, the first version of the software was released[13]. Later the name Satoshi Nakamoto turned out to be a pseudonym and the true identity of the inventor is still unknown. Initially, what got captured by the charm of this new technology was computer science and cryptography, as scientist from these two branches have tried to further study it. Later, with the take-off of Bitcoin trading, blockchain has captured the consideration of a wider audience, consistently with the theory of the Curve S, the innovation adoption curve as presented by Everett Rogers'. This shows how the general process of interest and adoption towards a new technology, or rather innovation, is characterized by a few years of slow adoption followed by an exponential growth. In the case of the blockchain there was a real boom of massive interest at the end of 2015 and 2017, linked to the Bitcoin phenomenon: it was the latter that led the attention towards this new technology and still today, a big share of audience fails to discern one from the other, identifying them as synonyms[14].

Although there is no single definition shared by everyone, blockchain can be defined as a digital, decentralized and distributed ledger in which every transaction is recorded and added in chronological order, with the aim of creating permanent and unalterable evidence and traces. In other words, blockchain can be defined as a new type of data system that records and retains data allowing multiple stakeholders to share and allow access to the information in a confidential manner[15].

Entering more into the technicalities of its operations, each time new information/data is received following a transaction, a new block containing this information is added to the chain; the succession of information and data gradually

[12] Harvey, Moorman and Toledo (n 9).

[13]Horst Treiblmaier, 'The Impact of the Blockchain on the Supply Chain: A Theory-Based Research Framework and a Call for Action' <www.emeraldinsight.com/1359-8546.htm>.

[14] ibid.

[15] ibid.

forms a real chain of blocks (from here the name blockchain)[16]. Due to the continuous addition of blocks, the size of this chain grows over time since each new set of information corresponds to a block. Furthermore, this chain has an immutable nature and once written, its content is no longer modifiable or eliminable, unless invalidating the entire structure whose integrity is guaranteed by the use of cryptographic primitives[17]. Summing up, blockchain can be defined as an ordered, incremental, solid and digital block chain of cryptographically linked data[18], whose main components are:

• Node: the participants in the blockchain, physically formed by the servers of each participant. Through the nodes we can create a vast network of interconnected computers that share information in a secure, fast and decentralized way, as well as allowing us to enjoy all the advantages that blockchain technology can offer us. The nodes can perform various functions, such as archiving of data or the service of sending or receiving operations. In addition to the mining service for creating new blocks, validating and confirming transactions, among others. However, all interconnected nodes are governed by the same rules as the established consensus protocol.

• Transaction: it consists of the data that embody the values that are "exchanged" and that need to be verified, approved and then archived.

• Block: is represented by the grouping of a set of transactions that are joined to be verified, approved and then archived by blockchain participants.

• Ledger: is the public register in which the blocks are "noted" in a transparent and unchangeable fashion so that all transactions are carried out in an orderly and sequential manner. The Ledger is made up from the set of blocks that are chained together by means of an encryption function and from the use of hash.

• Hash: an operation that allows you to map a string of text and/or numeric with variable length in a unique and univocal string. Hash identifies each block in a

[16] https://docs.microsoft.com/en-us/dotnet/standard/security/ensuring-data-integrity-with-hash-codes

[17] A cryptographic primitive is a low-level algorithm used to build cryptographic protocols for a security system

[18] Zheng, Z., Xie, S., Dai, H. N., Chen, X., & Wang, H. (2018). Blockchain challenges and opportunities: a survey. International Journal of Web and Grid Services, 14(4), 352-375.

unique and secure way. A hash must not allow to trace the text that has generated the block[19].

The two main features of the blockchain are decentralization and distribution. These features are not linked to the nature of this technology but rather to the contexts in which blockchain operates, contexts that are very much connected to activities of sharing, distribution, communication and agreement. The blockchain is defined as decentralized since there is no entity that controls the transaction process; in relation to distribution, however, it refers to how the computation work is divided among the different computers[20]. The blockchain is therefore a type of Distributed Ledger Technology (DLT), a data archive shared by several entities which operates on a distributed network of sites, countries or institutions[21]. blockchain uses the sharing of ad-hoc messages together with a distributed network in order to make sure to that the data is stored in the whole network and avoids single points of failure, meaning a weak point that puts the entire system and its integrity at risk. This technology operates by registering and storing every single transaction on the network in a block cryptographically linked to it and replicated among the participants of the network. As previously mentioned, each block has a hash value, generated by an algorithm that transforms the contents of the block into a random mix of letters and numbers. By verifying mathematically that the hash values match the expected values, users can be sure that the data has not been altered[22].

For a new block of transactions to be added to the blockchain, it must be checked, validated and encrypted. Only with this step can it become active and be added to the blockchain. For this step to happen, each time a block is composed, a complex mathematical problem is solved, and this requires a conspicuous commitment also in terms of power and processing capacity. This operation is referred to as "Mining" and is carried out by "Miners"[23]. The work of the "Miner" is absolutely fundamental in the economy of blockchain management. Anyone can become a “Miner” and can

[19] Meunier (n 2).

[20] Roy Lai, David Lee and Kuo Chuen, *Blockchain – From Public to Private*, vol 2 (1st edn, Elsevier Inc 2018) <http://dx.doi.org/10.1016/B978-0-12-812282-2.00007-3>.

[21] Daniel Conte De Leon and others, ‘Blockchain: Properties and Misconceptions’ <www.emeraldinsight.com/2071-1395.htm>.

[22] Lai, Lee and Chuen (n 20).

[23] Rebecca Yang and others, ‘Public and Private Blockchain in Construction Business Process and Information Integration’ (2020) 118 Automation in Construction 103276 <https://doi.org/10.1016/j.autcon.2020.103276>.

compete to be the first to solve the complex mathematical problem related to the creation of each new block of transactions that can be added to the blockchain. In this regard, each node, computer connected to the bitcoin network, which has the task of storing and distributing an updated copy of each block has a duplicate of the decentralized blockchain, guaranteeing the quality of the data through massive database replication. In fact, there is no official centralized copy and no user is more credible than others: all are at the same level[24].

Most cloud-based services rely on a single trusted organization that controls and manages the data archive and the network and also controls access to associated services. Such type of approach can be positive and desirable for some applications or, at times, necessary for certain business environment. In other cases, however, the DLT can radically change certain applications used in firms by exploiting the value of DLTs, which are able to offer a more efficient system[25]. Using the blockchain as an illustrative case, a transaction in the blockchain network can be performed between any two peer without the need for authentication by a central agency. By doing so, the blockchain can significantly reduce server costs and avoid the "bottleneck" phenomenon, where the performances of a system are strongly constrained by a single component, very common in centralized servers[26].

A practical example of how the blockchain works can be when two subjects are willing to conclude a deed of sale and need to manage one commercial transaction: once it is created, it contains a series of elements such as the public address of the recipient, information relating to the transaction and Cryptographic keys. In the example these elements are represented by the price, information on the property, the agreement to pay from the buyer and so on. Then, a new block is created with all the data related to the transaction between the two actors. The block, which also includes other transactions, is prepared to be subjected to verification and approval by the participants in the blockchain and is subsequently brought on the net to be verified by them. Once verified and approved by the network, it is added to the blockchain. If the information is considered correct, the transaction is authorized,

[24] Lee Kuo Chuen, David, Handbook of digital currency: bitcoin, innovation, financial instruments, and big data, Academic Press, 2015, pp. 47–51

[25] Conte De Leon and others (n 21).

[26] ibid.

validated and archived on all the nodes of the blockchain. From this moment it is accessible by all participants. In other words, the reference of that specific transaction becomes permanent, immutable and impossible to modify[27].

2.2.1 Blockchain: Public and Private

In relation to the consensus structure (authorization) of the platform and the accessibility from users, an important distinction has to be made between *private* and *public* blockchain:

Private blockchains are often referred to as "permissioned blockchains". Unlike public blockchains, they are a closed network and only allow participation by certain authorized entities. They also grant specific rights and restrictions to network participants. This indicates that private blockchains have a more centralized nature, because only small groups of people can control the network. A public blockchain could be described as a public park. The park is accessible to everybody- everyone is free to picnic, walk their dogs or play ball. It is not owned by anyone and everyone in the community takes responsibility for keeping it clean. The park's rules are set by everyone who uses it, who must reach a general consensus on what the rules will be. A private blockchain, on the other hand, is more like a community garden in the middle of a group of houses arranged in a square. It is not accessible to those who do not live there and to enter it someone has to let you pass by his house. The small group of people share the responsibility of tending the garden and use it only for themselves. On more technical terms, the private (Permissioned ledgers) functions in a way that whenever a data or record is added, the system of approval is not bound to the majority of participants in the Blockchain but only to a limited number of actors who are defined as “trusted”. According to this model, the actors can operate independently, but only one or more preselected actors perform the function of validators in the network. These types of blockchains use access control levels to select the participants of the network and use an active consensus mechanism. Differently from private, the public

[27] Meunier (n 2).

blockchains (Permissionless ledgers) are open ledgers, do not have a property or *deus ex machina* and are designed not to be controlled, preventing any form of censorship. Every member of the network can contribute to updating the data on the ledger and to have access, in quality of participant, to all immutable copies of all transactions approved by consent. The Public blockchains use complex algorithms to reach consensus among the participants of the network but, at the same time, they may not be suitable for many companies, given the minority protection to privacy compared to private individuals. The most famous and widespread example is represented by the Bitcoin Blockchain[28]. Based on the type of platform used, the blockchain can be designed to provide different levels of accessibility to data on the blockchain. In other words, it can provide more transparency to the data, while ensuring the required privacy. To protect the most sensitive information, it is advisable to keep such information "off chain", rather than being stored and replicated between the nodes within the structure "on chain", meaning that the information and data should be stored outside and separately from the blockchain.

The distinctions listed above raise already some doubts about compatibility with competition policy issues. In particular, the consensus system of the two structures determines the selection of new participants upon entry. This introduces the problem of the possible abuse of dominant position of participants which are in a position of major control within, weakening the decentralize attribute of the technology. Moreover, and this concerns closely our analysis, this type of structure makes the access to competition authorities much more hermetic for the evaluation of anticompetitive behaviours.

In conclusion, the main features of the blockchain are:

• Decentralization: as described above, this feature differentiates the blockchain by centralized transaction systems, in which each transaction must be validated by the agent central "trusted".

[28] Roy Lai, David Lee and Kuo Chuen, 'Blockchain-From Public to Private' <www.elsevierdirect.com>.

• Persistence: Every transaction that takes place in the network must be confirmed and recorded in the blocks distributed throughout the network, which make it almost impossible to alter them and any falsification would be easily detected.

• Anonymity: Each user can interact with the blockchain network with a generated address ad hoc or can create multiple to avoid exposure. There is no central part that keeps all the user's personal information. This mechanism preserves a certain amount of privacy on transactions.

• Verifiability: In the blockchain each transaction is validated and registered with a brand thunderstorm. By doing so, users can easily verify and track previous records accessing any node of the network, also improving the concept of traceability and transparency of the data stored in the blockchain[29].

• Sharing of data: sharing is the basis of the blockchain. The blockchain allows parties to collaborate to the creation of a single value chain and be part of an ecosystem, updating a single truthful, accessible and solid version of an information, since each part keeps a copy of the "ledger" (distributed ledger).

• Value Transfer: All transactions are executed and tracked as token (device necessary to authenticate) permanent and digital with a verifiable history of the assets 'ownership.

• Origin: it is possible to know the origin of the data and trace the complete history.

• Tamper proof: if an actor within the system has tried to modify the data, this remains tracked in the system.

• Control: You can control what a user can see and do at the data item level (unit atomic data).

2.2.2 Main areas of applicability of the Blockchain

[29] Treiblmaier (n 13).

Today the topic of the blockchain is explored and applied in many different fields, from identity management and transparency in commercial exchanges, to data storage in the cloud, to "smart contracts", radically transforming the way companies operate. The main areas of application of the blockchain can be summarized and classified as follows:

• Financial services: distributed ledgers improve transparency and security while bringing substantial benefits especially for back-office operations. The continuous progress of the blockchain in the capital market has the aim of improving the workflow and cut costs, enabling companies to provide better Business to Business (B2B) and Business to Consumer (B2C) services in terms of security and privacy.

• Government: the blockchain is an opportunity to improve public services and promote more transparent government-city relations. The distributed ledgers allow radical optimization of the business processes through more efficient and secure data sharing. There blockchain creates an environment that does not require the presence of intermediaries for regulatory activity, solving the slow and costly processes in the different stages of the process.

• Health: the immutable data archives that can be analysed and updated in real time will completely disrupt the health care landscape. Previous centralized models have proved to be ineffective in providing quality healthcare at an accessible price to people.

• Identity: blockchain technologies bring monitoring and managing digital identities safety and efficiency, with continuous access and fraud reduction.

• Internet of Things (IoT): through the blockchain it is possible to track billions of connected devices and coordinate millions within each others, enabling significant savings for producers in IoT sector. As explained previously, a decentralized approach eliminates the presence of single points of failure, going to create a more resilient ecosystem for devices and at the same time ensuring the consumer privacy, which is made more secure thanks to the cryptographic algorithms used by blockchain.

• Insurance: the blockchain is used to revolutionize insurance policies by making use of "smart contracts" that operate independently on peer-to-peer networks,

helping to gradually eliminate the old paper and pen process and to eliminate red tape, one of the main issues of the insurance sector.

• Money: An unrestricted peer-to-peer digital money transfer platform without the need for a central figure to control one cryptocurrency, which in turn provides people all over the world with money in an immediate, safe and frictionless process.

• Music: take advantage of blockchain technology and "smart contracts" to create a database comprehensive and accurate decentralized music rights, also allowing the possibility of transmit copyright in a transparent manner.

• Supply chain: blockchain-based supply chains are fundamentally changing the way which companies do business, offering end-to-end decentralized processes through blockchain public.

• Contracts: the application of the blockchain in the legal field is called smart contracts; these are verified through blockchain and allow programmable, self-executing contracts[30].

As reported in the previous pages, the blockchain is commonly catalogued as "disruptive" technology but as suggested by Iansiti and Lakhani, professors at the Harvard Business School, it would be more correct to refer to the blockchain as a "founding" technology, given the potential in creating the foundations for economic and social systems[31].

2.2.3 Smart Contracts

As has been briefly explained in introduction chapter, the blockchain was born precisely for the purpose of creating a digital asset with exchange value, which can be freely transferred to a platform independent of government institutions. This happened in 2008 with the creation of the Bitcoin platform, on which users still

[30] https://blockgeeks.com/guides/blockchain applications/#:~:text=Examples%20of%20Blockchain%20Smart%20Contracts%20Applications&text=The%20ledger%2C%20too%2C%20could%20be,results%2C%20and%20managing%20healthcare%20supplies.&text=Key%20problems%20in%20the%20music,%2C%20royalty%20distribution%2C%20and%20transparency.

[31] Treiblmaier (n 13).

trade the bitcoin cryptocurrency. In the following years, however, blockchain applications have risen and made it possible to carry out more complex operations: this has led to draw the distinction between the so-called "First generation" blockchain (like Bitcoin) and "second generation" blockchain, of which Ethereum is the reference example[32]. While the former basically allow to operate mere unilateral transfers relating to sums of the cryptocurrency used in the single blockchain (for example, sums of bitcoin in the Bitcoin platform), the second generation blockchains are characterized by the fact that they have added a language of programming that allows users to program complex software that interacts with the distributed ledger[33].

Users of a second generation blockchain can create “tokens”, digital assets that differ from the initial cryptocurrency of the blockchain. Besides, users can as well create software programs through which exchange tokens based on pre-set conditions, the Smart Contracts. If tokens are the digital representation of goods, Smart Contracts are the tool through which it is possible to manage their circulation according to conditions set by the users themselves[34]. The legal framework of the Smart Contract is a widely debated topic within blockchain, which to date has not found a defined answer. Rather than as an agreement, in fact, the Smart Contract should be viewed as a channel in which agreements are concluded and managed. More precisely, Smart Contracts can be defined as software programmable in such a way that they can autonomously implement the functions encoded within them, taking into account pre-set settings[35] . The intrinsic character of the smart contract and the compatibility of smart contracts with art 101 of the TFEU is highly controversial and raises several concerns. On the one hand, some literature identifies them as possible tools to monitor the activities and conduct from undertakings assume a regulatory function and substituting competition authorities[36]. On the contrary, many authors identify this procedure as means of

[32] Primavera De Filippi and Samer Hassan, ‘Blockchain Technology as a Regulatory Technology’ (2016) 21 First Monday <https://arxiv.org/pdf/1801.02507.pdf>.

[33] ibid.

[34] Chris Pike and Antonio Capobianco, ‘Anti-Trust and the Trust Machine.’ (2019) 5 Competition Law & Policy Debate 48 <http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=139496964&site=ehost-live&scope=site>.

[35] Filippi and Hassan (n 32).

[36] ibid.

control that the companies involved in a cartel would use in order to check that no participant leaves tactically the agreements and gain advantage by not respecting the directives of the cartel[37].

2.3 Summary

The original architecture of the blockchain fits exactly within the deficits in trust, security, reliability resulting from the relationships between people, devices and electronic devices in traditional transactions. The nodes of the blockchain exchange value which is not only monetary, but also in the form of shares, right of voting, intellectual property. This happens through sophisticated cryptographic key systems and algorithms in a distributed ledger, able to track every transaction through unique digital assets. The reliability and transparency of these platforms are relevant factors for the competitiveness of markets and businesses, encouraging technological development that is increasingly apprehensive to the individual-user interests. Unfortunately, for the case of smart contract, the lack of trust that would be balanced is not only the one growing from competition authorities but also from the participants within the cartels which may use this tool as a way to compensate this lack of trust.

[37] Thibault Schrepel, 'Collusion By Blockchain And Smart Contracts' [2019] SSRN Electronic Journal.

3. Blockchain Competition

3.1 Introduction

In this chapter the EU normative in relation to competition law resulting from the provision in Art 101 of the TFEU will be introduced. After analyzing the meaning of undertakings and relevant markets resulting from the subject legal provisions, the chapter examines the relevant condition to apply the exceptions provided in the article. Furthermore, the discussion will move toward the evaluation on how the dynamics of blockchain technology is measured by the provisions in order to evaluate the extend of the anticompetitive intrinsic character in the technological platform.

3.2 A general framework of European competition law

3.2.1 The fundamental principles of the treaty

The proper functioning of the competitive market is, since its constitution, one of the primary objectives of the European Union, as well as, "one of the most effective tools for maintaining and consolidating the unitary structure of the market"[38]. In fact, in a free-market system such as the European market, competition has multiple purposes that affect both entrepreneurs and consumers. Entrepreneurs are encouraged to make continuous innovations to reduce costs and increase the quality of the products and services offered, allowing an effective and dynamic distribution

[38] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels, 5.5.2021 SWD(2021) 351

of resources. About the consumers, the aim of competition is to improve their well-being, choosing the products and services they deem best and most convenient[39].

The antitrust regime outlined by the Treaties, and ultimately confirmed by the Lisbon Treaty, is functional to the objective of integrating the various national markets into a single market by ensuring that the effectiveness of competition is measured from time to time on the characteristics of the product or the service and the structure of the related market. The EU competition law, in fact, is based on a system of prohibitions and exceptions: art. 101 paragraph 1 of the TFEU, prohibits all agreements (agreements, association decisions and concerted practices) that restrict competition. The same article, in paragraph 2, provides for the void of such agreements, while in paragraph 3 establishes some conditions of exemption from the prohibition of the agreement.

Like the other provisions of the Treaties, the articles on competition also have direct effect, and can therefore be enforced by the individuals at the national court. The regulatory framework has been enriched over the years by Regulation (EC) no. 1/2003 containing amendments to the application rules of article 101, paragraph 3. Furthermore, Communications from the Commission have been provided; as well as a series of block exemption regulations, regarding vertical and horizontal agreements[40].

3.2.2 Art. 101 and the prohibition of agreements restricting competition

In competition law, the term agreement refers to any situation of conscious and voluntary coordination of one's activities by independent companies. This case is therefore characterized by the presence of at least two independent companies, by the conscious and voluntary coordination of their activities and by the restrictive effect on competition that the coordination produces. In the legislative text of

[39] T. Boesman, 'Contribution on Art 101 TFEU in Verloren van Themaat and Reuder_s European Competiti (1).Pdf'.

[40] ibid.

Article 101, the notion of agreement is broken down into the sub-categories of agreements, decisions of business associations and concerted practices. All those may "affect trade between Member States and which have by object or effect of preventing, restricting or distorting competition within the internal market"[41]. With the term agreement the law refers both to formal adhesion to a contractual relationship and to the implementation of a letter of intent, a gentleman's agreement or tacit acceptance to a proposal or contractual clause. What matters is therefore not the formal nature of the agreement, but the common manifestation of the will from at least two companies involved in a specific commercial conduct[42]. The second sub-category of prohibited agreements is given by the "decisions of business associations"[43]; decisions of any form, even non-binding ones, adopted by private and public bodies, which have as their object or effect the alteration of competition. Finally, as indirect proofs of the existence of an agreement, the "concerted practices" emerge as those forms of collaboration between companies which, even if they have not taken the form of an agreement, are the result of concertation between companies that can be held responsible for the detriment of fair competition. However, it is not enough to identify parallel behaviors to conclude that there is a form coordination between companies[44]. This can be considered as proof of collusion solely when concertation constitutes the only possible explanation to those parallel behaviors. The concerted practice can derive from recommendations, suggestions or the simple communication of its prices or other conditions of sale between competing companies, and is prohibited as a limitation of the autonomy of each economic operator to determine its conduct in the common market. For the purposes of the prohibition, there must be a causal link between the concertation and the subsequent conduct of the undertakings on the market[45].

[41] Art 101.1 TFEU

[42] Chris Townley, 'Which Goals Count in Article 101 TFEU? Public Policy and Its Discontents: The OFT's Roundtable Discussion on Article 101(3) of the Treaty on the Functioning of the European Union' (2011) 32 European Competition Law Review 441 <http://login.westlaw.co.uk/maf/wluk/ext/app/document?sp=at171067afe0-55123&crumb-action=reset&docguid=IB66437A2CA1511E09431D7160DB4864F>.

[43] Art 101.1 TFEU

[44] Townley (n 42).

[45] T. Boesman (n 39).

3.2.3 The discipline of exemption from the prohibition: article 101.3

Agreements, concerted practices and decisions which have as their object or effect the restriction of competition, as quoted in Article 101, may be exempted from the prohibition if they have certain characteristics, which are provided for by paragraph 3 of article 101[46].

The granting of an exemption does not imply that the agreement benefiting from it escapes the application of article 101.1. On the contrary, the exemption can only be granted to agreements which have elements of the prohibition; for those that do not fall under article 101.1 the problem does not even arise. It is therefore a question of assessing, in a first phase, whether an agreement falls within the scope of application of paragraph 1. After it is verified the affect on trade between Member States and the anti-competitive object or effect, a second phase of comparative evaluation will be carried out between the favorable and restrictive effects, where, for the purposes of the exemption, the former must prevail over the latter[47].

Furthermore, paragraph 3 provides for the possibility of declaring the prohibition inapplicable to agreements, decisions and concerted practices (called individual exemptions) or to categories of agreements, decisions and concerted practices (called exemptions by category)[48]. With the instrument of exemption, an attempt was made to eliminate the consequences deriving from the rigorous application of Article 101, to re-establish the contractual autonomy of the parties and to recognize the usefulness of certain agreements for the Union.

The community law establishes four conditions for an agreement that falls under the prohibition of article 101.1 TFEU, to be declared inapplicable pursuant to paragraph 3 of the same article. The conditions that must be cumulatively and are to be considered exhaustive, in the sense that when they are satisfied, the derogation

[46] Art 101.3 TFEU

[47] Townley (n 42).

[48] Renato Nazzini and others, 'COMPETITION LAW REVIEW Concurrences N° 1-2019 I On-Topic I Concurrences N° 1-2019 I On-Topic I' <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3081914;> accessed 13 May 2021.

cannot be subject to other conditions. The exemption is granted as long as the four conditions are met and ends when this situation is no longer valid.

Of the four conditions, two are positive and two are negative; the positives are the follows:

a) those agreements which contribute to improving the production or distribution of products or to promoting technical or economic progress are exempt. The agreement must be concretely suitable for achieving the benefits stated by the parties and these benefits must prevail over the negative ones.

Such improvements claimed by the parties must be objective and the parties must produce sufficient evidence to allow verification of the alleged efficiencies. The link between the agreement and the increases, the likelihood and extent of each increase, and how / when the individual increases will be made has to be shown. The advantages deriving from the improvement may consist in the reduction of costs, and in the expansion of the quantity or quality of the offer in accessing new markets or increasing the degree of market transparency. Other positive effects are considered to be the protection of the environment, the reduction of pollution, the development of technologies for energy saving and the introduction of technologies that make it possible to compete with non-EU countries. An anti-competitive effect that the Commission has repeatedly informed that cannot be exempted, despite the fact that companies can demonstrate the achievement of positive effects deriving from the restriction of competition, is the conduct of fixing prices.

b) For the purposes of the exemption, the agreements must also reserve a fair share of the resulting profit to users. The notion of "users" includes both direct and indirect purchasers, as well as purchasers of intermediate and final products. The notion of “profit” includes all the advantages that users derive from the operation of the agreement, both in the short and in the long term; benefits to which users must participate. The concept of "fair share" implies that the passing-on of benefits must at least compensate users for the actual or possible negative effects of the restriction; what matters is the net effect.

The other two conditions for the exemption are negative, intended as elements that the agreements need to avoid in order to be exempted:

c) to impose restrictions on the undertakings concerned which are not indispensable for achieving these objectives. A restriction will be indispensable if it can be assumed that the benefiting party would not have agreed to contract in the absence of such a restriction, or when a different behavior does not seem possible to achieve that particular consumer-friendly result, or, if other anti-competitive measures were possible but not sufficient to achieve the objectives deemed worthy.

When the benefits are also achievable by the companies individually, the agreement cannot be exempted

(d) to give these undertakings the possibility of eliminating competition for a substantial part of the products in question. This was intended to prevent companies with a high degree of power in the relevant market from benefiting from the exemption to unacceptable levels. It is therefore important to identify the structure of the market on which the agreement will have an effect, with reference to potential competition and with an analysis of the current demand[49].

3.2.4 The guidelines on horizontal cooperation agreements

In January 2011 the EC adopted new guidelines on the applicability of art. 101 TFEU regarding regulations on horizontal agreements, one relating to research and development agreements and the other to specialization agreements, which will be discussed in detail later. These guidelines, like the previous ones, follow the legal evaluation criteria that are well founded on economic analysis. As regards to horizontal agreements, on the one hand we can appreciate the fact that they bring benefits to the competitive system as they allow companies to operate in the same market to exploit the existence of complementarity in the use of resources, as well

[49] Guidelines on the application of Article 101(3) TFEU (formerly Article 81(3) TEC)

as in the organization of production systems, and the use of skills and knowledge of those involved. On the other hand, we are aware that such agreements can reduce competition and negatively affect the well-being of consumers due to the price and product alignment they favor between companies. The guidelines therefore serve to facilitate the task of balancing pro and anti-competitive effects. Compared to the traditional approach, which envisaged an absolute presumption of illegality for hardcore restrictions (considered as hardcore agreements of price, quantity and distribution), the new guidelines introduce a tripartition between hardcore agreements, restrictive agreements for the object (which in any case deserve further evaluation pursuant to paragraph 3 of article 101 TFEU) and restrictive agreements for their effects. An admissibility is also introduced for restrictive agreements by object, which arises from the need to take into account the characteristics of those horizontal agreements for which the traditional presumption of a hardcore nature would not be reasonable. Agreements of this type must therefore also be able to benefit from a balance between positive and negative effects, even if they materialize in behavior that can be defined as restrictive for the object. These guidelines are the basis for evaluating the most common types of horizontal agreements which are:

- research and development agreements;
- production and specialization agreements;
- purchase agreements;
- standardization agreements.

The production agreements include both joint production agreements and specialization agreements whereby a company entrusts the production of a product to another company. The positive effects of these agreements can be described in terms of an increase in the efficiency of production processes and an improvement in the quality and variety of products. This is attributable to the complementarity of activities between companies or to economies of scale. Such agreements can at the same time lead to collusive effects both in terms of increased common costs or illicit exchange of information, and in terms of excluding third party competitors in a

downstream market. They generally have an anti-competitive object and are often problematic.

The *joint purchase agreements* are intended to strengthen the bargaining power of the companies participating in the so-called "Buying center"[50], and thus to achieve shared economies of scale. The lowering of purchase costs can be passed on to consumers with a consequent lowering of the final price. The buying centers are assessed with a certain rigor by the antitrust authorities and must contain specific clauses to prevent certain risks: the first risk is given by the consideration of the market power of the participants in the final market for the sale to users, considering the situation where the participants in the central control of the entire final market would have fewer incentives to pass the final price reductions to consumers; a second risk relates to the possibility that the buying center excludes operators outside the market from purchasing certain products.

Research and development agreements include both research activities, usually aimed at the development and patenting of the invention and the launch of a product. This type of cooperation is viewed favorably by antitrust law since the pooling of capital and know-how can favor the flow of innovations offered to the market. Concern about anti-competitive effects in these cases is mainly due to two circumstances: first, that the reduction of competition on existing products and technologies goes beyond the scope of R&D cooperation; the second, that equally efficient competitors are excluded when a company, with market power over a technology, reserves the exploitation of results only to itself. The matter is the subject of the exemption regulation, Reg. 1217/2010, which provides for the exemption of R&D agreements to not cover more than 25% of the relevant market; the new guidelines broaden the scope of the regulation and are particularly flexible in leaving companies free to better organize cooperation in this type of activity[51].

[50] A buying center, also called decision-making unit (DMU),[1] brings together "all those members of an organization who become involved in the buying process for a particular product or service

[51] Guidelines on horizontal cooperation agreements

3.2.5 The Commission's guidelines on vertical restraints

Some types of vertical agreements can increase economic efficiency, within a production or distribution chain, bringing the following benefits to participating companies:

- Reduce the costs of the parties' commercial and distribution transactions;

- Allow for better coordination between the participating companies;

- Increase of sales and investment. Following the generally positive experience of the application of regulation no. 2790/1999, the Commission adopted this new block exemption regulation.

Article 101 TFEU, par. 1, (pursuant to art. 81 TEC, par. 1) prohibits agreements which may affect trade between member states and which prevent, restrict or distort competition. Paragraph 3 of Article 101 of the TFEU (ex Article 81, paragraph 3 of the TEC) exempts agreements that produce sufficient advantages, such as to offset the anti-competitive effects. In this sense, vertical agreements for the sale and purchase of goods and services are involved, concluded between companies each operating at a different level of the production or distribution chain. Typically, vertical agreements, which only determine the price and quantity for a specific buy and sell transaction, do not restrict competition. On the contrary, if the agreement contains restrictions for the supplier or the buyer, for example if it obliges the buyer not to buy competing brands, it could distort competition. Such vertical restraints can have negative but also positive effects: for example, they can help a manufacturer to enter a new market or avoid a situation where a distributor takes advantage of the promotional efforts of another distributor or allows a supplier to amortize an investment made for a specific customer. With Regulation (EU) no. 330/2010, the EC has established a series of objective criteria, designed to define the vertical agreements allowed between companies, which are positive for competition. The first requirement provides a market share threshold of 30% for both suppliers and buyers: a vertical agreement is covered by this block exemption

regulation if both the supplier and the buyer of the goods or services do not have a market share exceeding 30%[52].

3.3 The Blockchain technology within the legal framework of competition law

3.3.1 Introduction

The economic environment in which we live today embodies particularly complex characters and development mechanisms. Companies are constantly required to face competitive challenges caused by technological innovation and globalization. Both phenomena represent inestimable growth and success factors for companies that know how to seize the opportunities. This feeds a competitive pressure which is difficult to handle by those who do not have the means and resources to intervene promptly and respond adequately to the rapid and changing market dynamics[53]. In order to cope with these pressing changes, economic operators often decide on the development of common innovation policies, therefore based on a collaborative approach and mutual support. Although what has just been described is perfectly in line with the pro-competitive objectives of the European antitrust legislation, it is equally understandable that this cooperation may represent a risk to the normal performance of the markets, resulting in awaking the interest of antitrust law that often intervenes with specific prohibitions[54]. In this session will be presented the analytical discussion on which are taken in consideration the previous presented general legal frameworks and consideration from official articles.

3.3.2 The Blockchain Transparency

[52] Guidelines on Vertical Restraints 2010/C 130/01

[53] Harvey, Moorman and Toledo (n 9).

[54] Ai Deng, 'Smart Contracts and Blockchains: Steroid for Collusion?' [2018] SSRN Electronic Journal.

The transparency and the public nature of the information recorded within the blockchain offer a fertile context for the implementation of collusive conduct. A typical example could be represented by a cartel created through the codes of smart contracts, especially when these are equipped with algorithmic pricing systems capable of updating automatically when the conditions established within the smart contract are met[55]. Of similar concern would be the situation when competing firms decide to exchange information on prices or other strategic variables through the distributed ledger. In such cases it would be necessary to verify whether such conduct falls within the scope of the prohibition referred to in Article 101 TFEU and if necessary, whether they meet the requirements of the third paragraph of the same article for the purpose of exclusion from the prohibition.

Differently from the Federal Trade Commission Act (FTC), the European antitrust law does not prohibit the so-called "Facilitating practices" in the absence of elements that demonstrate the collusion phenomenon or the bi-directionality of the communication[56]. The Commission highlighted the need to find a causal link between the practices observed and the potential effects that these could produce on the integrity of the whole process, as it is well represented by the notorious case of Dole Food Company v. Commission, where the anticipation and communication of the prices created conditions of competition that do not match with the normal market conditions. The definition of what is meant by "normal market conditions" is far from easy, even less if evaluated in a new and changing context such as that of the blockchain. From this follows the need for the Commission to carry out a much more complex and detailed analysis which has to be conditioned by the degree of cryptographic pseudonymity and by the public or private design of the register[57].

3.3.3 Blockchain and cooperation agreements between undertakings

[55] ibid.

[56] v. E.I. Du Pont de Nemours & Co. v. Federal Trade Commission, 729 F.2d 128 (2nd Cir. 1984)

[57] Conte De Leon and others (n 21).

Within the current analysis, cooperation agreements between companies become particularly important. Generally considered pro-competitive, since they expand the offer or improve the production of goods and services, these agreements may be subject to competition rules (Art. 101 TFEU) under circumstances potentially capable of negatively affecting market trends. In recent years, it has been established a distinction between forms of cooperation that clearly show innovative aims and with an evident technological object and other collusive behaviours such as cartels. Inevitably, some common effects tend to blur the boundary between the two cases[58]. For example, we should think of the hypothesis in which a technological tool becomes the target of an anti-competitive agreement where the member companies conduct research and mutually share their respective skills, solely in order to then exploit the results of such activity[59]. The repercussions on the degree of product differentiation and on prices will be completely similar to those produced by cartels[60].

In relation to the development of blockchain registers, it is appropriate to highlight the reasons underlying the diffusion of these forms of collaboration. Among these, there is the impossibility for companies to independently bear the huge costs, the lack of specific skills and the high risk of the projects that characterize the discussed technology. Without any doubt, the cooperation supports and increases research efforts and can therefore be considered as a means to providing a more efficient sharing of information among firms[61]. However, the same agreements can give rise to conduct which reveals to be anything but competitive and facilitate collusion in the research market, precisely through the shield of an apparently legitimate collaboration[62]. Technological innovation, as mentioned previously, is one of the main variables that determine the strategic advantage of a company over its competitors. In this current economic context and in the light of its multiple applications, the blockchain assumes a crucial role. The phenomenon can therefore be analysed from a double perspective: the first concerns the collaborations within

[58] Meunier (n 2).

[59] Rohith P George and others, 'Blockchain for Business' (2019) 20 Journal of Investment Compliance 17.

[60] Thibault Schrepel, 'Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox' [2018] SSRN Electronic Journal.

[61] George and others (n 59).

[62] Christophe S Hutchinson and Maria A Egorova, 'Potential Legal Challenges for Blockchain Technology in Competition Law' (2020) 13 Baltic Journal of Law and Politics 81.

research and development of technological solutions (so-called R&D Agreements) which will compete with other emerging technologies, while the second concerns the initiatives to define interoperable systems and standard conditions, so-called Standardization Agreements. Both forms of collaboration are not of particular concern if they involve non-competing companies or companies that share complementary resources, where neither one of them can independently carry out a specific research activity, or if this is still in an initial phase, far from being able to exploiting its results[63].

The blockchain still represents a completely new technological product which is day by day creating new demand in a plurality of sectors and markets. It is therefore difficult to conduct the in-depth analysis that generally affects this type of agreement and to calculate the market shares of the companies involved in the R&D activity, especially for the purposes of applying the block exemption regulation, in the absence of precise sales estimates[64]. As anticipated at the beginning of this chapter, the blockchain can be relevant both for the purpose of assessing the restriction on competition in the product market in which it is applied and in the research market aimed at developing similar platforms for application in markets that do not yet exist. For example, the implementation of a blockchain which makes payment solutions offered by banks more efficient, is able to affect the already existing market for bank payment solutions and to restrict competition in the research market, in the situation where the parties would have been able to independently develop such technological solutions. The second is the case of Bitcoin that uses a blockchain register, which up until a few years ago was a new product for the market and consequently can only produce restrictive effects in the research market[65].

Cooperation agreements that aim to carry out research and experiments in the blockchain field seem to pose even greater problems if one observes the small number of companies equipped with the necessary means to carry out such research. It is additionally relevant that in most cases observed so far, there are competing companies, mostly leaders in the digital innovation sector, that hold a significant

[63] Point 130 of the Communication of the Commission 2011 / c 11/01,

[64] Renato Nazzini, 'The Blockchain (R)Evolution and the Role of Antitrust' [2018] SSRN Electronic Journal.

[65] ibid.

share of this market[66]. However, this does not seem at all to inevitably imply the unavoidable hypothesis of prohibited agreements under Article 101 TFEU, even though the blockchain offers objective and considerable advantages in relation to numerous applications. The exact impact in competitive terms of the agreements that catalyse the efforts of different companies can only be appreciated once these research efforts have been translated into concrete implementations. However, it is not too optimistic to affirm that even when demonstrated, the anti-competitive nature of the effects produced, as well as the increases in efficiency, the expansion of the quality and quantity of the supply, and the benefits and/or profit that would be distributed to users/consumers by the development of blockchain technology, would be of such value to justify the application of the exemption referred to in the third paragraph of Article 101 TFEU[67]. On the other hand, to date, there are no alternative ways to join consortia led by the largest companies in the technology industry. In this sense, the agreements in question could also be qualified as indispensable for the development of transparent, decentralized, distributed and secure solutions which, in various sectors, are now perceived as crucial for the economic and social progress. The Regulation (EU) No. 1217/2010, however, introduced a particular exemption regime for R&D agreements within the scope of art. 101 paragraph 3 TFEU. These are the so-called exemptions by category, which upon the occurrence of the specific conditions identified in Article 3 of the same Regulation, justify the automatic exclusion from the prohibition referred to in Article 101.1 TFEU and exempt the parties from the burden provided for by Article 2 of Regulation 1 / 2003. The aforementioned would otherwise require them to prove that the agreement meets the requirements of the third paragraph of Article 101 TFEU. For this exemption to be applicable, the agreement must establish that all parties have full access to the final results of the research and development activity. This includes any intellectual property rights and know-how in the hypothesis of further research and development activities. Where the collaborative activity is limited to the research phase only, the parties must have access to any

[66] Schrepel (n 37).

[67] Nazzini (n 64).

pre-existing know-how of the other interested parties, provided that this know-how is indispensable for the exploitation of the results[68].

Once the anticompetitive potential of the agreement has been ascertained, it is necessary to proceed with the weighting of the benefits and positive effects produced with the negative impact produced on the competitive game. Balancing that, in relation to the activities relating to the creation of blockchain platforms, as already highlighted, appears entirely favourable to the establishment of similar forms of cooperation[69]. Moreover, the only condition that seems to hinder the application of this exemption to R&D activities within the blockchain is the maximum market share which, in the case of competing companies, must not be greater than 25% in the relevant product or technology sector. Indeed, here it is believed (perhaps with excessive optimism) that precisely this provision can be decisive for involving many different companies in these activities, which perhaps would otherwise have renounced participating in similar initiatives. Therefore, it will be essential to provide that R&D agreements aimed at the creation of blockchain platforms can also benefit from the same exemption regime.[70] Similar considerations can also be made with regard to standardization agreements. They are generally able to guarantee positive economic effects especially in terms of efficiency gains and integration by improving the level of compatibility and interoperability of the systems. They also make it possible to reduce transaction costs, ensure compliance with certain standards regarding the quality and safety of products and mitigate dependence on a specific supplier[71].

As illustrated in the previous chapters precisely with regard to the latter, there are numerous requests for standardization that come from different sectors, such as the healthcare or the financial sector. Operators from these sectors and experts fear (rightly) the diffusion of fragmented approaches due to innovation that determine the birth of many different digital infrastructures unable to communicate with each other. As interoperability is a fundamental feature for a distributed platform, the

[68] Mariateresa Maggiolino and Laura Zoboli, 'Antitrust Law and Blockchain (s): Preparing the Field' (2020) 121 Blockchain and Public Law 1.

[69] Falk Schöning and Myrto Tagara, 'Blockchain: Mind the Gap! Lessons Learnt from the Net Neutrality Debate and Competition Law Related Aspects' (2018) 2018 Concurrences.

[70] ibid.

[71] Nazzini (n 64).

definition of minimum technical standards and consensus protocols is essential for its functioning. Nonetheless, these agreements are not exempt from significant critical issues, insofar as they provide for technical or design specifications that limit technological progress or prevent other manufacturers from participating in the standards development process[72]. This negatively affects the choice offered to users / consumers, since the majority of a sector adopts the standard conditions and decides not to deviate from them in individual cases (or deviate from them only in exceptional cases of strong buyers), customers have no choice but to accept the established conditions[73]. This often takes particular form; first, an appreciable restriction of competition can occur if firms engage in 'anti-competitive discussions in the context of setting standards' that favour collusive conduct. Second, the definition of specific rules and standards can have the effect of excluding alternative technologies or aggravating the conditions that competing companies are required to face in order to enter the market[74]. Such an agreement, which precludes the companies involved from conducting parallel research on alternative technological solutions, determines an increase in the risk of limitation to innovation. In order to prevent this consequence, it might be useful to prevent the parties from entering an agreement concerning the development of a blockchain from being bound to the exclusive use of the solution, and instead provide that they can use alternative technologies or platforms. It is also necessary that this choice is not conditioned by excessive conversion costs due to these rules or technical specifications, which could in fact discourage the use and development of further and different platforms[75]. Lastly, if a company is totally denied access to the result of the rule or if access is only granted under prohibitive or discriminatory conditions, there is a risk of an anti-competitive effect. In order to prevent the occurrence of foreclosure effects, it is therefore necessary to set up access conditions that meet the so-called FRAND terms on fair, reasonable and non-discriminatory terms[76]. In the face of these critical issues, as already highlighted for the cooperation agreements aimed at the development of blockchain registers, it is undisputed that standardization offers

[72] Thibault Schrepel and Vitalik Buterin, 'Blockchain Code as Antitrust' [2020] SSRN Electronic Journal.

[73] Schrepel (n 37).

[74] Deng (n 54).

[75] Schrepel (n 37).

[76] https://www.twobirds.com/en/news/articles/2018/global/blockchain-technology-and-competition-law-issues-to-be-considered

significant advantages, including facilitating consumer's choice and offering them better products in terms of quality and safety. It also optimizes the economic energies invested by each company and reduce the time needed to implement new technologies. Briefly, it favours competition on the basis of merit between technologies and helps to avoid dependence on a particular supplier. Consequently, this appears to be a characteristic which, despite the anti-competitive risks, we cannot give up[77].

3.3.4 Blockchain, exchange of information and concerted practice

By shifting the objective to the functional dimension of the blockchain, or to the analysis as a tool through which certain anti-competitive practices can be realized, a particularly critical profile concerns the potential ease in which sensitive data from a competitive point of view can be traded via blockchain. The main cases relate to the disclosure and exchange of information relating to prices, quantities, innovation. On closer inspection, information cooperation between companies fits perfectly in a context of perfect competition, therefore it should be a practice that is even pro-competitive. In reality, this almost never happens. On the contrary, the information asymmetries irremediably connote the markets and the relationships between the various operators to the point that the exchange or sharing of information becomes one of the first signals that suggest the alignment of prices and conduct[78]. This risk appears even higher in the opaque context in which the polymorphic concerted practices take shape. The only appreciable distinction between these and the abovementioned agreements, is the absence of a real agreement, being rather a broad set of cases united by an implicit coordination of reciprocal's activities. Again, if we use the metaphor of a cartel created through the codes that make up the structure of smart contracts, we understand how even this distinction, in the context of the blockchain, is rather tenuous[79]. In any case, such behaviours translate into a conscious collaboration between companies to the

[77] Nazzini (n 64).

[78] Schrepel (n 37).

[79] Deng (n 54).

detriment of competition and since the shapes of such practices are often more than blurred, ample recourse is made to presumptions. The consultations in question can be divided, on a descriptive level, into three stages: i) the concertation, or the conscious disclosure or exchange of information; ii) the internal conduct, or the decision to model one's strategies on the basis of the information learned; and iii) the external manifestation of the practice or the uniform effects produced on the relevant market[80].

The disvalue recognized to these practices by the national and community legal system is revealed by the presumption that characterizes the internal conduct, and which therefore makes it sufficient that the first moment of consultation is carried out, so that business behaviour is as an offense pursuant to art. 101 TFEU. The blockchain, in such a context, does not facilitate the position of companies. Imagine a distributed ledger whose nodes represent several competing companies in the same market. The introduction in the register, by any of them, of sensitive information, based on the principle of consent, can only presuppose the knowledge by each node of the data to be registered. How, then, could a company prove to be completely extraneous to the concertation of strategies?[81] It is in fact possible that, despite not having knowledge of the conditions and information relating to a competitor, the strategies of an innocent company are compatible with the restrictive agreement. In this hypothesis, it would be very difficult for the company to overturn the aforementioned presumption and demonstrate that in the development of its strategy it has taken into account criteria and variables that are completely independent from the information received or exchanged. Furthermore, it would be equally complex to assess whether the simple registration of certain data constitutes an agreement or a concerted practice such as to fall within the prohibition pursuant to art. 101 TFEU, or whether it represents nothing more than a unilateral practice, as such unrelated to the provisions of the antitrust regulations. On the other hand, however, the investigation activity carried out by the competent authority will be equally complex, if the design of the blockchain is private and therefore inaccessible[82].

[80] Filippi and Hassan (n 32).

[81] Deng (n 54).

[82] Lai, Lee and Chuen (n 20).

A further concern relates to the use of the consent mechanism where it is exploited in order to oppose the validation of transactions carried out by certain subjects and at the same time and favour operations involving only some nodes. The will of the majority of the nodes, in these cases, can have significantly restrictive effects on the competitive capabilities and opportunities of companies whose presence is unwelcome[83]. From the above, it is clear that the concept of transparency (probably most recognized and decisive for the success of the blockchain in the industrial sectors) is to be understood and evaluated, for the purposes of antitrust legislation in far from positive terms. In fact, if implemented by competing companies in the same market, it would make it possible to mutually know the commercial decisions and the measures adopted with greater speed and accuracy[84]. Coordination and monitoring of the adaptation of the same to common action strategies as well as the implementation, in cases of deviation or non-compliance, of certain mechanisms would also be facilitated[85].

3.4 Summary

Chapter three highlights the legal framework on which the analysis in relation to blockchain technology is conducted. Particularly important result the communication and guidelines related to the cooperation agreement between undertakings, which provide information that result relevant to identify what kind of agreements and conditions must be present to exclude the concerted practices from the provisions of Art 101.1 TFEU. Furthermore, the analysis identify the complexity of the investigation and the difficulty from competition authorities to distinguish collusive conducts from cooperation that should be preserved and protected due to the beneficial impact within society.

[83] Filippi and Hassan (n 32).

[84] Schrepel (n 37).

[85] ibid.

4. Conclusions

This thesis intends to address the very delicate issues of compatibility between competition law and blockchain technology, with specific regard to the impact that the diffusion of this technology could produce on the competitive dynamics that art 101 of the TFEU aims to protect in the near future. An attempt was therefore made to value both the most skeptical and the most enthusiastic positions, in the constant effort to offer an illustration that was as objective and comprehensive as possible. However, looking at these IT architectures within the current competitive context, does not allow us to adhere a priori to neither one of them. The need to offer an overview as complete as possible of the blockchain has inexorably forced us to extend the field of observation beyond the arguments offered by rigid polarization between "favorable" and "against" and to recognize its mutable nature, the variety of applied fields and the unpredictability of the development prospects. This was followed by the inevitable finding that, in regard to such a complex technology as the blockchain, it is not possible, unambiguously and absolutely certain, to answer any specific question. Nevertheless, it is evident that this technology could undoubtedly favor collusive conduct, as it would guarantee each node free access to any information registered on it with repercussions on a competitive level which is even more serious if the companies participating in the network are competitors. In this scenario, being a new technology with a low level of undertakings' participation within the platform, it would not be possible to draw conclusion in relation to the applicability of the block exception regulation. Nevertheless, the technology presents a potential beneficial impact which when shared among the users and consumers, would overcome the negative effects resulting from the anticompetitive practices. In this scenario, blockchain relies completely on the undertakings that take part in it and offer elements to both endorse and contrast collusive conducts. It is evident within these unclear coordinates that there is a need for competition authorities to improve monitoring systems that can overcome the level of complexity of the technology and prevent the establishment of practices that harm competition and are not exempt from art 101.3 of the TFEU.

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