A Discussion on the Blockchain Technology and Competition in context with the EU and US Law.

BACHELOR THESIS

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DECLARATION OF HONOUR:

I declare that this thesis is my own work, and that all references to, or quotations from, the work of others are fully and correctly cited.

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Abstract:

The technology, which has been around for a long time, has attracted the attention of the whole world relatively recently, along with the sharp rise of Bitcoin in 2017. In many areas of law, blockchain and cryptocurrencies have been studied all these years. However, competition law issues have not been treated as the most significant problems of blockchain application and were discussed by the legal authorities relatively rarely. In this paper, author will explain why it is so important to consider blockchain from a competition perspective, as well as will point out the most realistic and threatening uses of this technology for anticompetitive purposes.

Summary:

Blockchain is an innovative form of database which functions as a distributed ledger technology. It arranges data into blocks that are cryptographically and chronologically connected, what makes blockchain a superior form of database. Blockchain is typically divided into two types: public and private. While in the public blockchain all information is available for all users and there is no limit on who can participate, private blockchains are restricted and limit the number of members who can read it. The information may only be utilized by network participants who have access to the private blockchain.

Blockchain provides a number of advantages for the commerce and competition, the first of which is that it is decentralized. The remarkable technological architecture of blockchain sets it apart from other systems, allowing the technology to be tailored to a number of application cases. Timestamping, forking and immutability are the features of blockchain that make it so unique and progressive. However, problematic governance of blockchain, as well as its ability to reduce transaction costs and remove intermediaries, leading to the disruption of several markets are its obvious downsides.

From the perspective of competition and antitrust law, public blockchains are more or less safe and the only risk regarding such type of blockchain is an information exchange. For the private blockchains, competitive risks are much more significant. Not only there is a risk of information exchange, but also several types of abuses of dominant position may raise within permissioned blockchains. Current legislation of EU and US is not yet ready to face competition law issues which will come together with the development of blockchain technology. Competition authorities in both jurisdictions have to review existing legislation and make necessary changes to it in order to avoid major problems in the future.

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Introduction:

Background

Numerous efforts have been done in the past to create digital money, but they all were unsuccessful. The major question is the most significant. How can we be sure that if someone produces a new currency, they aren't going to give themselves a million units of this currency or even steal it from you? By leveraging a blockchain, which is a type of database, Bitcoin was built to overcome this issue. In just about all traditional databases, there is someone in authority who can make changes to the records and award oneself a million units of currency, for example. Blockchain is unique in that no one is in control. Instead, the individuals who utilize it have control over it. Bitcoins can't be counterfeit, manipulated, or double-spent, so those who hold them may be certain that they're worth something.[1]

Blockchain has been named the single most significant breakthrough since the internet's inception, and many believe that this technological advancement does have the potential to transform the way a lot of industries do commerce. While the internet provides for the digital publication and movement of information, blockchain enables the detection of asset ownership, making them distinctive and verifiable, enabling digital transfer and therefore asset exchange, providing trust in a transaction, and minimizing uncertainty.

Blockchain technologies have the ability to add enormous value to transactions by allowing users to interact with other parties utilizing a secure, shareable, and irreversible decentralized database. By improving transparency, each blockchain member sees and validates everything saved in this decentralized database. Rather of a centralized database, any transactions, assets, or data are kept in a decentralised network formed up of a large number of computers. This means that blockchain is possibly safer than centralized databases, because compromising a blockchain requires synchronously attacking all machines that are part of the blockchain network, which would be prohibitively expensive. All those characteristics of blockchain, rather than the specific technology that the word encompasses, are crucial. They open up the

[1] Euromoney, "What is blockchain?" Available on: https://www.euromoney.com/learning/blockchain-explained/what-is-blockchain

option of expediting multi-party procedures in a secure manner while maintaining the participants' confidence in each other.[2]

By 2027, the World Economic Forum estimates that 10% of the global gross domestic product would be kept on blockchain.[3] By establishing a world in which computers fill the gaps in contracts, it can certainly make contracting easier and minimize pervasive contractual shortcomings. Companies are investigating new methods of doing business utilizing blockchain technology as the advantages of blockchain have become apparent over time. Businesses all over the world are becoming increasingly interested in how this technology may be used.

Blockchain and Competition Law

Despite the high number of benefits, there are several applications of blockchain technology that might cause competitive risks. Blockchain actually makes part of the transaction data available to users inside the network as a shared database where information is recorded in real time and thus is available to anyone within that system. The data provided within the blockchain might reveal details about very delicate private business activities or strategies.

Blockchains may also be thought of as a distributed information storage mechanism that includes money transfers, payment information, company accounts, price history, and anticipated cost adjustments. Non-transactional data including registration documents, copyright and patent details, meeting notes, scheduled tasks, yearly summaries, and transportation records can also be stored within the blockchain. Users of blockchain technology may be subject to competition law problems because of that. These possibilities place various blockchain use scenarios squarely to the competition law enforcement, and compliance with competition rules must be taken into account early on because they have a direct effect on the regulations controlling a blockchain network.[4]

Since it is more than obvious that eventually blockchain will prevail over traditional systems and will be used by thousands of businesses all over the world, it is crucial to analyse its

[2] Mark Simpson, Jamie Cooke, "Blockchain: competition issues in nascent markets." Available on: https://www.nortonrosefulbright.com/en/knowledge/publications/81f70b38/blockchain-competition-issues-in-nascent-markets

[3] World Economic Forum, “Deep Shift: Technology Tipping Points and Societal Impact,” p.24. Available on: https://www.weforum.org/reports/deep-shift-technology-tipping-points-and-societal-impact

[4] Jacques Derenne, Michael Hofmann, Ciara Barbu-O'Connor, "Blockchain and EU Competition Law." Available on: https://www.jdsupra.com/legalnews/blockchain-and-eu-competition-law-9904251/

impact on the competition and on the position of companies on the market. It is also important to analyse how blockchain technology can be overviewed under EU and US law and to find out if existing legislation is sufficient to resolve issues which blockchain technology may bring to the competition. In the research, author's objectives are: to point out the main functions of blockchain which benefit or threat commercial activity, as well as healthy competition on the markets; to analyse how blockchain may impact competition rules in their current form; and to find out if the existing legislation needs to be changed in order to comply with the blockchain issues.

Thus, in the paper, author will answer following research questions:
What are the benefits and threats of blockchain technology for the competition? What issues may blockchain cause from the perspective of existing competition and antitrust legislation?

Author's preliminary answer to the research questions and hypothesis are as following:

Blockchain technology may provide enormously high value for the commercial activity as such. However, it may, at the same time, completely change and disrupt several market practises, change current positions of many companies and irrevocably turn over the competition in some commercial markets. Existing legislation is not yet ready for the implementation of blockchain and needs to be reviewed and adjusted in order to be ready for the rapid development of such technologies as blockchain.

The paper consists of three main parts which lead to the answers on the research questions:

1. **What is Blockchain**, where author briefly describes the essence and the main aspects of the technology which together provide overall knowledge regarding the object, discussed in the topic.
2. **How is Blockchain Directly Related to Competition**, where author discusses certain features of blockchain which directly influence competition, as well as where author describes main disadvantages and controversial elements of the technology for the commercial activity and competition.
3. **Blockchain from the Perspective of Competition Law**, where author evaluates blockchain with regard to the current legislation in EU and US, describes main threats of blockchain based on the competition and antitrust rules in these jurisdictions, as well as provides opinions of competition authorities regarding blockchain and decompounds existing case law on the topic.

Methodology

In the paper, author will mostly use and analyse qualitative data. To make the most precise conclusions regarding the topic, author will refer to other scientific researches with the scholarly opinions and expertise. Legal opinion is highly influenced by the books and articles of Dr. Thibault Schrepel, who is considered as the one of the most significant scholars in the area of blockchain and competition law, since he cooperated with both European Commission and US Federal Trade Commission regarding the blockchain competition issues. For the legal investigation, author will focus on the EU and US legislation in order to provide comparative analysis on the topic.

Because of author's participation in the analysis, opinions written in the work may differ from the opinions written in secondary sources. Author's opinions will be based either on his own perception of the topic or on scholarly examinations.

1. What is Blockchain?

This section focuses entirely on the foundations of blockchain operation, emphasizing those that are most important for competitive analysis.

1.1 General Characteristics

The word "blockchain" refers to a set of technologies that have been used to build networks establishing trust amongst individuals that have no reason to trust each other. The three technologies that make up blockchain are distributed ledger, cryptography, and network protocol.[5]

A blockchain is a digital chain made up of data from many blocks that are linked together in a logical order. This chain keeps a decentralized, distributed, unchangeable, and protects record of all transactions that take place between the blockchain's nodes. A consensus method operates on the principle of adding an additional block to the database, in which various participating nodes choose whether or not to add a new block of data to the database. Every block on the chain comprises a number of transactions, so each time a new transaction takes place on the blockchain, a trace of that operation is added to the chain of each member. Distributed Ledger Technology is a decentralized database that is administered by various

[5] Christophe S. Hutchinson, Maria A. Egorova, "Potential Legal Challenges for Blockchain Technology in Competition Law," *A Journal of Vytautas Magnus University* (2020) ISSN 2029-0454, pp. 84-85.

people. Blockchain is a sort of Distributed Ledger Technology (DLT) in which records are kept using a hash, which is an irreversible digital signature. The distributed ledger allows the same information to be stored in several locations.

Distributed Ledger Technology

Because distributed ledger technology is a hypernym that encompasses blockchains as one form, it must be referenced while discussing blockchain. In a decentralized network, a distributed ledger employs independent nodes to store, verify, and coordinate transactions. A blockchain is comparable to a database, except it arranges data into blocks that are cryptographically and chronologically connected, and it may also include smart contracts and other types of consensus procedures.[6]

Even before Bitcoin and blockchain, the paradigm of distributed ledger technology existed. DLT systems are "a specific application of the wider concept of shared ledgers, which are simply defined as a shared record of data among multiple parties," according to the World Bank.[7] The narrowest interpretation of this technology would describe it as a decentralized network that maintains and updates a chain of cryptographically linked blocks of data, with network nodes encouraged to participate in system maintenance and protection so that data is organized into a specific structure.

Proof of Work

Proof-of-work is a method in which computers compete to be the first to solve difficult challenges. Because the energy and resources necessary to finish the puzzle are frequently regarded the digital counterpart of the real-world process of mining valuable metals from the earth, this process is usually referred to as mining.

Proof of Work asks people who are in the system to solve a complicated mathematical problem in order for the block to be added to the chain. Mining refers to the method of

[6] Michel Rauchs and others, “Distributed Ledger Technology Systems: A Conceptual Framework.” Available on: https://deliverypdf.ssrn.com/delivery.php?ID=388082074064088027089013103004120064039053020018026058109067011101115097066025002086004023025048015127038004076088001119118005023025088064054106090078001077070071026023005046003024031120126092020096022079011069127011091077086085017108096064001073066074&EXT=pdf&INDEX=TRUE

[7] World Bank Group, “Distributed Ledger Technology (DLT) and Blockchain.” FinTech Note No. 1. Available on: http://documents.worldbank.org/curated/en/177911513714062215/pdf/122140-WPPUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf

finding a solution this problem and people who help to solve these issues are usually awarded with cryptocurrency.[8]

However, mining is a difficult task. The mathematical problem can only be solved though many attempts with extremely low chance of success. It demands a large amount of computer capacity, which uses a high amount of electricity. Since a sole workstation cannot resolve the mathematical issue, the advantages of mining must outweigh the cost of the processing units and the energy required to operate them.

Miners sometimes share their resources through firms that assemble groups of miners to improve efficiency. The blockchain network's income and fees are subsequently distributed among them,[9]

As more computers join the blockchain to try to solve the challenge, the challenge becomes more complicated to fix and the network grows bigger, presumably dispersing the chain wider and making it more difficult to destroy or hack. However, mining activity has become mainly in the hands of several mining pools in reality. These corporations now have the computational and electrical resources required to operate and build a blockchain network based on Proof of Work certification.[10]

Public and Private Blockchain

Blockchains come in a variety of shapes and sizes. The distinction is whether the information kept on the blockchain is public or private, and whether or not potential nodes and users on the network require permission to join.

Public Blockchain

The term public (or permissionless) blockchain refers to a blockchain network that anybody may join at any time. In general, there are no limits on who can participate. Furthermore, anybody with access to the ledger may participate in the consensus process. One of the public blockchain platforms, for example, is Ethereum.[11] Each participant must set up their system by adopting the controlling protocol in order to become a node on that network. One can stay

[8] Luke Conway, “Proof-of-Work vs. Proof-of-Stake: Which Is Better?” Available on: https://blockworks.co/proof-of-work-vs-proof-of-stake-whats-the-difference/
[9] Euromoney, "How does a transaction get into the blockchain?" Available on: https://www.euromoney.com/learning/blockchain-explained/how-transactions-get-into-the-blockchain
[10] Daniel Deepak Charles, "Blockchain - What's All the Hype About Blockchains and Bitcoin?" Available on: Blockchain - What's All the Hype About Blockchains and Bitcoin? (eatmy.news)
[11] “What is Ethereum?” Available on: https://ethereum.org/en/what-is-ethereum/

anonymous within the network by using a unique user identity. Each participant's identify is tracked in the ledger. The ledger is transaction-based and keeps track of previous transactions. Based on previous transactions that have credited or debited the account, this information may be used to determine if the participant has adequate cash, capacity, inventory, and so on to accomplish the proposed transaction.[12]

Anyone can submit transaction blocks for inclusion on public blockchains. It lacks central verification tool that controls the blockchain to decide which blocks of transactions are added and which are genuine when there are inconsistencies. Rather, blockchains employ a consensus mechanism to determine which record should take precedence.[13] On the Bitcoin blockchain, for example, the first entity to solve a computational challenge properly gets to submit the next block to the network.[14] This is referred to as "mining."

For the permissioned public blockchain even though the information is available to everyone, adding new information or verifying new transactions demands approval from a central body.

Private Blockchain

A private (or permissioned) blockchain is a variation of blockchain technology in which the network is controlled by a single entity. As a result, it is not open to the general public to participate. In practice, all private blockchain systems will have some kind of permission process in place to identify who is logging on to the site. Essentially, private blockchain solutions create these platforms for a company's internal networking infrastructure.[15]

This type of blockchain limits the number of members who can read it. Nodes are approved by a central authority in such a system, and the information may only be utilized by network participants since it is private. However, it is not necessary for the central authority to be a single body. On a private blockchain, a group of entities is common. There are full nodes that own a whole record of the ledgers and light nodes that hold bits of the ledger in such blockchain, as it is a common practice with a private blockchain.

Unlike public blockchain systems, private blockchains are not completely decentralized. It can be said that it is a partly decentralized scenario at this point. From another perspective,

[12] C.S. Huthinson, "Potential Legal Challenges for Blockchain Technology in Competition Law," pp.86 - 87.
[13] Gwyneth Iredale, "Public Vs Private Blockchain: How Do They Differ?" Available on: https://101blockchains.com/public-vs-private-blockchain/
[14] Matthew Sparkes, "What is bitcoin and how does it work?" Available on: https://www.newscientist.com/definition/bitcoin/
[15] Gwyneth Iredale, "Public Vs Private Blockchain: How Do They Differ?"

private blockchains usually will have rules that other systems do not have. To guarantee a company's correct flow, all nodes must follow specific standards within permissioned blockchains.[16]

Which is Better for the Commercial Activity?

A public blockchain appears to be the ideal solution since it can be used in a wide range of applications and has no access restrictions. In the case of other hybrid systems, organizations may find that combining public and private blockchains is a feasible option.

1.2. Key Terms Describing Blockchain

Cryptographic Hashing

A cryptographic hash function is a mechanism that accepts an arbitrary quantity of data and creates a fixed-size output of enciphered text termed a hash value, or simply "hash," which may then be saved instead of the password and later used to verify the user.

Hash functions are widely used data sets in computer systems for activities like communication integrity checks and information authentication. They are cryptographically "weak" since they can be solved in mathematical functions, but they are difficult to decode. Cryptographic hash functions add security characteristics to traditional hash functions, making it more difficult to decipher a message's contents or information about receivers and senders.[17]

A chronological chain is generated by the hashed link encoded in every block of a blockchain to the preceding block. Hashing, in addition to the consensus mechanism, assures that the whole chain, including the content, cannot be changed since a modification would influence one specific hash value, and from there, all subsequent hash values, rendering the chain invalid. It also enables for the creation of an identity by producing a unique hash of files of any size.[18]

Consensus Mechanism

[16] Toshendra Kumar Sharma, ”Public Vs. Private Blockchain : A Comprehensive Comparison.” Available on: https://www.blockchain-council.org/blockchain/public-vs-private-blockchain-a-comprehensive-comparison/
[17] Jake Frankenfield, “Cryptographic Hash Functions.” Available on: https://www.investopedia.com/news/cryptographic-hash-functions/
[18] Stephan Leible, Steffen Schlager, Moritz Schubotz and Bela Gipp, “A Review on Blockchain Technology and Blockchain Projects Fostering Open Science.” Available on: https://www.frontiersin.org/articles/10.3389/fbloc.2019.00016/full

A consensus mechanism is a mistake tolerant technique used in computer and blockchain systems to obtain the necessary agreement among distributed processes. The consensus mechanism on the Bitcoin blockchain, for example, is known as Proof-of-Work (described earlier), which involves the use of computational power to solve a tough but flexible problem in order to maintain all nodes in the network truthful.[19]

Consensus mechanisms enable dispersed systems, such as computer networks, to collaborate while remaining safe. They specify how users on a blockchain verify each other's transactions. Many additional unique ways and combinations of existing consensus processes have been devised and deployed in new blockchains since the Bitcoin blockchain and PoW.

Proof of stake (PoS) is a widespread consensus technique that originated as a lower cost alternative to the PoW process. It entails assigning a participant node responsibility for maintaining the public ledger in proportion to the quantity of crypto currency units it holds. However, this has the disadvantage of encouraging cryptocurrency holding rather than usage.

While PoW and PoS are perhaps the most popular in the blockchain field, additional consensus algorithms such as Proof of Capacity (PoC) allow participating nodes on the blockchain network to share system memory. The more random-access memory (RAM) or hard drive capacity a node possesses, the more privileges it has to keep the public ledger up to date. The Decred blockchain's Proof of Activity (PoA) is a hybrid that incorporates elements of both PoW and PoS. Another is Proof of Burn (PoB), which compels users to transmit tiny amounts of money to inaccessible wallet addresses, thereby basically deleting them out.[20]

In a crypto economic system, a consensus process also aids in the prevention of certain types of economic assaults. By controlling 51 percent of the network, an attacker can theoretically jeopardize consensus. Consensus measures are in place to prevent this "51 percent assault." Different approaches have been developed to address this security issue in various ways.[21]

Crypto-Tokens and Initial Coin Offerings

[19] Jake Frankenfield, "Consensus Mechanism (Cryptocurrency)." Available on: https://www.investopedia.com/terms/c/consensus-mechanism-cryptocurrency.asp#:~:text=A%20consensus%20mechanism%20is%20a,systems%2C%20such%20as%20with%20cryptocurrencies.

[20] Ibid.

[21] Hayden Fowler, "Consensus Mechanisms." Available on: https://ethereum.org/en/developers/docs/consensus-mechanisms/

Crypto-tokens have a very significant role in the usage of blockchain technology. Crypto-tokens serve as a means of exchange for blockchain transactions. They're similar to loyalty points, air miles, or credit card points. They do not have the same widespread acceptance as fiat currencies. These tokens are frequently used as a monetary unit to track the services that users contribute to the platform, including verification and block-writing, or to facilitate transactions among sellers and buyers in the marketplaces that the networks provide. Crypto-tokens have shown to be a very effective tool for entrepreneurs to receive early funding. Rather of incurring the costs of an initial public offering of shares or the difficulty of persuading a venture capitalist to invest in the firm, blockchain start-ups have begun to do initial coin offerings (ICO).[22]

The development and selling of crypto-tokens are known as an ICO. An initial coin offering is when a blockchain program produces a certain quantity of crypto-tokens and sells them to the general public. Investors can purchase a new cryptocurrency token produced by the firm through an initial coin offering. This token may have some usefulness in relation to the firm's product or service, or it may simply reflect a stake in the enterprise.

What can be a significant problem with initial coin offerings is the fact that anyone can launch an ICO. This lack of regulation further indicates that one might fool you into thinking they're running a legal ICO before taking your money. An ICO is perhaps one of the easiest ways to put up a fraud out of all the various fundraising options.[23]

1.3. The Checks and Balances of Blockchain.

The answer to the question of who controls blockchain is "everyone." Blockchain is based on a democratic check-and-balance system. Each party has their own power to affect outcomes, and networks will fail unless there is an underlying agreement between all parties.

Users

Anyone who conducts a transaction on a blockchain network is referred to as a user. Any transaction, whether it's moving money abroad or purchasing a new vehicle for the company with cryptocurrency describes a person as a user. The network relies on users since they are

[22] John P. Conley, ”Blockchain and the Economics of Crypto-tokens and Initial Coin Offerings,” - Vanderbilt University Department of Economics Working Papers, VECON- 17-00008. Available on: http://www.accessecon.com/pubs/VUECON/VUECON-17-00008.pdf

[23] Sabrina T Howell, Marina Niessner, David Yermack, "Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales." Available on: https://academic.oup.com/rfs/article/33/9/3925/5610546

the ones who value the token. Users are the ones who make the transactions that are recorded in the blockchain, and they have the authority to decide whether or not to participate in it.[24]

Aside from basic supply and demand, such as more users pushing up the value of Cryptocurrency in comparison to traditional money, the blockchain with the most users will contribute blocks to the end of the chain faster and so be more trusted. If transaction fees are available on the specific blockchain, more users may be leveraged for transaction fees, and, like digital platforms, can create value by building new compatible applications.

Users suggest new transactions on permissionless public blockchains. Any participant has the option to register as a user. They have control over the blockchain to the degree that their choice to use it or not to use it determines the economic worth of the blockchain. They have a wide range of impact, from affecting transaction costs to adding value by designing apps that operate on top of the platform layer. They also have the ability to force blockchain hard forks. Though, their influence is restricted by the fact that they are unable to execute monitoring and control due to their extremely decentralized and spontaneous characteristics. It imposes a structural constraint on their conduct and makes them predominantly price-driven.[25]

Developers

Blockchain developers are the software's original creators, and they're in charge of putting the blockchain's rules into action exactly as they're written. They are, in essence, developing the code program and, as a result, deciding on the consensus process to be utilized. Because public blockchains are dynamic and consensus-based systems, primary developers' influence is limited to their reputation and knowledge of the technology. Blockchain, as a software-driven computer-based network technology, is not a static construct and will require modifications in the form of introduction of changes to the software.[26]

In general, it can be said that the blockchain's architecture restricts their influence because they lose any direct control over other players once the blockchain is activated. Indeed, a

[24] Adam Collins, "The Checks and Balances of Blockchain." Available on: https://medium.com/@adc613/the-checks-and-balances-of-blockchain-9cafb2543888

[25] Dr. Thibault Schrepel, ”A Path for Antitrust in Blockchain Ecosystems.” p.32. Available on: https://deliverypdf.ssrn.com/delivery.php?ID=074071112000081013020109001125085025056018064054034063029007090123094069075118081077004031019026053056124094116083124117023121118039014012004000002109092084120111107063029094003113102017072106090016011072004117095022029100073089083090005109125098126112&EXT=pdf&INDEX=TRUE

[26] Angela Walch, “The Bitcoin Blockchain as Financial Market Infrastructure: A Consideration of Operational Risk.” pp. 837 – 838; p.845.

blockchain's founders and key engineers have no influence over who proposes protocol upgrades. They have no influence over who may utilize the blockchain at the platform layer or create applications on top of it. As a result, the blockchain code, interface, application, data, and benefit are not within the control of the blockchain founders and key engineers.[27]

They are somewhat powerful "consultants," but their power is always constrained by the reality that blockchain participants nearly always seek to maximize their own personal gain. They are further constrained by social norms to the point that they could concern a hard fork if they are unable to get a sufficiently broad agreement among users and minors. It reduces their propensity to act against the interests of all other participants even more.[28]

One operational risk associated with blockchain is that just a few individuals have a thorough understanding of how the software operates.[29]

Miners

Basically, the blockchain's analogy of bank staff are miners. It is their responsibility to keep the network that processes transactions safe. In general, the more miners on the network, the safer it is. Miner competition exists on a single blockchain as well as across many blockchains in multi cryptocurrency systems.[30] A proof of work method is used to mine most blockchain networks. Miners have voting power equal to their computational power in PoW. A big, diversified, and event-distributed mining pool is essential in an ideal network.

As for the rewards for the work, mining payments and transaction fees are used to compensate miners for their efforts. A major feature of the mining process is the rivalry among miners on a same blockchain. The competition for the operational incentive is what drives the insertion of blocks to the chain and ensures the blockchain's fundamental integrity - competition for the prize of attaching blocks will develop as incentives expand.

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[27] Dr. Thibault Schrepel, ”A Path for Antitrust in Blockchain Ecosystems.” p.29.

[28] Dirk A. Zetzsche, Ross P. Buckley & Douglas W. Arner, ”The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain.” [2017] UNSWLRS 52; p.21. Available on: https://deliverypdf.ssrn.com/delivery.php?ID=719105092024096124116107023083013118038069081083039091121092124090086105098064029066123029119022059121027021071091091091092067017078060077029073103078094002119094047065040118000072000086107091011018019092077098011001074096096096109027083001007087124&EXT=pdf&INDEX=TRUE

[29] Angela Walch, “The Bitcoin Blockchain as Financial Market Infrastructure: A Consideration of Operational Risk.” *supra* note 26; p. 867.

[30] sFOX, ”Miners, Developers, and Users: The Checks and Balances of Bitcoin.” Available on: https://www.sfox.com/blog/miners-developers-and-users-the-checks-and-balances-of-bitcoin/

Miners validate transactions aggregated into blocks on decentralised public blockchains. Any participant has the option of becoming a miner. They may be able to impact the blockchain by launching a 51 percent assault and forcing a soft fork. When miners are gathered into mining pools, the danger is increased. In this case, the blockchain protocol is modified to reduce the set of rules imposed by full nodes.[31] Once enough hashing power, or energy used to mine a cryptocurrency, is allocated to it, a transformation like this happens. Though, the rewards for cooperating and maintaining the normal work of blockchain are much more profitable for miners than so called 51% attacks.[32]

Why is Balance of Powers important for Competition?

We've seen how each of Blockchain's primary communities contributes to the entire ecosystem's stability: Miners maintain the blockchain safe and growing so that developers can upgrade it and end users may utilize it. Developers work to enhance the protocol's efficiency and user experience so that users will want to use it. Users spend and store cryptocurrency as a form of value transfer and storage, making it valuable enough for miners to invest time and resources in mining it.

This overall balance of power, which applies to all blockchains, is the broad analytical foundation for determining whether one of these parties has sufficient influence to be classified as control under antitrust or competition rules on a case-by-case basis. One may say that such limits only apply when miners, users and developers operate independently. Though, when blockchain members collaborate, they can get around many of these limitations and take possession over the blockchain.[33]

2. How is Blockchain Directly Related to Competition?

This section focuses on how exactly certain aspects of Blockchain technology may positively or negatively impact competition.

[31] Jean Bacon, Johan David Michels, Christopher Millard and Jatinder Singh, ”Blockchain Demystified: A Technical and Legal Introduction to Distributed and Centralised Ledgers.” p.12. Available on: https://deliverypdf.ssrn.com/delivery.php?ID=759099099100077026029027074016091025023080034035049002106080105067070088022109095005019106107032112124109125119084114004027015061037071049081099025065028076098081026065017064112070071120107127100107007022116026066010096102122066068012071004002112006024&EXT=pdf&INDEX=TRUE

[32] Kyle Torpey, ”The Checks and Balances of Bitcoin Governance.” Available on: https://bitcoinmagazine.com/technical/the-checks-and-balances-of-bitcoin-governance-1454695089

[33] Dr. Thibault Schrepel, “The Theory of Granularity: A Path for Antitrust in Blockchain Ecosystems,” pp. 33-35.

2.1 Key Features of Blockchain that have Significant Impact on Competition

The blockchain technology is unique due to its mix of well-known qualities such as hashing, decentralization, and immutability, which explains why science and commerce are becoming increasingly interested in it.

Decentralization

A blockchain is a digital resilient peer-to-peer system that consists of nodes that each store the entire blockchain or a portion of it. The design thus provides for the automated distribution of software as well as other information across the network. Decentralization also reduces the possibility of a single point of failure and the reliance on a centralized power that must be trusted.

While decentralized networks are frequently used in blockchain technology, a blockchain application cannot just be classified as decentralized or not. Instead, decentralization should be extended to all components of a blockchain program on a scale ranging. Better and fairer service may be accomplished by decentralizing resource utilization and access in an application. Decentralization has certain drawbacks, such as decreased transaction throughput, but the benefits of enhanced stability and service levels outweigh the drawbacks. Wherever appropriate, decentralization should be used. But it doesn't have to always be decentralized just because it's a blockchain application. Any blockchain solution's purpose is to provide what its customers require, which may or may not incorporate various degrees of decentralization.[34]

Though, it is important to mention that each blockchain-related solution to some extent uses decentralization. Decentralization application varies depending on the blockchain protocol and any blockchain-related solution. The maturity of the solution, the time-proven dependability of its incentive models and consensus procedures, and the capacity of the founding team to strike the proper balance determine the adoption level. Decentralized blockchain solutions are being researched and used by organizations of all types, sizes, and industries on a larger scale. Applications that offer quick international or emergency relief to persons in need without the involvement of a bank, government, or third-party agency are

[34] Ittai Abraham, Dahlia Malkhi, "The Blockchain Consensus Layer and BFT," - Vmware Research Group. Available on: https://dahliamalkhi.files.wordpress.com/2016/08/blockchainbft-beatcs2017.pdf

significant examples. Also, if talking about the programs which allow people to create their own online identities (like social media) may sell this information for their own profit with no value to the user. It would be much easier to make it fair for everyone if systems were decentralized.[35]

Immutability

The capacity of a blockchain ledger to retain a persistent, irreversible, and unchangeable history of transactions is known as immutability. It is an undeniable quality that blockchain supporters tout as a major advantage. Immutability has the capacity to make audits more efficient for companies, as well as increase the confidence and integrity of the data that organizations use and exchange on a daily basis. The cryptographic hashing and decentralized validation procedure ensure that data saved on the blockchain cannot be changed or removed.

Immutability gives integrity, and blockchain deployment may provide an exceptional degree of confidence to the data that businesses utilize on a daily basis. Companies may utilize blockchain to show to stakeholders that the data they provide and use has not been manipulated, while also converting the audit process towards a more effective and reasonable operation.[36]

What is important to know about blockchain's immutability is that it does not necessarily provide 100% perfect and truthful information. Blockchain doesn't render data accurate naturally, automatically, or miraculously; rather, its application cryptographically protects information enough that it can't be changed or erased without repercussions. To assure an often-needed validation component, actions such as sharing your hash results straight with stakeholders or putting up a decentralized network of validation nodes are a solid complement to the historical immutability provided by the blockchain hashing process. The more stringent the enforcement standards are, the more trustworthy the blockchain data becomes.

[35] AWS, "What is Decentralization in Blockchain?" Available on: https://aws.amazon.com/blockchain/decentralization-in-blockchain/#:~:text=In%20blockchain%2C%20decentralization%20refers%20to,thereof)%20to%20a%20distributed%20network.

[36] Jesse Yli-Huumo, Deokyoon Ko,Sujin Choi ,Sooyong Park,Kari Smolander, "Where Is Current Research on Blockchain Technology? —A Systematic Review." Available on: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0163477

New data within blockchain can be recreated only if there is cooperation between the parties, and the hashes are completely recalculated. Both are costly and need a tremendous amount of computer power to mine the blocks until their hashes can be passed off as genuine on a public blockchain.[37]

Smart Contracts

Smart contracts are essentially programs that execute when certain criteria are satisfied and are maintained on a blockchain. They're usually used to automate the fulfilment of a deal so that all parties may be confident of the conclusion right away, without the need for any intermediaries or time waste. They can also automate a workflow, starting the following step when certain circumstances are satisfied.[38]

They work on the "if and then" principle, which means that if the participants to a transaction meet the pre-determined requirements, the transaction is verified by a smart contract; otherwise, it is denied. It's a software mechanism for electronically facilitating, verifying, and enforcing agreement execution. These activities might include transferring payments to the proper parties, certifying a vehicle, providing alerts, or imposing a warning. Whenever the contract has been concluded, the blockchain is updated. It guarantees the transaction can't be modified, and the results are only visible to those who have been granted access. Platforms like as Ethereum allow you to put up a programming logic for processing transactions between nodes.[39]

There can be as much specifications as necessary in a smart contract to convince the parties that the work will be executed correctly. Participants must agree on how transactions and associated data are recorded on the blockchain, agree on the "if and then" rules governing these transactions, investigate all conceivable exceptions, and design a framework for resolving disputes in order to set the terms. The smart contract can then be coded by a developer, however firms that utilize blockchain for business are increasingly providing models, web - based applications, as well as other digital tools to make smart contract construction easier.

[37] Kevin Doubleday, “Blockchain Immutability — Why Does it Matter?” Available on: https://medium.com/fluree/immutability-and-the-enterprise-an-immense-value-proposition-98cd3bf900b1
[38] IBM, ”What are smart contracts on blockchain?” Available on: https://www.ibm.com/topics/smart-contracts
[39] Matthew N. O. Sadiku, Kelechi G. Eze, Sarhan M. Musa, Smart Contracts: Journal of Scientific and Engineering Research, 2018, 5(5):538-541. ISSN: 2394-2630

The main advantages of smart contracts are their speed, efficiency, accuracy, trust and transparency. When a condition is satisfied, the contract is instantly performed. Since smart contracts are virtual and computerized, there is no paperwork to deal with, and no time wasted correcting errors that might occur when filling out documentation by hand. There's no need to worry about information being tampered with for personal gain since there's no third party engaged and confidential transaction logs are exchanged among participants. And, of course, smart contracts eliminate the necessity for intermediaries to conduct transactions, as well as the time delays and costs that come with them.[40]

Forking

One of the benefits of blockchain is that it empowers all transactions to be carried out in line with the management rules established at the moment of the blockchain's inception. Do blockchains, on the other hand, have the versatility to adjust to different conditions? Depending upon the nature of blockchain and its governance mechanism, forking may be able to facilitate such changes.[41]

If a group of nodes wants to modify the guidelines, they can create a fork by splitting the regulations from the initial blockchain. All users can switch to a new fork if the modifications are approved by all nodes. However, if only a small number of nodes agree to make the modification, they can split into two blockchains at the moment of forking. Until the time of forking, a forked blockchain usually has access to the data.[42]

Numerous digital currencies have their own development teams in charge of network updates and upgrades, similar to how changes in web services help web browsing to steadily improve. As a result, a fork may occur to improve the security of a coin or to provide new features. However, a fork may be used by the developers of a new cryptocurrency to create entirely new currencies and ecosystems.

"Hard forks" are forks that are incompatible with prior versions of the protocols and algorithms. When the code changes so much that the new version is no longer backwards compatible with previous blocks, a hard fork occurs. Hard forks generally alter consensus

[40] Stephan Leible, *supra* note 18.
[41] Rajnish Gupta, "Discussion paper on blockchain technology and competition," p.16., Available on: https://www.cci.gov.in/sites/default/files/whats_newdocument/Blockchain.pdf
[42] FreemanLaw, "Hard and Soft Forks: A Detailed and Simplified Explanation of How Blockchains Evolve." Available on: https://freemanlaw.com/hard-and-soft-forks-a-detailed-and-simplified-explanation-of-how-blockchains-evolve/

rules in such a way that earlier blockchain versions are incompatible. The blockchain divides in two in this scenario: the old blockchain and a new one that implements the new framework. This results in the creation of a completely new cryptocurrency, as well as the origins of a number of well-known coins. Hard forks resulted in the emergence of cryptocurrencies such as Bitcoin Cash and Bitcoin Gold from the original Bitcoin network.[43]

Unlike hard forks, soft forks are backwards compatible with earlier blockchain versions. Consider a soft fork as a blockchain software upgrade. It becomes a currency's new set of criteria as long as all users embrace it. Soft forks are used to add new features or functionalities both to Bitcoin and Ethereum, often at the coding level.

Blockchains are modified for a multitude of reasons, much like any other software: adding functionality; addressing security concerns and to settle a community dispute about the cryptocurrency's strategic vision.

Timestamping

Every entry in a blockchain is timestamped in chronological order. It offers consumers with full transaction history, visibility, and transparency. Timestamps combined with a cryptographic hash can be used as a Proof-of-Existence for specific information at a certain moment.

Blockchain-based timestamping is already being used in a variety of sectors and businesses throughout the world. It may be utilized for a variety of purposes, including governance, commerce, payments, insurance, distribution networks, and for a lot of other purposes.

The most essential use case for blockchain-based timestamping is for vital legal and non-legal documents. The production and update timings of documents may be recorded, tracked, and authenticated using blockchain technology. This is critical because physical papers, as well as current digital records, are simple to change and copy.[44]

To secure the ownership of their work, users can substitute contemporary notary services with a simple timestamping system. And all of this may be done publicly and securely on a digital platform without the need for a middleman. All of this is done in secure and private way. Without disclosing the content of your document, you may provide evidence of

[43] Coinbase, "What is a Fork?" Available on: https://www.coinbase.com/learn/crypto-basics/what-is-a-fork
[44] Originstamp, " What Is Blockchain-Based Timestamping and Who Needs It?" Available on: https://originstamp.com/blog/what-is-blockchain-based-timestamping/

ownership at a certain time and date. The same may be said for the paper's verification and truthfulness.

Any type of digital media format may be timestamped. Artists, for example, can prove their ownership of drawings, books, literature, photographs, and other works of art. An estate owner might show in court that he owns a property or that he bought it at a given point in time.[45]

Decentralised Autonomous Organisation

Many individuals assume that along with the rise of digital technologies, the web, and now blockchain, smart contracts, and initial coin offerings, businesses can be organized in a different way, where instead of having a hierarchical centralised structure, such innovations can be used to reduce tensions and allow businesses to operate in a decentralized manner. This ideology and context inspired the creation of a DAO.[46]

A decentralized autonomous organization is a blockchain-based system that allows individuals to coordinate and govern themselves using a set of self-executing rules placed on a public blockchain. DAO is a firm or organization whose decisions are taken electronically via recorded software code or by a vote of its members. Essentially, it is a set of hard-coded rules that governs the behaviour of a company.

By putting decision-making authority in the hands of an automated system and a public process, the DAO's creators hoped to minimize human mistake and exploitation of investor funds. The DAO, which runs on ether, was created to allow investors to contribute money anonymously from anywhere in the globe. The DAO then would issue tokens to such owners, letting them to vote on potential initiatives.[47]

Summary of Blockchain Advantages for Competition

Blockchain offers a number of advantages, the first of which is that it is decentralized. The network is made up of a number of nodes, which are systems that contain blockchain data

[45] Ibid.
[46] Samer Hassan, ”Decentralized Autonomous Organization,” - ISSN 2197-6775. Available on: http://hdl.handle.net/10419/235960
[47] Usman W. Chohan, ” The Decentralized Autonomous Organization and Governance Issues.” Available on: https://deliverypdf.ssrn.com/delivery.php?ID=883022123123085094023085005001103126050076068001039051073088007098009024097117080095110048059008102059004067093111075116105008012020000002083002092066075087121092015048045084126076116071122031120015117114004116025105122125092120119086116006082118120020&EXT=pdf&INDEX=TRUE

and also help to validate transactions. Whenever a transaction occurs, both parties engage with one another through peer-to-peer transmission, with interaction taking place straight amongst them rather than through a centre location. Because the network's properties cannot be modified by a single body for its own profit, the blockchain's decentralised design allows it to be safer for its users. Every node preserves a copy of the database, which contains all of the previous entries' information. Whereas it adds stability to the network, it also adds security by preventing record modification. Any effort to damage the network will only succeed if the data on the most of the network's nodes is changed. It will be almost impossible to amend, alter, or remove a record after it has been added to a blockchain. As a result, the blockchain's set of data of previous transactions is essentially irreversible and unchangeable.[48]

The remarkable technological architecture of blockchain sets it apart from other systems, allowing the technology to be tailored to a number of application cases. Users, for example, may create blockchains with public or private access, as well as customized governance frameworks, depending on the goal. Cryptocurrencies, for example, present extra, unique potential to develop economic models and rewards for users or whole communities, in addition to the technological aspects.

Also, blockchain-based timestamps are especially important for companies who require Know Your Customer information from the users. Know Your Customer is a financial services standard that requires trading platforms and exchanges to have access to a user's identifying information. In circumstances when the user is accused of engaging in unlawful behaviour, these papers are transmitted to regulatory organizations. One issue with existing Know Your Customer software used by exchanges is that it is vulnerable to hackers. To avoid this, regulated exchanges might create a permissioned blockchain with access to KYC information restricted to financial firms and regulators. A hacker cannot access the information because the system is cryptographically protected and private. Stolen or abused identities would be significantly reduced as a result of such integration.[49]

2.2. Negative or Controversial Influence of Blockchain on Competition

No Need for Intermediaries

[48] Rajnish Gupta, *supra* note 41., p. 8.
[49] *supra* note 44.

In general, when there are several companies in a market, each vying to attain the maximum quality and most inventive items at the lowest price, consumers will benefit from the competition. And in some cases, because of the level of competition, a market might be required to use the help of necessary intermediaries, who, by giving the required trust to the participating parties, mediate between the various firms, and organizations interested in entering into a transaction. Middlemen such as banks or e-commerce platforms help to handle difficulties arising from a lack of confidence between the two parties involved in the transaction. Intermediaries effectively serve as counterparties to both transaction participants, keeping a centralized record of all payments, facilitating exchange of information, and confirming their identities. As a result, the intermediary gives two parties the assurance they need to communicate or deal with one another. They operate as a conduit for buyers and sellers to deal with an unknown party, which can be a business or a person.[50]

Blockchain eliminates the necessity to have middlemen, allowing transactions between two parties to take place without the use of a third-party. Though, there is the question - is it possible that blockchain technology will disrupt and eliminate the necessity for platforms as well as payment intermediaries? By establishing trust amongst the parties involved in the transaction, blockchain technology has the ability to eliminate the need for middlemen. This might lower transaction costs while also improving market efficiency. Furthermore, if the capacity to crowdfund supplier ratings and create trust in that supplier is a core element of a platform, blockchain technology may be a viable alternative for that platform. This is because it may give confidence in a product's origins as well as assurance that payment will be received. As a result, some experts believe that blockchain technology will cause the platform business model to be disrupted.[51]

Reduction of the Transaction Costs

According to the standard theory of the firm, for the company to carry out a transaction, it must first determine who it wants to deal with, then conduct discussions leading up to a deal, draft the agreement, conduct the necessary inspections to ensure that the contract's terms are being followed, and so on. While the costs of incomplete contracting are likely to remain high, blockchain technology may reduce contract enforcement costs. This may cause companies to outsource more new, formerly essential services, to specialized, and maybe

[50] Rajnish Gupta, *supra* note 41., p. 5.
[51] OECD. "Blockchain Technology and Competition Policy - Issues paper by the Secretariat." Available on: https://one.oecd.org/document/DAF/COMP/WD(2018)47/en/pdf

smaller, companies. As a result, similar to the disruption caused by the digital platform business model, this might generate new and possibly highly competitive marketplaces.[52]

Confidential Data Within the Blockchain

In many respects, having an unchangeable history of transactions appears to be the answer to many current corporate concerns. But what happens if sensitive information, such as employee home addresses, is released on a blockchain by accident? Ideally, this won't be a problem, as normal design considerations in blockchain contexts require a separation of sensitive and personally identifiable data.

If you're operating a private blockchain, you'll need to persuade the other parties to agree to a "fork" in the chain, which occurs when a blockchain divides into two routes, with the new designated database continuing on. All or almost all of the parties engaged in this blockchain will need to agree on the terms, including which block to fork at and any extra database rules. If this blockchain is genuinely public, removing this information will be very difficult - A hard fork is likewise necessary here, but convincing the other participants in the network to cooperate is far more problematic.[53]

Because it lessens the motivation to compete, the communication of commercially sensitive information that lowers strategic ambiguity in the market might provide the circumstances for rivals to collaborate and result in competition law breaches.

The use of transparency to enhance organizational performance is one of the major aspects of blockchain technology. Transparency, on the other hand, may aid and intensify anticompetitive collaboration. As they have visibility of records of all transactions inside the distributed ledger, competitors that are part of the same blockchain network may be able to trade commercially sensitive data. While ledgers may have a number of advantages, particularly when we talk about various types of agreements, this can be extremely problematic because there is a danger that delicate data is shared between competing companies.[54]

Companies May Cooperate Through Blockchain and Soften Price Competition

[52] OECD. "Blockchain Technology and Competition Policy - Issues paper by the Secretariat."
[53] Kevin Doubleday, "Why Does Blockchain Immutability Matter?"
[54] Ciara Barbu-O'Connor, Jacques Derenne, Dr. Michael Hofmann, "Blockchain and EU Competition Law." Available on: https://www.jdsupra.com/legalnews/blockchain-and-eu-competition-law-9904251/

One option is that all market competitors will utilize the same blockchain. Another option is for each company to have its own blockchain, similar to how each company may have its own dedicated server. When everyone uses the same blockchain, the possible transparency could help to determine any cartel participants who deviate, and smart contracts could specify automated punitive measures for those who do. Transparency may also aid in determining the terms on which to cooperate, such as pricing or market share.

A market-wide blockchain's potential transparency might also aid enterprises in oligopolistic marketplaces in implicitly coordinating without any direct or indirect interaction, or any agreement to do so. The question is - could having complete access to a market-wide blockchain be a plus-factor that competition authorities evaluate when determining whether parallel action was the product of cooperation between the parties?[55]

Talking about smart contracts, they may actually allow companies to establish a low-cost yet effective agreement, which might be valuable in a number of situations. The capacity to commit might be a competitive advantage. It may, for example, aid in the resolution of obstacles, including when parties involved choose to make investments yet none wishes to go first and lose their investment because this would allow the competitor to harvest all of the relationship's benefit. They may, however, allow corporations to ease price competition. They could, for example, let a company to effectively commit to a pricing point by keeping it expensive to depart from it. Low-price assurances, most-favoured-nation provisions, and platform parity agreements might all be used to accomplish this.[56]

Blockchain Governance is Potentially Problematic

Governance refers to an organization's decision-making procedures, such as who is accountable for what, how significant decisions are made or executed, whether authority is concentrated between few people or dispersed among all participants, and so on. The procedure through which nodes agree to make modifications to the blockchain is referred to as blockchain governance. The procedure also outlines which stakeholders are engaged in the decision-making process and how they reach an agreement.[57]

[55] OECD. "Blockchain Technology and Competition Policy - Issues paper by the Secretariat," p.6.
[56] OECD. "Blockchain Technology and Competition Policy - Issues paper by the Secretariat," p.7.
[57] Andrej Zwitter, Jilles Hazenberg, " Decentralized Network Governance: Blockchain Technology and the Future of Regulation." Available on: https://www.frontiersin.org/articles/10.3389/fbloc.2020.00012/full

The debate over governance in the context of blockchain now centres on two examples: centralized vs. decentralized, and on-chain vs. off-chain. The basic blockchain dilemma, which puts into question modern power systems, is the first conflict. The second pertains to human engagement and the level of automation in decision-making. Notwithstanding the of the form of organization, the issues at hand usually revolve around network access, components of working capital, block size, reward systems, voting, and decision-making.[58]

Within blockchain networks, balancing the interests of all key parties is a complex task. There are several different methods to construct a blockchain governance model, and its feasibility is primarily determined by a range of criteria unique to each project. While some want to emphasize the value of educated, professional perspectives, others want to emphasize the community aspect and be more accessible whenever it comes to stakeholder engagement in governing. Nevertheless, one thing is certain: blockchain has reimagined traditional governance and shattered the basic underpinnings upon which our state-centric, 'old' system is built.[59]

3. Blockchain from the Perspective of Competition Law

This section focuses on the interaction of Blockchain technology with the competition law of European Union and antitrust law of United States.

3.1. Interaction with EU Competition Law and US Antitrust Law

The blockchain presents two sorts of competition challenges: it makes it more difficult to define dominant market positions and to assign blame for anti-competitive behaviour. It is important to mention that at this time and in the near future, no single blockchain is expected to gain a dominating position.

To some extent, all data and transactions recorded on public blockchains are available to everyone. Transactions on private blockchains are only accessible to their users if they have been built that way. As a result, the amount of anti-competitive activities on public blockchains may be fewer than in other technological sectors, owing to the increased openness that public channel chains provide between users.

[58] Watson Law, " Blockchain Governance: What Is It, What Types Are There and How Does It Work in Practice?" Available on: https://watsonlaw.nl/en/blockchain-governance-what-is-it-what-types-are-there-and-how-does-it-work-in-practice/

[59] Fabrice Lumineau , Wenqian Wang, Oliver Schilke, "Blockchain Governance—A New Way of Organizing Collaborations?" Available on: https://pubsonline.informs.org/doi/full/10.1287/orsc.2020.1379

Nevertheless, those who work with blockchain technology may come into contact with the TFEU's articles 101 and 102. The technology raises a variety of concerns, including the possibility of information sharing and coordination, the possibility of dominance abuse, and the difficulty of implementing existing legislative presumptions to blockchain.

What are the Relevant Laws?

EU

Article 101 of the Treaty on the Functioning of the European Union prohibits any undertaking agreements, decisions by undertaking organizations, and coordinated activities that may impact trade between Member States and have as their goal or effect the prohibition, limitation, or distortion of competition within the internal market.[60]

Article 101's major goal is to offer reparation to people who have been harmed by restrictions on free competition inside the internal market. Because free competition is so important to the internal market's functioning, it's critical to have rules in place that make any trade barriers illegal. European Union must maintain an open, free, and distortion-free system of competition. This is Article 101's principal goal, as there are no other rights or responsibilities imposed on states or private actors, and so Article 101 represents the single foundation for precise substantive and legal implications under competition law.[61]

Article 102 prohibits any abuse by one or more undertakings of a dominant position within the internal market or in a substantial part of it. Goal of the Article 102 is to safeguard market competition as a means of improving consumer welfare and guaranteeing effective resource allocation.[62]

Article 102's main function is to prevent competition from being distorted to the disadvantage of the public interest, individual businesses, and consumers, therefore safeguarding the European Union's well-being.[63]

US

[60] Treaty on the Functioning of the European Union, OJ C 115, 9.5.2008, pp. 88–89, Article 101. Available on: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A12008E101
[61] LawTeacher, "Article 101 TFEU - Competition." Available on: https://www.lawteacher.net/acts/article-101-tfeu.php
[62] Treaty on the Functioning of the European Union, OJ C 115, 9.5.2008, pp. 88–89, Article 102. Available on: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A12008E102
[63] LawTeacher, "Articles for EU Competition Law." Available on: https://www.lawteacher.net/international-conventions/eu-competition.php

As for US legislation, there are the three fundamental federal antitrust statutes that control competition-related activities. The Sherman Act was created as a first antitrust legislation, as a complete charter of economic liberty aimed at maintaining open and unrestricted competition as the norm of commerce. Later, Congress passed two additional antitrust laws: the Federal Trade Commission Act and the Clayton Act.

Every contract, combination, or conspiracy in restriction of commerce, as well as any monopolization, attempted monopolization, or conspiracy or combination to monopolize, are prohibited by the **Sherman Act**[64]. The Sherman Act does not ban all trade restraints; only those that are unreasonable are prohibited.

The **Federal Trade Commission Act**[65] prohibits unfair business practices and misleading acts or activities. All Sherman Act offenses are also considered FTC Act violations.

The **Clayton Act**[66] targets tactics like mergers and interlocking directorates that the Sherman Act does not expressly ban. Section 7 of the Clayton Act forbids mergers and acquisitions that have the potential to significantly reduce competition or create monopolies.

Information Exchange

The majority of blockchains are anticipated to be pro-competitive and increase efficiency. Markets will work better as a result of decentralization and openness. However, the key to grasping blockchain from the perspective of competition law is that all data within the blockchain is available to everyone inside the peer-to-peer network, irrespective as to whether it is accessible to everyone or permission-based.[67] The fact that the users have a consensus to share this data is critical in this respect. As a result, if the exchanged information is competitively sensitive and relates to strategic data, it is extremely likely to be considered as a collusion facilitating factor.

Horizontal information exchange

EU

[64] Sherman Act. Available on: http://neconomides.stern.nyu.edu/networks/ShermanClaytonFTC_Acts.pdf
[65] FTC Act. Available on: https://www.ftc.gov/sites/default/files/documents/statutes/federal-trade-commission-act/ftc_act_incorporatingus_safe_web_act.pdf
[66] Clayton Act. Available on: http://euro.ecom.cmu.edu/program/law/08-732/Antitrust/ClaytonAct.pdf
[67] Morten Nissen, Martin von Haller Grønbæk, "Blockchain technology and competition law - issues to be considered." Available on: https://www.twobirds.com/en/insights/2018/global/blockchain-technology-and-competition-law-issues-to-be-considered

The Horizontal Guidelines in EU state that exchanges of truly public information are unlikely to constitute an infraction of Article 101 in general. The Guidelines also state that for information to be public, getting it should not be more costly for customers and organizations unconnected with the exchange system than for the companies trading the information.[68] This is precisely what blockchain accomplishes. It transforms private information into rather public data.

The European Commission has typically had a low standard for demonstrating collusion under EU case law on information exchange. In essence, if one organization has commercially sensitive information about the other market player, it is assumed that it will consider that knowledge when planning its own commercial behaviour. Furthermore, the standard for debunking these presumptions is usually rather high.[69]

The essential feature of blockchain technology is that it creates a decentralized ledger that is available to everyone in the network. This, together with the anonymity of blockchain, creates an enticing possibility for companies to collaborate. Information transferred between rivals inside a blockchain network apparently has a simultaneous threat of competition law actions being initiated. This is owing to the seriousness of an infringement based on the sharing of information, as well as the fact that such an interchange would take place in a highly technical environment, with new technological innovations coming under greater pressure from the Commission.[70] If all rivals in a market utilize the same blockchain, an Article 101 violation becomes possible.

Blockchain, like most other technological tools and platforms, is primarily based on computational equations. The European Commission has often expressed its worries regarding algorithms and the potential for them to create competition issues, hence raising the likelihood of a competition law probe. The Commission's algorithm caution primarily concerns automated pricing using self-learning algorithms. The issue might be the

[68] Communication from the Commission — Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements., OJ C 11, 14.1.2011. Available on: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52011XC0114%2804%29

[69] European Commission, "Blockchain: Mind the gap! Lessons learnt from the net neutrality debate and competition law related aspects." Available on: https://ec.europa.eu/competition/information/digitisation_2018/contributions/falk_schoening_myrto_tagara.pdf

[70] Ibid.

development of a pricing, output, or even new initiatives monitoring system that is constructed on blockchain technologies or just distributed inside a blockchain network.

Several problems might pique a competition law authority's attention in such a circumstance. It is reasonable to believe that a corporation that operates software, platforms, or automated systems understands how they work. It is difficult for a company to avoid culpability by claiming ignorance of certain facts. Even if it was ignorant of the illegal activities of its subsidiaries or workers, an organisation will be held accountable. This is especially true in the case of blockchain, which is based on the idea of exposing all information through agreement. Despite the lack of a central administration or storage hub, the argument for dispersing the data encoded in the network is to maintain security measures.[71]

However, it's vital to analyse if blockchain applications make a difference in terms of information sharing when compared to conventional systems. One distinction might be that information on a blockchain can be shared in near real-time. Due to the safe and unchangeable nature of blockchains, there may be higher trust in the veracity of data kept in them than in other systems.

US

In US, as the main law regarding horizontal information exchange can be considered Section 1 of Sherman Act. There has been debate among US competition authorities about whether some actions, such as using computer algorithms to determine pricing, should be subjected to the same amount of attention as classical price fixing. The Sherman Act is violated whenever companies agree to limit competition between them, whether by agreeing to advertise similar prices for their products or by fixing prices using modern technology such as blockchain. The unlawful conduct is the agreement to determine the price, while the manner by which the contract is implemented through is less essential.[72]

This remark is in violation of Section 1 of the Sherman Act, which forbids anticompetitive cooperation such price fixing, bid rigging, and market allocation.[73] A breach of Section 1 necessitates coordinated activity by two or more businesses. Antitrust liability cannot arise

[71] European Commission, Ibid.
[72] Andrew Finch, "Antitrust in the Financial Sector: Hot Issues & Global Perspectives." Available on: https://www.justice.gov/opa/speech/principal-deputy-assistant-attorney-general-andrew-finch-delivers-remarks-antitrust
[73] Sherman Act, Section 1. Available on: https://www.govinfo.gov/content/pkg/COMPS-3055/pdf/COMPS-3055.pdf

from the development of a blockchain itself. Private blockchains can in fact be beneficial to competition. Because the participants are familiar with one another, the arrangement may result in lower transaction costs, better node connectivity, and more coordinated chain verification.[74]

Though, the same problem which is concerned under EU competition law is also relevant for the US antitrust law. If competitively sensitive parameters like pricing or client data are exchanged amongst rivals, such agreements may enhance antitrust risk. In reality, a private blockchain might enable an antitrust violation by allowing parties to communicate or monitor each other to verify that they are complying with the provisions of the contract. Irrespective of consideration to real or claimed procompetitive consequences, competitors may utilize private blockchains to effectuate price-fixing scheme, which is a direct breach of Section 1.[75] It is important to mention that even if there is no price-fixing agreement, blockchain participants may violate Section 1 if they exploit the technology to enable unlawful transfers of competitively sensitive data or deny competitors access to the system. Agreements to share competitively sensitive information can limit competition, and the communication itself can reveal illegal cooperation.[76]

Vertical information exchange

EU

EU competition authorities have typically been less cautious about vertical agreements since these are not made amongst rivals. Nevertheless, there are issues about distribution methods or procedures that might be expressed. Vertical deals have risen to the forefront of public debate in the digital era. Vertical agreements have been thrust back into the limelight by the EU's Digital Single Market plan and, in particular, the European Commission's e-commerce sector probe. Vertical interactions among blockchain participants might also generate competition law problems from a blockchain standpoint.[77]

When a blockchain connects vertically connected businesses, smart contract applications raise worries that an upstream company may utilize the chain to manage its downstream

[74] Ryan C. Thomas and others, "Blockchains and Antitrust:New Technology, Same Old Risks?" Available on: https://www.jonesday.com/files/Publication/92640617-6a6a-45b4-8f82-18d5e65d5b40/Presentation/PublicationAttachment/c9c5c7fa-4f65-4758-b00f-1a970848eb13/Blockchains_and_Antitrust.pdf
[75] Ibid.
[76] Ibid.
[77] European Commission, supra note. 69.

customers. Automated contracts may make activities like resell pricing maintenance easier to implement.[78] For example, if the network participants are the producer and its distributors, this may be the situation. In this case, the blockchain might be utilized to simplify inter operations, particularly those involving delivery tracking and paying implementation. Whereas those are acceptable applications of a blockchain, it may also be used to keep track of vendors pricing. And even considering that this process is not illegal itself, it might be regarded as an important element for the resale price maintenance, which is prohibited under competition law. In this scenario, the European Commission could consider whether the information given goes beyond what is permissible as a simple dealer-to-distributor communication.[79]

One method to fight this may be to divide blockchain usage into various groups, such as buyers and sellers, to limit access to the statistical data that drives behaviour. Separation mechanisms such as this jeopardize the blockchain's essential decentralised character, setting the scene for the centralisation vs. decentralisation discussion that regulators and business must have if blockchains need to be broadly used.[80]

US

Overall, one may say that US competition authorities are not that much concerned about vertical information exchange like they are concerned about horizontal. Though, Sherman Act is not only used by courts to challenge the acts of horizontally connected organizations. In several cases, courts have looked into and criticized trade restrictions imposed by vertically connected businesses, including contracts between producers and merchants.[81]

While there are significant differences between denouncing horizontal and vertical relationships as illegal, both categories of relationships are focused on the presence of interactions. In the first scenario, communications are between competitive companies; in the second, communications are between firms in a vertical arrangement.[82] It can be surely said

[78] Lin William Cong, Zhiguo He, ”Blockchain Disruption and Smart Contracts,” - The Review of Financial Studies /v 32 n 5. Available on: https://www.researchgate.net/publication/333388218_Blockchain_Disruption_and_Smart_Contracts
[79] European Commission, supra note. 69.
[80] Lin William Cong, Zhiguo He, “Blockchain Disruption and Smart Contracts” ; and Pat Treacy, Alex Latham, "Blockchain and Competition law"
[81] Julia Shamir, Noam Shamir, "Reviewing Antitrust Policies: The Use of Vertical Information Sharing in Achieving Collusion." Available on: https://www.hurvitz-institute.tau.ac.il/wp-content/uploads/2016/07/vertical_information_sharing.pdf
[82] Ibid.

that possible cases of resale price maintenance under blockchain technology may raise certain issues under United States antitrust law in the same extent as it is for the law of the EU.

Abuse of Dominant Position and Monopolization

EU

The blockchain technology poses serious challenges regarding what constitutes a dominating position. According to the Commissions description of Article 102 TFEU, this article prohibits abusive conduct by companies that have a dominant position on a particular market.[83] Article itself states that any abuse by one or more undertakings of a dominant position within the internal market or in a substantial part of it shall be prohibited.[84]

Though, since blockchain cannot be considered as legal entity, it can be problematic to find out if a non-entity may retain a dominating position. Also, it is unknown if it is possible to construct a, so to say, monopoly without a monopolist using blockchain.[85] Finally, if blockchain is dominant, who are the users who control it?

Liability will be allocated in various ways depending on how a dominating position is defined, provided that a corporation in a dominant position is completely accountable for the practices carried out inside it. The same stays for blockchains: the way dominance is defined will determine the scope of culpability. The term "dominance" may be used to blockchains in a variety of ways. Various ideas of responsibility are feasible when it comes to the material component of the relevant markets.[86]

One of the primary issues with dominance will be how to analyse how the functioning of a blockchain might lead to domination. There are various measures that may be used to analyse this, including the amount of users, registered activities, competitive position and

[83] European Commission, "Procedures in Article 102 Investigations." Available on: https://ec.europa.eu/competition-policy/antitrust/procedures/article-102-investigations_en#:~:text=Article%20102%20of%20the%20Treaty,position%20on%20a%20particular%20market.

[84] Article 102 TFEU. Available on: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:12008E102

[85] Gur Huberman, Jacob d. Leshno, Ciamac Moallemi, "Monopoly without a Monopolist: An Economic Analysis of the Bitcoin Payment System." Available on: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3025604

[86] Thibault Schrepel, "Is Blockchain the Death of Antitrust Law?" 3 GEO. L. TECH. REV. 281. Available on: https://deliverypdf.ssrn.com/delivery.php?ID=022074007112126079122069020065066096052038021023029087122003065125112030077028003099058031037055107005101000084121079004078021010070031064016125117016020091107083029042017012007015031095115083125098100000122086015031126080005110096005066096109095003123&EXT=pdf&INDEX=TRUE

involvement of significant industry participants which will all influence how competition authorities address the situation. Article 102 TFEU might raise problems if a blockchain is regarded a vital service or is designated as dominant based on the conditions listed above.[87]

Blockchain suppliers may be divided into two groups: those that want to provide particular function in certain industries, and those who want to provide multipurpose technology. In some ways, blockchain may be viewed as a disintermediation tool, as it eliminates the need for intermediaries. However, if a single business becomes the required or exclusive provider of a key technology or service, that firm will be restrained by competition laws on dominance to a certain degree (including Article 102 TFEU). For example, a company that is dominant in delivering blockchain for a certain application might be barred from setting prices or giving other terms that would prevent smaller or future competitors from contesting its position.[88]

The market strength of the blockchain might be compared to other online goods or services, as well as non-digital equivalents. As a consequence, the strength of blockchain would be assessed in the same manner that online sales may be integrated into the broader sales market. It would be conceivable to limit responsibility to users who provide or exploit dominant application that has been involved in anti-competitive behaviour. Then, it will be possible to distinguish between three important parties on the blockchain: developers, users, and miners, depending on who is doing the anticompetitive behaviour.[89] For instance, if huge corporations misuse their dominant positions in the advertising industry to target certain blockchains, blockchain participants might pursue competition laws and seek damages.[90]

US

In the United States, monopoly power is defined as the ability to set prices and exclude competitors. The two criteria mentioned above are interconnected, and the US Supreme Court has considered them as one. Unlike the EU Law on Abuse of Dominance, which includes detailed instructions for assessing relevant markets and determining enforcement priorities

[87] Pat Treacy, Alex Latham, "Blockchain and competition law," supra note. 80.
[88] Mark Simpson, Jamie Cooke, ”Blockchain: competition issues in nascent markets.” Available on: https://www.nortonrosefulbright.com/en/knowledge/publications/81f70b38/blockchain-competition-issues-in-nascent-markets
[89] Christophe S. Hutchinson, Maria A. Egorova, "Potential Legal Challenges for Blockchain Technology in Competition Law," *A Journal of Vytautas Magnus University* (2020) ISSN 2029-0454, pp. 91-92.
[90] Thibault Schrepel, "Unlocking the Potential Between Blockchain and Antitrust." Available on: https://www.theregreview.org/2022/01/17/schrepel-potential-between-blockchain-antitrust/

for applying Article 102 of the TFEU to abusive exclusionary activity by dominant companies, the US Law does not.[91]

The Sherman Act 2 outlaws monopolization and monopolization efforts. However, monopolistic power is insufficient for a Section 2 claim. The corporation must actively preserve its monopolistic position by anticompetitive exclusionary behaviour. Exclusionary behaviour has been established by courts in a variety of situations, like if a monopolist refuses to deal with competitors, enters into exclusive supply or purchase agreements, or denies competitors access to a vital facilities.[92]

If, for example, a monopolist demands its customers to use its blockchain to complete transactions, and this requirement forces customers to abandon a competitor's blockchain, a Section 2 violation may occur. When a monopolist refuses to negotiate with a rival, Section 2 is invoked.

Although a company generally has no obligation to deal with its competitors, antitrust liability is applied if a monopoly firm rejects to sell a competitor a product that it made available to others, or when a monopolist had a previous relationship with the competitor but afterwards cancelled it with no reasonable business justification. As a result, a monopolist blockchain owner may be subject to Section 2 inspection if it previously permitted a competitor access to its blockchain but then barred that competition without a compelling business rationale.[93]

Exploitative, Exclusionary and Discriminatory Abuses

Abuse of dominant position is generally divided into these three groups. It is vital to evaluate possibilities of the appearance of such abuses within the blockchain technology.

Exploitative Abuse

[91] MHRD, "Competition Law: Abuse of Dominant position in US and EU." Available on: https://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/law/03._competition_law/18._abuse_of_dominant_position_in_us_and_eu_/et/5657_et_18et.pdf

[92] Ryan C. Thomas and others, “Blockchains and Antitrust:New Technology, Same Old Risks?” Available on: https://www.jonesday.com/files/Publication/92640617-6a6a-45b4-8f82-18d5e65d5b40/Presentation/PublicationAttachment/c9c5c7fa-4f65-4758-b00f-1a970848eb13/Blockchains_and_Antitrust.pdf

[93] Ibid.

The act of placing unjust conditions on existing consumers or suppliers and basically using the market power to enforce unbalanced transaction conditions or exorbitant pricing are known as exploitative abuses.

Although these were formerly thought to be the sole circumstances to which Article 102 TFEU was applicable, recent Court of Justice case law has favoured exclusionary abuse cases whilst disregarding exploitative abuse cases. The scenario of economic dependency abuse is much more exceptional. Though, Several Member State rules, in contrast to EU competition legislation, have special measures in this regard.[94]

It's worth noting that under US law, which exclusively sanctions exclusionary abuses, this form of misuse is technically legal. The exploitation of monopolistic power is not prohibited by US law. Instead, it only forbids anticompetitive behaviour that aids in the acquisition or maintenance of monopolistic power.[95] But especially when it comes to intellectual property and digital marketplaces, some of these exploitative activities are detected and forbidden in practice.[96]

When blockchain designers give services in return for preferential treatment, or when one blockchain forces unpleasant measures on another blockchain, or when one blockchain imposes unfavourable measures on another blockchain, exploitative abuse may happen.

However, because blockchain is still in its early stages, putting too much focus on exploitative practices is pointless. The dynamic of the blockchain ecosystem will almost certainly address such abuses, since this sort of abuse is still feasible, and at some point, it will very likely result in legal action.[97]

Exclusionary Abuse

Refusal to deal, tie-in sales, predatory pricing, margin squeeze or exclusive dealing and rebates are examples of exclusionary abusive tactics.[98]

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[94] Patrice Bougette, Oliver Budzinski, Frédéric Marty, " Exploitative Abuse and Abuse of Economic Dependence: What Can We Learn From an Industrial Organization Approach?" Available on: https://www.cairn-int.info/journal-revue-d-economie-politique-2019-2-page-261.htm#:~:text=While%20the%20effects-based%20approach,transaction%20conditions%20or%20excessive%20prices.

[95] Kenneth Reinker, Lisa Danzig, "Abuse of dominance in USA." Available on: https://www.lexology.com/library/detail.aspx?g=bd2b38f1-9b66-448f-9bca-835c2fb9b94e

[96] Thibault Schrepel, Death of Antitrust Law, supra note. 86

[97] Christophe S. Hutchinson, supra note. , p.99

[98] Dr. Thibault Schrepel, Death of Antitrust Law. supra note. 86.

Refusal to deal

The European Commission believes that a dominant company's refusal to deal is likely to remove effective competition in the market, either immediately or over time.[99] When a monopolist refuses to interact with a rival, Article 102 TFEU, which forbids the abuse of dominant position, is invoked. Whereas a firm's responsibility to interact with competitors is often absent, the European Court of Justice has recognized anticompetitive activity in cases[100] where a monopolist does not allow his competitors to buy the products which are overall available to other buyers.[101]

For US, as described by FTC, a seller has the freedom to select his or her business partners. A company's reluctance to engage with anyone else is legal as long as it is not the result of an anticompetitive agreement with other companies or part of a predatory or exclusionary plan to acquire or retain a monopoly.[102] As it was stated before, refusal to deal may lead to the violation of Section 2 of Sherman act in the case if monopolist restricts his competitors from buying products which are available to others, quite similar to how it is in EU.

Outside of blockchain, refusal to deal is happening regularly, however, it can be predicted that it will be less common for blockchain, especially taking into account the public ones. Public blockchain is designed to enable open access. It basically means that a refusal to provide access to it would have to be included in its governing architecture. It is impossible to choose users in a planned or exclusive manner. As a result, the refusal to trade can only be implemented by changing the access rules. Exclusionary techniques are thus contradictory with the public blockchain essence, and blockchains that employ such would no more be regarded as public.[103]

Though, private blockchains are distinguished by their refusal to provide public access. The gate - keeping mechanism in private blockchains can take many different shapes. Based on

[99] European Commission, "Guidance on the Commission's enforcement priorities," OJ C 45, 24.2.2009. [85] Available on: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52009XC0224%2801%29
[100] As a good examples of refusal to deal cases, see Oscar Bronner v Mediaprint case (Available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A61997CJ0007) or European Night Services v Commission case (Available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A61994TJ0374)
[101] Romano Subiotto, David R. Little, ”The Application of Article 102 TFEU by the European Commission and the European Courts,” Journal of European Competition Law & Practice Advance. Available on: https://www.clearygottlieb.com/~/media/organize-archive/cgsh/files/other-pdfs/the-application-of-article-102-tfeu-by-the-european-commission-and-the-european-co.pdf
[102] FTC, ”Refusal to Supply.” Available on: https://www.ftc.gov/advice-guidance/competition-guidance/guide-antitrust-laws/dealings-supply-chain/refusal-supply
[103] Thibault Schrepel, Death of Antitrust Law. supra note. 86.

the governance options, it could, for instance, restrict a rival from accessing blockchain data, promote or set up new operations, or verify the blocks, and be administered by various sorts of users. In cases when refusal to allow access to permissioned blockchain is not genuinely reasonable, exclusionary actions by gatekeepers may violate both Article 102 TFEU and the second section of Sherman Act if private blockchain becomes a vital infrastructure.[104]

Tying and bundling

When a vendor forces a consumer to purchase another product when they buy the first, or at the very least forces buyer not to buy the second product from anywhere else, this is known as a tying agreement. On the other hand, when many things are presented and sold jointly, this is known as bundling.[105] These practises are forbidden under both US antitrust[106] and EU competition law.[107]

In public blockchains, tying will most probably never happen. This form of blockchain is, in fact, openly available and functional. Considering that, using another service or blockchain to process it is improbable. Since tying or bundling activities need to be built into the governance architecture on the moment the blockchain was created, it is doubtful that any of these practices can possibly be observed on public blockchains due to the difficulties of altering them.[108]

However, it does not stay the same for private blockchains. There is a risk that profit-seeking companies may want to abuse tying. For example, it can be implemented by asking a third-party account to gain access to its blockchain or to be able to obtain tokens.

Predatory pricing

Predatory pricing is illegal in the EU, as according to Article 102 TFEU. Predatory pricing has two parts, as per the Commission's enforcement objectives in implementing Article 82 of

[104] Victor Chan, ”Collusive Behaviour in Permissioned Blockchain.” Available on: https://aifc.kz/uploads/Collusive%20Behaviour%20in%20Permissioned%20Blockchain(edited).pdf
[105] Matthew Lane, "Tying and Bundling." Available on: https://www.project-disco.org/competition/042319-antitrust-in-60-seconds-tying-bundling/#:~:text=A%20tying%20arrangement%20happens%20when,the%20same%20under%20antitrust%20law.
[106] Section 1 of the Sherman Act and Section 3 of the Clayton Act can both be used to dispute tying.
[107] The best case law to describe tying from the perspective of European Union is C-3/37.792, Commissions Decision on Microsoft Corporation. Available on: https://ec.europa.eu/competition/antitrust/cases/dec_docs/37792/37792_4177_1.pdf
[108] Thibault Schrepel, Death of Antitrust Law. supra note. 86

the EC Treaty to abusive exclusionary behaviour by dominant undertakings: sacrifice and anti-competitive foreclosure.[109]

A predatory pricing complaint can be filed in the United States under Section 2 of the Sherman Act. The Sherman Act demands proof of a hazardous likelihood of monopolization, and the recoupment requirement is one of the most significant contrasts between the EU and US approach to predatory pricing. Prices below cost are prohibited under US competition law, but only if there is evidence of future cost recoupment. On the other hand, the EU has a more stringent standard that prohibits under cost pricing without evidence of recoupment.[110]

When a member submits an operation to be recorded into the blockchain, payment is essentially done by the high transaction fees. Predatory pricing is extremely improbable on public blockchains since it is needed to convince enough users to modify the governance model in order to make it viable.

Like with tying and bundling, possible issues do remain for the permissioned blockchains, since private blockchains may update the algorithm at any time without needing to persuade anybody. As a result, because the protocol can be readily altered, the pricing may likewise be easily adjusted in reaction to the pricing of competitors.[111]

Exclusive dealing

And yet last but not the least important practise is exclusive dealing, which is prohibited by Article 102 TFEU, as well as is considered illegal under Section 3 of the Clayton Act. In general, exclusive dealing happens when one person trading with another establishes constraints on the other's ability to freely choose with whom to trade.[112]

Again, public blockchains are most probably safe from these practises. First of all, for it to be possible, such practise shall be linked to the blockchain itself from the start. It is also worth mentioning that it is simply inefficient to utilize more than one blockchain for one transaction.

[109] European Commission, "Guidance on the Commission's enforcement priorities," supra note.99., [64 – 73]
[110] Gönenç Gürkaynak, Onur Özgümüş, "Predatory pricing, Global Dictionary of Competition Law, Concurrences," Art. N° 12336. Available on: https://www.concurrences.com/en/dictionary/predatory-pricing
[111] Thebault Schrepel, Death of Antitrust Law. supra note 86., p.316
[112] ACCC, "Exclusive dealing." Available on: https://www.accc.gov.au/business/anti-competitive-behaviour/exclusive-dealing#:~:text=Broadly%20speaking%2C%20exclusive%20dealing%20occurs,when%20it%20substantially%20lessens%20competition.

However, companies who own a private blockchain may wish to include exclusive dealing to the blockchain in order to be the only ones who have some sort of data on their blockchain, since private blockchain allows to do so. As it stays for almost every other type of abuse, permissioned blockchain may suffer from the risk of exclusive dealings.

Discriminatory Abuse

Discriminatory abuses arise when parties apply different conditions to identical transactions with other trading partners, putting them at a disadvantage. The most frequent type of this abuse is discriminatory pricing. As described by European Commission, price discrimination is a source of concern in European competition policy for a number of reasons. The first reason is that dominant enterprises' pricing discrimination may diminish consumer welfare by capturing consumer surplus without excluding competitors. Secondly, the fulfilment of the Internal Market goal has given competition a mandate to beat private enterprises' attempts to create trade barriers across Member States, allowing them to price discriminate across borders. And lastly, exclusionary effects of pricing discrimination might damage either the dominant company's competitors or its subsequent consumers.[113]

Under US law, only price discrimination that is intended to hurt rivals is illegal under the Sherman Act, Clayton Act, and Robinson-Patman Act[114].

Since public blockchains are visible, pricing discrimination will be uncommon. Though, blockchain members may experience discriminatory conditions within private blockchains, as applying varying conditions to different people is a working approach to encourage users to utilize a blockchain. Discriminatory pricing might encourage certain individuals to remain engaged in the blockchain by providing reduced costs, perhaps giving rise to a discriminatory consequences. As a result, it can be stated that on permissioned blockchains discriminatory abuses may possibly happen.[115]

3.2. Opinion of Competition Authorities on Blockchain

EU

[113] European Commission - DG Competition, ”How should price discrimination be dealt with by competition authorities?” Available on: https://ec.europa.eu/dgs/competition/economist/concurrences_03_2007.pdf
[114] Robinson-Patman Antidiscrimination Act. Available on: https://www.govinfo.gov/content/pkg/COMPS-12152/pdf/COMPS-12152.pdf
[115] Thebault Schrepel, supra note. 86., p.321

Latest comments by EU competition law authorities show the European Commission's increased attention on competition law challenges arising from blockchain technology. As it is stated by the Commission, competition law authorities shall employ their current investigation powers in situations if a blockchain network is utilized to hide anticompetitive conduct.

Johannes Laitenberger maintained the policy line, indicated that corporations have a responsibility to create algorithms that comply with competition law, stating that in order to stay on the right side of the law, the software should be developed to avoid collusion, as a primary concern.[116]

Though, to this day there was no that much comments on the blockchain concerns towards the competition law. As it was stated by the Luca Jahier, a President of the European Economic and Social Committee, despite the fact that EU authorities have evaluated blockchain to some extent, a comprehensive and common EU strategy remains lacking. Considering its past record, the EU has a one-of-a-kind opportunity to maintain its dominant global market position, but only if it acts.[117]

According to Mr. Jahier, the development of blockchain technology is currently relatively dispersed within the EU. Several challenges must be solved in order to unlock Blockchain's potential in the EU single market and for European society, with the current legal ambiguity being a top priority. As a result, the EESC called on EU institutions to give clarity and a common ground in order to fully realize Blockchain's promise for Europe. Jahier states that the European Commission should first issue a message on EU Blockchain and DLT development based on Blockchain principles, expressing political intent, ownership, and laying out a vision and action plan to build an enabling environment.[118]

US

[116] Johannes Laitenberger, "Competition at the digital frontier." Available on: https://ec.europa.eu/competition/speeches/text/sp2017_06_en.pdf

[117] Opinion of the European Economic and Social Committee on Blockchain and the EU single market: what next? EESC 2019/02261., OJ C 47, 11.2.2020. Available on: https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ%3AC%3A2020%3A047%3AFULL&uri=uriserv%3AOJ.C_.2020.047.01.0017.01.ENG

[118] Opinion of the European Economic and Social Committee on Blockchain and the EU single market: what next? EESC 2019/02261., OJ C 47, 11.2.2020., Ibid.

As for the US, the antitrust regulators in the United States are still working on their approaches to cryptocurrencies and associated inventive use cases; their curiosity is obvious, but no comprehensive guidance has been yet issued.

However, not so long ago, on March 9, 2022 President of the United States Joe Biden signed an executive order aimed at ensuring appropriate digital asset creation. This order has a lot to say, and it raises a lot of excellent points. Biden achieves an intriguing mix between highlighting blockchain's promise and addressing the technology's key drawbacks. The President asks for the creation of a blockchain-friendly regulatory system in this regard and the competition issues are definitely not last on the list.[119]

The rising usage of digital assets and digital asset exchanges and trading platforms, according to Biden's directive, poses a danger of unfair and abusive conduct or practices (for example, antitrust breaches). Consequently, the greater the number of transactions is, the more troublesome transactions are discovered. President Biden has directed the FTC, among other agencies, to provide a study on the consequences of digital asset innovations and adoption. The study will provide normative recommendations, such as prospective legal and statutory actions, to safeguard US consumers, investors, and enterprises.[120]

Considering that, it can be surely said that now FTC will have a very important task to impose legislation on blockchain technology, while being extremely careful overlooking that it does not put in danger the survival of the technology itself. According to the opinion of Dr. Thibault Schrepel, the FTC should begin with centralized players' actions against blockchain ecosystems. The future of blockchain cannot be jeopardized by legal action against centralized corporations. Secondly, because consumer harm is easier to show outside the chain than inside the chain, Dr, Schrepel says that antitrust agencies shall focus on activities whose impacts are noticeable for corporations utilizing blockchain and smart contracts to collude.[121]

3.3 Case Law

[119] The White House, "Executive Order on Ensuring Responsible Development of Digital Assets." Available on: https://www.whitehouse.gov/briefing-room/presidential-actions/2022/03/09/executive-order-on-ensuring-responsible-development-of-digital-assets/

[120] Thibault Schrepel, "Competition policy and antitrust law in Biden's blockchain executive order." Available on: https://www.networklawreview.org/biden-blockchain-antitrust/

[121] Ibid.

There is not many existing case law overlooking the blockchain from the competition and antitrust law perspective at the moment. And unfortunately, all cases regarding competition issues did not in fact provide any answers to the most important questions in this regard. Nevertheless, the existence of such cases proves that blockchain may potentially raise competition problems which cannot be resolved by the current legislation. In this section, author will examine two cases which were overlooked by courts in the US. It is important to mention that there is no case law regarding competition issues of blockchain in the EU.

UnitedCorp v Bitmain[122]

To the degree that there have been disagreements or regulatory actions, courts in both EU and US have centered on the financial features of cryptocurrencies, rather than competition problems. However, an antitrust action was just a question of time. UnitedCorp, a diversified technology firm, accused Bitmain, the largest Bitcoin mining pool in December 2018.[123]

UnitedCorp offers a range of blockchain technologies that enable blockchain transactions to be completed using ordinary phone numbers. Their systems are based on Bitcoin Cash, a cryptocurrency. Bitcoin Cash was one of publicly available cryptocurrencies, and its governance was stated in its protocols, which were observed by the miners who verified transactions on the Bitcoin Cash network, just like any other cryptocurrency. Bitcoin Cash's protocols were set for an update in November 2018. Nonetheless, the system's creators couldn't agree on the new regulations, resulting in a division between two groups.

According to UnitedCorp, crypto software developers and cryptocurrency mining hardware specialists intended to, so to say, hijack the Bitcoin Cash network. UnitedCorp claimed that the defendants colluded to shift hashing power by transferring mining power from other cryptocurrencies to make UnitedCorp's fork unreliable.[124]

Different proceedings on this case were going for a long time. In February 2020, the court rejected the initial version of the lawsuit, and the plaintiff submitted an updated complaint at the end of the month. Bitmain was successfully defended and the judge rejected the revised

[122] Case 1:18-cv-25106-KMW. Available on: https://www.morrisoncohen.com/siteFiles/files/2018_12_06%20-%20United%20American%20v_%20Bitmain.pdf
[123] Ibid.
[124] Konstantinos Stylianou, "What can the first blockchain antitrust case teach us about the crypto-economy?" Available on: https://jolt.law.harvard.edu/digest/what-can-the-first-blockchain-antitrust-case-teach-us-about-the-crypto-economy

case with delay in March 2021, ruling that the plaintiff had failed to state a plausible antitrust allegation.[125]

Gallagher v. Bitcointalk.org

Arguably one of the first ever case which connects blockchain with competition law is Gallagher v. Bitcointalk.org.[126]

In this case, Ryan Gallagher filed a lawsuit in the United States District Court for the Northern District of California on September 24, 2018, alleging that the defendants – Bitcointalk.org, Martti Malmi (a Bitcoin developer), and the Bitcoin Foundation – were running an unlawful monopoly and denied the ability to compete.[127]

Basically, Ryan claimed that Bitcointalk.org banned him and slandered his name even though "he had zero negative points in their reputation system"[128] Court held that the application was incomplete and stated that there is not enough evidence. After several attempts of Mr. Gallagher to appeal the decision, United States Magistrate Judge advised to the Federal Court that because of the abusive history of the claimant, claim shall be rejected and dismissed with prejudice.[129] And the Court agreed with that.

Unfortunately, competition issues were not discussed that much under this case. Nevertheless, it can be mentioned that this case questions if restricting access to a blockchain infrastructure is an antitrust violation. Technically, as it was discussed in the paper before, it does violate Sherman Act. However, in this case it could be said that the overall lack of knowledge of the judges regarding blockchain and cryptocurrencies played a major role. Judges simply had no idea which allegations regarding blockchain could be proven, what resulted in the absence of the normal proceeding about the antitrust law violations. Despite this, Gallagher case is probably the first one or at least one of them and because of that it is still important for the future of competition policy on the blockchain technology.

[125] Jones Day, "Bitmain obtains dismissal of all claims in antitrust suit alleging Bitcoin Cash cryptocurrency market manipulation." Available on: https://www.jonesday.com/en/practices/experience/2021/03/bitmain-obtains-dismissal-of-all-claims-in-antitrust-suit-alleging-bitcoin-cash-cryptocurrency-market-manipulation
[126] Case No.18-cv-05892-JSC. Available on: https://leconcurrentialiste.com/wp-content/uploads/2020/04/gallagher-bitcointalk-incomplete.pdf
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[129] Document 12 of the case. Available on: https://leconcurrentialiste.com/wp-content/uploads/2020/04/gallagher-bitcoin-foundation-findings.pdf

Discussion

In this section, author will describe and summarize findings and analyses from the previous sections in order to explain the significance of the results and connect them to the research questions.

Is Blockchain Beneficial or Harmful for Competition?

According to the previous findings, author may state that blockchain overall is much more advantageous for the competition than it is dangerous. Decentralization, timestamping, immutability, possibility to execute smart contracts, forking and many more[130] are the reasons why blockchain is much better than any existing to this day centralized system. Blockchain is certainly going to be used a lot in the commerce sector in the nearest future, because of how indispensable its functions are. However, to answer this question more precisely it is vital to distinguish between private and public blockchains. As it was shown in parts 2 and 3 of the paper, competitive risks within private blockchains are a lot more significant than the risks for the public ones.

Since public blockchains are kind of open to everybody in the network, a lot of negative aspects, especially from the perspective of law, do not seem to be that scary. Information exchanges are still possible in public blockchains, but any exclusionary abuses, like predatory pricing, tying, bundling and refusal to deal, as well as any discriminatory abuses are particularly impossible to put into practise within public blockchains. Though, it is possible that for the huge corporations permissionless blockchains will not be as interesting as private ones, since private blockchains can be manipulated by the smaller groups of individuals.

As for private blockchains, all sorts of collusion and dominant position abuses are possible because of its "hidden" nature. In authors opinion, if private blockchains will eventually become a prioritised choice for the businesses, it may become very problematic and may cause a lot of harm not only from the perspective of legislation, but for the both digital and non-digital markets as a whole. Permissioned blockchains certainly require much more enhanced control in order not to disrupt competition on the several markets.

[130] See Part 2 of the work.

Overall, it can be concluded that blockchain is not something we need to be scared of, but on the contrary, it shall be studied and researched to avoid possible threats and to only keep its benefits.

Is Current Legislation Able to Solve Possible Blockchain Competition Issues?

Comparing the approaches to law making of European Union and United states, author may without any doubts say that in the case of blockchain, European approach with the definite description of what is allowed and what is not seems much better than the approach in US, where a whole law can consist of a few sentences without any expressed explanation of what it actually prohibits. It is especially relevant when we are talking about newest digital innovations, to which the old rules, written in the US Acts cannot provide an answer.

US law in fact provides more questions than answers when discussing blockchain technology. Under US acts, you can never understand the consequences of any collusion or abuse done within the blockchain. And the case law provided earlier in the work[131] proves that US courts right now are not able to adequately and competently evaluate cases, where the competition law is violated through several practises inside the blockchain. In authors opinion, it is more than clear that the lack of explicitness and perspicuity makes US law insufficient to deal with the majority of issues which blockchain may cause to the competition.

EU legislation, on the contrary, may answer a few questions regarding blockchain interactions with competition law, but they still lack necessary definitions for some terms, which need to be interpreted differently in the case of blockchains. For example, EU legislation and European Commissions commentaries do not in fact answer how dominant position shall be interpreted and applied to blockchains, where it is unknown who exactly is dominant.[132]

Altogether, it can be answered that both jurisdictions have to apply certain changes to the legislation in order to be ready to any sort of competition and antitrust law violations withing the blockchains. Otherwise, author believes that at some point, governments will be simply required to prohibit any use of blockchains for the commercial purposes, what will lead to the situation where private blockchains will either never be implemented to the markets or will

[131] See Part 3., Case law.
[132] See Part 3., section about dominant position.

cause too much chaos to the commerce and competition without the possibility to return back.

What is the Expected Future of Competition and Antitrust Law with Regard to Blockchain?

Since the future growth of blockchain is unpredictable, estimating the scale of the processes that may emerge alongside it is impossible. At this point, only Ethereum and Bitcoin are considered as dominating blockchains, and the evolution of the technology is also far from its peak.

As author stated earlier in his work, Joe Biden has already shown interest of the US in investigating blockchain antitrust concerns. FTC is right now most probably working hard on creating new legislation or interpreting the already existing one. Author believes that European Commission will soon follow the decisions of the US government and will either propose changes to the current competition rules or will draft another commentary with the explanation of EU vision on this topic. It is also possible that after Joe Biden's executive order, European Commissions Digital Market Act[133], which will be put in force not earlier than in 2023, can be updated in order to implement changes regarding blockchain competition issues. However, all of these are no more than just guesses and hopes of the author.

Nevertheless, it can be concluded that we certainly shall await some changes in the legislation of both EU and US, and it is only a matter of time. Author believes that this topic will become more and more relevant while the time goes and the technology develops. In authors opinion, in just a few years, thousands of lawmakers around the world will consider the blockchain technology as the top priority of investigation not only in the competition and antitrust area, but in many others not less significant fields of law.

Conclusion

Authors objectives were to identify the key functions of blockchain that benefit or threaten commercial activity and healthy market competition, to examine how blockchain may affect present competition regulations, and to determine if existing legislation needs to be updated to address blockchain challenges. Taking into account all previously written analysis of

[133] See Digital Market Act. Available on: The Digital Markets Act: ensuring fair and open digital markets | European Commission (europa.eu)

academic studies, case law and legislation, author considers that he achieved the objectives and provided proper answers for the research questions.

In Part Two, author described in detail benefits and threats of the blockchain, by touching not only upon technological features of this innovation, but also by predicting changes on the market, which blockchain may cause. This Part together with Part Three provided an explicit answer on the first research question.

In Part Three, author discussed competition and antitrust law aspects which may raise together with the development of blockchain technology by not only discussing legislation itself, but also by providing opinions of competition authorities and analysing case law. This part solely provided a direct answer on the second research question.

Summarizing the answer on the first research questions, based on the analysis, author may state that blockchain overall is advantageous for the competition, since it provides quite a lot of tools which make certain elements of commerce much more convenient. Blockchain is beneficial for competition because of its decentralized nature, immutability, forking, timestamping, as well as because of its ability to create smart contracts and to organize businesses in a different way without hierarchical centralised structure. Though, potential problems with its governance, possible transaction cost reductions and removal of the need for intermediaries shall be considered as the main threats for commerce and competition itself.

Answering on the second research question, author can say that as for the public blockchains, most of the blockchain competition law issues are not relevant because of its visibility effect, which makes it is extremely difficult to implement any of the anticompetitive practises under permissionless blockchains. As for the private blockchains, situation is a lot more different. Within private blockchains, different forms of collusion and dominant position abuses are possible. Under private blockchain, companies may practise both horizontal and vertical information exchange, and dominant companies may take advantage of exclusionary, exploitative and discriminatory abuses. Arguably, current legislations of EU and US are not yet ready to deal with the problems which blockchain may cause to the competition.

Further research and limitations

This research was focused primarily on Articles 101 and 102 TFEU, as well as on Sherman and Clayton Acts in US. However, paper did not touch upon any Merger Control regulations.

Blockchain may cause issues from the perspective of Articles 2(3) and 3(4) of the European Merger Control Regulation[134]. Author recommends to clarify aspects related to merger control in the further researches on this topic.

Main limitation of the research is the fact that there are not many commentaries of competition authorities about the related issues, as well as there is yet no legislation which was made specifically considering blockchain issues in the competition law area. Author believes that the research on this topic shall be continued when competition authorities of either US or EU will reveal the fact that the changes in legislation are indeed required. It is also important to analyse any appearing case law in the future, especially in the EU, where there is no blockchain competition cases registered yet.

In authors opinion, this topic has a great potential for the future research because of its enormous significance for the competition and antitrust law. Author hopes that this research may give ground to the further studies, which will consider previously related points and will develop new approaches to the possible competition problems.

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