The Challenges of Blockchain Technology to Antitrust Law

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Contents

Abstract

This paper intends to describe in greater detail the challenges that blockchain presents for the implementation and enforcement of antitrust law against anticompetitive practices. The paper discusses how the decentralized and autonomous technology and structure of blockchains as well as the lack of its control by governments or any other central institutions will create challenges in terms of the detection of anticompetitive practices on blockchain in the first place, and then, imposing the relevant sanctions thereupon. In particular, the blockchain software triggers decisions and actions automatically (i.e. decisions and actions are managed by the neutral software), without interference of blockchain participants, making it impossible for the antitrust law violations to be attributed to an intention of a blockchain participant. This will force antitrust law enforcers to become more pro-active in their planning, especially when the competence of state courts is already difficult to assign to disputes with blockchains. Therefore, the implementation of self-regulation, such as "law is code", by the market players will have an utmost importance, and eventually, the relevant antitrust regulations and standards will be implemented within the system itself to address the anticompetitive practices on an ex-ante basis.

Introduction

Introduction of blockchain has been considered as the most important innovation since the internet. The World Economic Forum predicts that ten percent of global gross domestic product will be stored on blockchain by 2027.[1] Blockchain may reduce transactional costs and make contracting easier by creating a world in which "computers . . . fill in the gaps of contracts."[2] As a result, blockchain could facilitate trade, but it would also present numerous legal challenges in terms of antitrust law. Since the blockchain technology eliminates the need

[1] World Economic Forum, Technology Tipping Points and Societal Impact, Survey Report 24 (Sept. 2015), available at: http://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf;
[2] Thibault Schrepel, Antitrust Conversations with Nobel Laureates, (2018), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3132319;

for a fiduciary—that is, a person who creates trust—because it functions automatically, without any natural or artificial person, it is obscure what happens to the application of antitrust law. From a legal perspective, the way the rules are applied to the blockchains, are not well-suited for analyzing the anticompetitive practices that are occurring or may occur in the future on the blockchain technology. The legal challenges arising out of introduction of blockchains are actually similar to the legal challenges deriving from introduction of internet. When the internet entered the mainstream, some individuals announced the end of antitrust law.[3] In his article Cyberspace and the Law of the Horse, Judge Frank H. Easterbrook argued that any effort to create specific rules for the "cyberspace" arena was, like efforts to create from whole cloth a special law of horses, "doomed to be shallow and to miss unifying principles.[4] However time has shown that the internet did not kill general bodies of law, on the contrary, most of the same principles are applied today as twenty years ago, and antitrust law is but one example of this.[5] The main challenges, that antitrust law faces in relation to the blockchain technology, are as follows: it is impossible for the authorities to detect the anticompetitive transactions (as all the transactions are encrypted), even if such transactions were to be detected, it is impossible to attribute them to any individual or legal entity (as the identity of users on the blockchain are secure), and lastly, even if the identities of users were known, it would be difficult to determine the proper jurisdiction (as the network is decentralized). For the purposes of exploring the above challenges and finding solutions thereto, this paper will discuss what is the blockchain technology, how it works, which jurisdiction is competent for the blockchains, what are possible frictions of blockchains with antitrust law, and how can these frictions be solved without hindering the core principles of blockchain technology or causing the death of antitrust law.

[3] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576 p. 283;

[4] Ibid, p. 284;

[5] Ibid;

1. The Origin Story

In 2008, during the times of global financial crisis, an innovative and revolutionary paper "Bitcoin: a peer-to-peer electronic cash system" appeared on the internet. The paper was written by an anonymous author, who used a pseudonym - Satoshi Nakamoto. Satoshi Nakamoto not only developed bitcoin, but also developed the first blockchain database and disappeared from the public eye in 2010.[6]

According to Satoshi Nakamoto, the banks and governments had too much power and they used it in their own self-interest. Envisaging a new type of money called Bitcoin could significantly change that, since the Bitcoin would not be controlled or run by central banks or governments and anyone would be able to transfer/receive it anywhere around the world for free.[7] At first nobody paid attention to Satoshi Nakamoto's ideas, probably because the world was concerned with handling the outcomes of global financial crisis at the time, however slowly more and more people started buying and using Bitcoin. Nowadays, Bitcoin is accepted by a variety of businesses, from major online retailers to small bodegas and food trucks, and a whole new industry has emerged to help individuals to buy, sell, store, transfer Bitcoin and track its price.[8] Since it was launched in 2009, Bitcoin has grown to a network of more than 10,000 participants (nodes), who either create new bitcoins (miners) or use the network for executing transactions (clients).[9] Besides, the price of the Bitcoin has been rapidly and drastically increasing over the years, for example, in January 2013, its price was $13.40, in

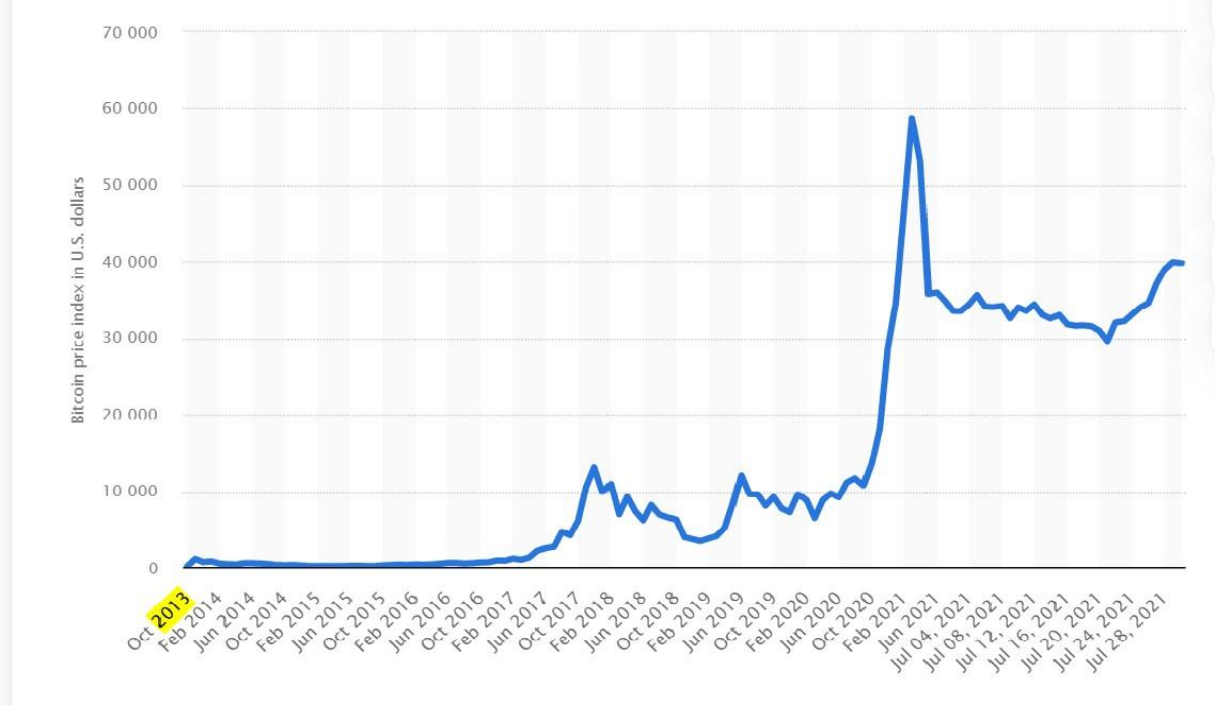
[6] Baldridge, Rebecca, Why The Father of Bitcoin Is Nowhere to Be Found, available at: https://robbreport.com/lifestyle/finance/bitcoin-founder-satoshi-nakamoto-1234613022/;

[7] Satoshi Nakamoto, A Peer-to-Peer Electronic Cash System, 2008, available at: https://bitcoin.org/bitcoin.pdf, pp. 1-2;

[8] Luther, William J., Bitcoin and the Future of Digital Payments (July 15, 2015), available at: http://ssrn.com/abstract=2631314, p.2;

[9] https://www.euromoney.com/learning/blockchain-explained/the-difference-between-blockchain-and-bitcoin; see also: The, Frederik, eCash in a Social Theory of Money: Bitcoin and Other Cryptocurrencies, 2014, available at: https://ssrn.com/abstract=2491743, p. 2;

January 2015, it has increased to $315, eventually, as of January 2021, it amounted to $41,528.[10] The following chart will help to clearly visualize the changes to the Bitcoin prices from October 2013 to July 30, 2021.[11]



Considering above, many believe that blockchain will change the future of money exactly the way internet changed the world in terms of information exchange, as said, the World Wide Web enables the frictionless transfer of information, whereas blockchain enables the frictionless transfer of value.[12]

[10] Edwards, John, Bitcoin's Price History, available at: https://www.investopedia.com/articles/forex/121815/bitcoins-price-history.asp; see also: https://www.statista.com/statistics/326707/bitcoin-price-index/

[11] https://www.statista.com/statistics/326707/bitcoin-price-index/

[12] Malinova Katya, and Park, Andreas, Market Design with Blockchain Technology 1 (2016), as sited in Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 286;

2. Definition of Bitcoin

Bitcoin is a peer-to-peer, client based, completely distributed electronic currency that does not depend on centralized issuing bodies (national banks and governments) to operate, its value is created by the users, and it is tradable in the same manner as sovereign currencies.[13] To better understand the Bitcoin, at first, I would like to discuss the basics of the currencies in general, and then, continue with the characteristics of the Bitcoin.

Payment systems depend on value, which is the desirability allocated by someone to material things, either based on the needs (food, accommodation) or on the scarcity of such material things (gold or other metals), or even to intangible things, such as labor, experience, knowledge, etc.[14] Currencies were invented to transfer value, which was initially done through barter and then by allocating the value to the coins made of scarce metals, later on the coins became unwieldly, giving the rise to the introduction of the paper notes. [15] The paper note was basically a promise to give the bearer the equivalent value in metal to the one indicated on the paper note. In another words, the money was based on the idea, that the issuer of the paper notes had metal reserves, which could be redeemed at any time (known as gold or silver standard) and naturally, the maximum amount of money, which could be exchanged by the issuer was equal to the available metal.[16] However, during the Great Depression people panicked and started trading in their paper notes for gold. The governments were in danger of running out of gold, therefore they replaced the gold standard with a new monetary system,

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[13] Guadamuz, Andres and Marsden, Christopher T., Blockchains and Bitcoin: Regulatory Responses to Cryptocurrencies (December 7, 2015), Volume 20, December 2015, available at: https://ssrn.com/abstract=2704852, p. 2;

[14] Davies G. and Bank J.H., A history of money: From ancient times to the present day. Third edition. Cardiff: University of Wales Press, 2002, cited in: Guadamuz, Andres and Marsden, Christopher T., Blockchains and Bitcoin: Regulatory Responses to Cryptocurrencies (December 7, 2015), Volume 20, December 2015, available at: https://ssrn.com/abstract=2704852, p. 4;

[15] Guadamuz, Andres and Marsden, Christopher T., Blockchains and Bitcoin: Regulatory Responses to Cryptocurrencies (December 7, 2015), Volume 20, December 2015, available at: https://ssrn.com/abstract=2704852, p. 5;

[16] http://historymatters.gmu.edu/d/5354/;

where the value of the money derived from the wealth and economic trustworthiness of the country instead of amount of gold in reserves (fiat money).[17] This way, the governments were not tied to the gold anymore and if they needed to, they could adjust the amount of money in the economy and the interest rates as well. The value of modern fiat money arises from the law, the currency is supported by the government as well as the economy of the country where it is issued – this is one of the main reasons why the trusted governments have strongly valued currencies.[18]

As to the Bitcoin, it was devised to have an intrinsic value unlike the fiat currencies. The intrinsic value of Bitcoin derives from the computing power used for solving algorithms, which is the only way to produce new coins.[19] However, as time goes by the algorithms used for producing new coins require more and more computing power, making it more difficult to create new coins (for example, making a new coin is more than 45 billion times more difficult than it was for the initial coin, and four times more difficult than it was exactly one year before).[20] This difficulty is built into the system to make the supply of Bitcoin scarce and finite, at a maximum of 21 million.[21] As mentioned before - the scarcity creates a value. Another way of looking at the Bitcoin is that its value derives from people, just like fiat money, but with faith placed in computer programming, not the countries and governments.[22] In short, Bitcoin

[17] https://www.npr.org/sections/money/2011/04/27/135604828/why-we-left-the-gold-standard;

[18] Guadamuz, Andres and Marsden, Christopher T., Blockchains and Bitcoin: Regulatory Responses to Cryptocurrencies (December 7, 2015), Volume 20, December 2015, available at: https://ssrn.com/abstract=2704852, p. 6;

[19] The, Frederik, eCash in a Social Theory of Money: Bitcoin and Other Cryptocurrencies, 2014, available at: https://ssrn.com/abstract=2491743, p. 2;

[20] Guadamuz, Andres and Marsden, Christopher T., Blockchains and Bitcoin: Regulatory Responses to Cryptocurrencies (December 7, 2015), Volume 20, December 2015, available at: https://ssrn.com/abstract=2704852, p. 7;

[21] The, Frederik, eCash in a Social Theory of Money: Bitcoin and Other Cryptocurrencies, 2014, available at: https://ssrn.com/abstract=2491743, p. 2;

[22] Guadamuz, Andres and Marsden, Christopher T., Blockchains and Bitcoin: Regulatory Responses to Cryptocurrencies (December 7, 2015), Volume 20, December 2015, available at: https://ssrn.com/abstract=2704852, p. 7;

can be defined as the first electronic currency, which uses an encryption techniques, such as cryptography to control the creation of monetary units and transactions, verify the transfer of funds and prevent fraud (since electronic currencies use the cryptography, they are often referred to as cryptocurrencies). [23]

It must be noted, that many attempts have been made to create electronic currency in the past as well, but with no success.[24] The main reason for such failure was the high possibility of fraud, in another words the lack of trust towards the issuer of such electronic currency, namely, if someone issues a new currency called the X, how can anyone trust that the issuer won't give themselves a million X, or steal your X for themselves? Bitcoin solved this problem by using a specific type of database called a blockchain, which we will discuss in the following chapter.

3. Definition of Blockchain Technology

In this Chapter, I would like to define the characteristics of the blockchain technology and explain how it works. This could be useful in understanding the following chapters relating to the frictions of blockchain and cryptocurrencies with antitrust law.

The World Economic Forum defines the blockchain as follows: "currently, most people use a trusted middleman such as a bank to make a transaction. But blockchain allows consumers and suppliers to connect directly, removing the need for a third party. Using cryptography to keep exchanges secure, blockchain provides a decentralized database, or "digital ledger", of transactions that everyone on the network can see. This network is essentially a chain of computers that must all approve an exchange before it can be verified and recorded".[25]

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[23] Satoshi Nakamoto, A Peer-to-Peer Electronic Cash System, 2008, available at: https://bitcoin.org/bitcoin.pdf, pp. 1-2; see also: Halaburda, Hanna and Gandal, Neil, Competition in the Cryptocurrency Market (June 27, 2016), available at: https://ssrn.com/abstract=2506463, p. 5;

[24] Reiff Nathan, Were There Cryptocurrencies Before Bitcoin? available at: https://www.investopedia.com/tech/were-there-cryptocurrencies-bitcoin/;

[25] World Economic Forum, Technology Tipping Points and Societal Impact, Survey Report 24 (Sept. 2015), available at: http://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf;

In another words, blockchain is an open database (digital ledger) recording all sorts of transactions made in cryptocurrency between the users, who use unique alphanumeric address to keep their identities secret.[26] These transactions are duplicated and distributed across the entire network of computer systems on the blockchain, thus their existence is seen by all users and each user can independently verify the recordings of the transactions.[27] Such verification of recordings prevents users from cheating the system and spending the same bitcoin for several transactions.[28] It should be pointed out, that even though recordings of the transactions are open to every user, the transactions itself are encrypted, therefore their meaning and purpose is anonymous.[29]

Blockchain can also described as a decentralized (distributed) database, allowing online payments to be sent directly from one party to another without going through a central authority (financial institution).[30] Other databases, such as Structured Query Language (SQL) database, have someone in charge who fully manages the database service and can change the entries, whereas in blockchain database nobody is in charge, it is run by people who are using it,[31] eliminating the need to rely on the trust.[32] Clearly, this shall not be understood as if there is no trust involved in the blockchain database at all. "Not relying on the trust" only means

[26] Ibid;

[27] Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, p. 2;

[28] Cong, Lin and He, Zhiguo, Blockchain Disruption and Smart Contracts (December 27, 2018), available at: https://ssrn.com/abstract=2985764, p.2;

[29] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 287;

[30] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 287; see also: Guadamuz, Andres and Marsden, Christopher T., Blockchains and Bitcoin: Regulatory Responses to Cryptocurrencies (December 7, 2015), Volume 20, December 2015, available at: https://ssrn.com/abstract=2704852, p. 5;

[31] https://www.euromoney.com/learning/blockchain-explained/what-is-blockchain;

[32] Satoshi Nakamoto, A Peer-to-Peer Electronic Cash System, 2008, available at: https://bitcoin.org/bitcoin.pdf, p. 8;

that the database functions on the basis of cryptographic trust built within the system and not on the basis of the trust between different actors/peers within its network.[33] This may sound complicated, but it is actually similar to how flat money works: we do not need to trust every person with whom we exchange goods or services, it is enough if we trust that we are being paid, and that the money earned increases our purchasing power.[34]

Furthermore, blockchain technology is immutable, meaning that users agree to a certain set of procedures, called the protocol, which is governing the blockchain technology.[35] Once the protocol of one blockchain is established, users can not deviate from it, unless such deviation is decided by their majority.[36] This immutability creates trust mentioned above.

Considering above, blockchain has resolved two fundamental mathematical problems: the byzantine generals' problem, according to which computer systems cannot reach consensus without relying on a central authority, and the double spending problem, according to which the same single digital token can be spent more than once.[37]

4. Public and Private Blockchains

In blockchain the participants do not share the same privileges, and different blockchain implementations vary in how they decide who can access their network, which is either to maintain the distributed ledger and/or grant the consensus for modifying such ledger.[38]

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[33] The, Frederik, eCash in a Social Theory of Money: Bitcoin and Other Cryptocurrencies, 2014, available at: https://ssrn.com/abstract=2491743, p. 5;

[34] Ibid;

[35] Nielson, Bryant, Review of the 6 Major Blockchain Protocols, RICHTOPIA, 2017, available at: https://richtopia.com/emerging-technologies/review-6-major-blockchain-protocols;

[36] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 288;

[37] Chohan, Usman W., The Double Spending Problem and Cryptocurrencies (January 6, 2021), available at: https://ssrn.com/abstract=3090174, p.1; see also: https://www.euromoney.com/learning/blockchain-explained/the-risks-with-public-blockchains;

[38] Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, p. 2;

Considering above, there are two main types of blockchains: public and private.[39] The distinction between public and private blockchains is of crucial importance in this paper, firstly, because in a public blockchain anyone can participate in reducing the risk of collusive and exclusionary practices, while in private blockchains the risk of anti-competitive behavior is high; and secondly, the detectability of an anti-competitive conduct may depend on the accessibility of the blockchain.

A public blockchain is "permissionless" or "open", therefore anyone is free to join the network and all participants share the same privileges.[40] That is, anyone who owns a copy of the ledger and has the means (for example, computing power) to carry out a transaction, read, write, or participate within the blockchain, may do so, as long as they follow the rules of the network, otherwise, the majority will reject the transaction proposed by them.[41] This reiterates the idea, that public blockchain is decentralized and does not have a single entity which controls the network, and that the data on a public blockchain are secure and it is not possible to modify or alter them once they have been validated on the blockchain.[42] Bitcoin and Ethereum are the examples of public blockchain.[43]

[39] Please note, that other than two main types of blockchains, there are also semi-private blockchains, and private blockchains are divided into single entity blockchains and consortium blockchains;

[40] Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, p. 2; see also: Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 290;

[41] Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, p. 2;

[42] Sharma, Toshendra Kumar, Public vs. Private Blockchain: A Comprehensive Comparison, available at: https://www.blockchain-council.org/blockchain/public-vs-private-blockchain-a-comprehensive-comparison/; see also: Buterin Vitalik, On Public and Private Blockchains, available at: https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/;

[43] Ibid;

As to the private blockchain, it is a "permissioned" blockchain, which works based on access controls which restrict the people who can participate in the network.[44] In private blockchains, there is some inbuilt method to recognize users, to make sure that they are allowed to access the network and carry out the actions such as the completion of new transactions.[45] The Private blockchains are controlled by one or more entities and this leads to reliance on third-parties to transact.[46] For example, in "single entity private blockchain" a single entity will set up the protocol, run the blockchain and give the said permissions, whereas in "consortium private blockchain", pre-selected set of nodes control the consensus process, meaning that the companies operating a node would have to agree on granting the said permissions.[47] Hyperledger Fabric of Linux Foundation are the examples of private blockchain.[48]

The following table will help to clearly visualize the differences between these types of blockchains:[49]

[44] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 290-291;

[45] Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, pp. 2-3;

[46] Sharma, Toshendra Kumar, Public Vs. Private Blockchain: A Comprehensive Comparison, available at: https://www.blockchain-council.org/blockchain/public-vs-private-blockchain-a-comprehensive-comparison/;

[47] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 290-291;

[48] Sharma, Toshendra Kumar, Public Vs. Private Blockchain: A Comprehensive Comparison, available at: https://www.blockchain-council.org/blockchain/public-vs-private-blockchain-a-comprehensive-comparison/;

[49] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 292;

Blockchain types	Public blockchain	Private (single entity) blockchain	Private (consortium) blockchain
Access	No permission required	Members only	Members only, who could be co-founders
Typical implementation	As a public blockchain application	Via a private blockchain implementation	Via a private blockchain implementation
Innovation target	New business models	Supporting existing models or launching new services	Processes within existing relationships
Blockchain governance	Public consensus	Controlled by a single owner	Equal weight to all participants
Number of users	Millions (billions?)	Dozens to few thousands	Dozens to few thousands

To summarize, the major differences between the public and private blockchains are as follows: in a public blockchain, anyone can participate by verifying and adding data to the blockchain, whereas in private blockchains, only authorized entities can participate and control the network; a public blockchain is decentralized, making the network more secure, whereas a private blockchain is more centralized, making the network prone to hacks, anti-competitive manipulations and data breaches/; In public blockchain, no one can oversee or alter transactions, whereas in a private blockchain, anyone who is overseeing the network can alter or modify transactions; in public blockchain, no one knows the identity of participants, which increases the risk of potential collusion or an attack by a group of miners which control more than 50% of the network's computing power, whereas in private blockchain, each participant is known, thus there is no chance of collision or attack.[50]

[50] Sharma, Toshendra Kumar, Public Vs. Private Blockchain: A Comprehensive Comparison, available at: https://www.blockchain-council.org/blockchain/public-vs-private-blockchain-a-comprehensive-comparison/; see also: Buterin Vitalik, On Public and Private Blockchains, available at: https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/;

5. Competition between blockchains and non-blockchain technology and applications

It has been suggested, that blockchain has the potential to be more conducive to competition, compared to the non-blockchain applications of big tech companies, such as Google, Amazon, Facebook, Uber, PayPal, SWIFT, mainly because it has a potential to eliminate the need for the trusted intermediaries and check the compliance of operations being run on the blockchain and its applications itself (which would ultimately decrease transaction costs and increase efficiency).[51] Besides, blockchain applications compete more easily with non-blockchain applications of big tech companies mentioned above, by enjoying a stronger network effect called token effect.[52] Firstly, I would like to briefly describe what are the blockchain applications, and then, explain how does the network and token effects work.

There are three types of blockchain applications: the first type, blockchain 1.0, is similar to the currency and includes currency transfer, remittance, and digital payment systems, the second, blockchain 2.0, is a contract and includes stocks, bonds, futures, loans, mortgages, titles and smart contracts, and finally, blockchain 3.0 includes all applications in the areas of government, health, science, literacy, culture, and art.[53] This clearly demonstrates, that blockchain applications have the capacity to perform any tasks that are currently being performed by non-blockchain applications mentioned above, enabling the former not only to compete with the latter, but also to establish and maintain the dominant market position by means of network effect.[54]

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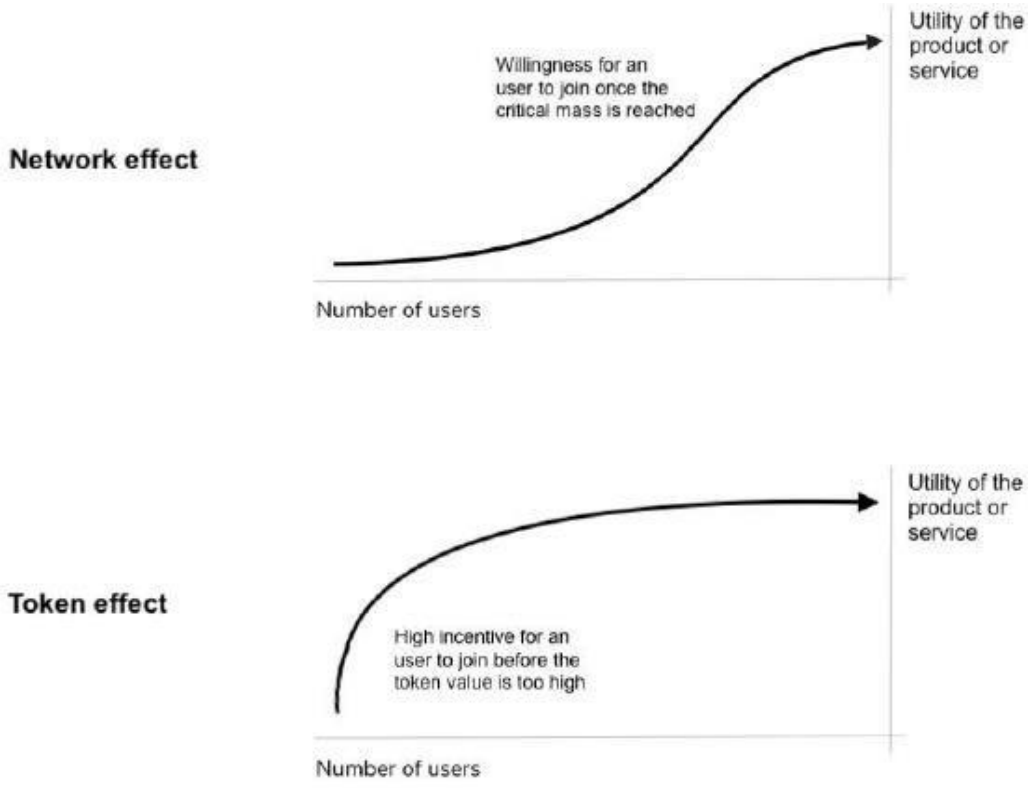
[51] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 297;

[52] Halaburda, Hanna and Gandal, Neil, Can We Predict the Winner in a Market with Network Effects? Competition in Cryptocurrency Market, 2016, available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2832836;

[53] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 295-297;

[54] Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, pp. 6-7;

The network effect is associated with world wide web and means that the more a technology (application) is used, the more the new users are encouraged to join the technology (application) and the utility of the product or service increases, in another words, the value of a network is proportional to the number of users that it connects.[55] Therefore, once a certain number of users is reached (called the critical mass point), the value derived from technology is greater than its price, similarly, if critical mass is not reached, the interest in joining the network of existing users is low and so is the utility of product or services.[56] Blockchains, however, operate differently because they are adding financial utility, when technology (application) utility is low (token effect).[57] The following figure will help me to demonstrate the comparison:[58]



[55] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 297-299;

[56] Ibid;

[57] Ibid;

[58] Ibid;

As demonstrated above, there is no link between the incentive to join the blockchain technology (application) and the utility of the product or service, thus the number of users do not determine the value of blockchain technology.[59] This means, that due to token effect, the blockchain platforms (unlike other non-blockchain platforms) do not need the middle-market companies (big tech companies) for increasing the utility of the product or service offered by them. Without using the middle-market companies, the transaction costs decline and eventually, instead of "Login with Facebook" on a website, you may one day "Connect with Bitcoin".[60] This is how, token effect diminishes the power of existing technologies (applications) and shifts the competition to the end users.

6. Possible Frictions of Blockchains with Antitrust law

In current market economies, competition between the market participants is considered as an instrument for creating the consumer welfare, and if competition is undermined by the market participants, the market ceases to function properly, and consumer welfare diminishes (for example, market price increases, market output reduces, product quality worsens, product variety worsens or innovation rate lowers).[61] Antitrust law prosecutes market participants', who use their market power, either individually or jointly, to alter the game between supply and demand on the market to their advantage, hindering the competition practices, and eventually, harming the consumer welfare. It is noteworthy, that antitrust law does not regulate the market ex ante by imposing conditions for market participants to access, remain and/or compete on the same market, it rather, operates ex post control on the participants' behaviors to impede and prevent them from exploiting their market power by

[59] Ibid;
[60] Ibid, p. 301;
[61] Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, pp. 2-3;

carrying out anticompetitive conducts (such as, anticompetitive agreements or abuses of dominance) on the market.[62]

A company is capable to harm the well-functioning of the market and negatively affect the consumer welfare only when it holds a certain amount of market power in the given market, either alone (as in the case of abuse of dominance) or together with other companies (as in the case of an anti-competitive agreement or collective abuse of dominance).[63] Therefore, the definition of relevant market is of crucial importance, as it makes it possible for the antitrust authorities, inter alia, to determine the supplier companies' market power for the assessment of dominance, namely, antitrust authorities identify if supplier companies have the power to impose any competitive constraints on their rivals (which will eventually lead to increasing the market prices or reduction of product quality).[64] For that purposes, antitrust authorities distinguish between the product market and the geographical market, the former comprising of all the items (such as products, services, technologies etc.) that are being used by customers or consumers and latter comprising of the area where the companies act under the similar conditions in comparison with the conditions of neighboring markets.[65]

Once the relevant market has been defined, antitrust authorities are able to identify the suppliers and customers/consumers active on the market and calculate their market power, considering the overall market size, market shares (the sales of the relevant products in the relevant area by each supplier) of each supplier as well as countervailing bargaining power (the power of the customer/consumer party to credibly threaten to switch to another supplier within a short time) and barriers to entry (all the factors which prevent or hinder the entrance

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[62] Ibid;

[63] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 303;

[64] http://competitionlawblog.kluwercompetitionlaw.com/category/market-definition/; see also: Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, p. 6;

[65] Ibid;

to the defined relevant market, such as sunk costs, brand loyalty of consumers, network effects (natural barriers), legal requirements or exclusive rights coming from the public authorities (legal-administrative barriers) and advertising campaigns to improve reputation, or range strategies to pre-empt rivals (strategic barriers).[66]

When it comes to Blockchain, two issues arise, namely, it is difficult to determine the dominant market positions and attribute the liability for anticompetitive practices.

6.1. Dominant Position

It is challenging to define the relevant market in terms of blockchain technology, as no material or geographical dimensions of such market exist. Besides, the services provided by the blockchain technology or on its applications are proposed on "zero-price market", meaning that costs incurred by the users to access the services do not necessarily signal the presence of market or marketplace activity (such as trade), making it difficult to apply antitrust law.[67] Although, as mentioned before, the relevant market must be properly defined to enable public authorities to sanction the practices of dominant companies. Blockchain, being a decentralized organization and not having an identity of a legal entity, raises important questions about the definition of dominant position, namely, whether non-entity is capable to hold a dominant position, or can blockchain create a monopoly without a monopolist, and if we consider the blockchain to be dominant, which users and/or entities hold that dominant position.[68]

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[66] Commission Notice on the definition of relevant market for the purposes of Community competition law, O.J. [1997] C 372/5, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31997Y1209(01)&from=DA , paras 20-53; see also: OECD, Monopsony and Buyer Power (2008) DAF/COMP(2008)38, 179, available at: https://www.oecd.org/daf/competition/44445750.pdf; see also: OECD, Glossary of industrial organisation economics and competition law, (OECD, 1993), available at: https://www.oecd.org/competition/abuse/2376087.pdf;

[67] Newman, John M., Antitrust in Zero-Price Markets: Foundations, University of Pennsylvania Law Review [Vol. 164: 149], 2015, p. 158;

[68] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 302;

The way in which the dominant position is characterized will determine the scope of liability, considering the fact, that an entity holding a dominant position (blockchain) is fully liable for the practices implemented within it.[69] Only viable solution to characterizations of dominance that could be applied to blockchains, is as follows: market power is based on the type of applications (products and services) that run on the blockchain (1.0, 2.0, or 3.0) and the market will be defined by assessing and analyzing the functioning of applications, in another words, blockchain market power would be assessed in comparison with other digital products or services as well as non-digital alternatives (exactly in the same way as online sales are integrated into the general sales market in comparison with the physical sales).[70] Characterizing a dominant position this way would make it possible to impose the sanctions on the users who offer, run, or use a dominant application that has implemented an anticompetitive practice.[71] When it comes to the geographical definition of relevant markets, it must be considered, that some applications are focused solely on a local market, while others compete globally, thus, the definition shall be made on the basis of case-by-case analysis.[72]

6.2. Abuse of Dominance

In this Chapter, I would like to discuss three types of unilateral practices: exploitation, exclusion, and discrimination and determine whether the blockchain further enables anticompetitive practices that are already recognized and whether the blockchain gives rise to new anticompetitive practices that originate from the technology.

Apparently, the number of anti-competitive practices on the public blockchains may be lower than on private blockchains, as information and transactions recorded on the public blockchains are visible by all, which on the first sight, should create a disincentive to

[69] Ibid;

[70] Ibid; see also: Maggiolino, Mariateresa and Zoboli, Laura, Antitrust Law and Blockchain(s): Preparing the Field, Edward Elgar Publishing, 2020, available at: https://ssrn.com/abstract=3570887, p. 6;

[71] Ibid, 305;

[72] Ibid;

implement anti-competitive practices, however this may be tricky as all transactions are pseudonymous and nobody knows their nature and purpose.[73] The following table will help to visualize the possible anticompetitive practices, before discussing each one of them in greater detail:[74]

UNILATERAL PRACTICES ON BLOCKCHAIN	EXCLUSIONARY ABUSES							EXPLOITATIVE ABUSES	DISCRIMINATORY ABUSES
	Refusal to deal	Tying / bundling	Predatory innovation	Predatory pricing	Margin squeeze	Exclusive dealing	Rebates / discounts		
PUBLIC BLOCKCHAIN	**Very unlikely** public blockchains run on public access, by definition	**Very unlikely** access to public blockchains cannot be submitted to conditions of buying/using another product or service, also, it would have to be implemented in the governance from start	**Unlikely** modifying the blockchain functioning is not possible without the agreement of a majority of all users	**Very unlikely** implies a new governance to be adopted to first lower the price to use the blockchain, then to raise it, which is public information	**Unlikely** public blockchain is horizontal by definition, and also, the platform layer as no financial utility which *de facto* does not encourage margin squeeze	**Unlikely** using a blockchain is costly which *de facto* creates an incentive for using only one, also, it would have to be integrated in the blockchain from start	**Unlikely** granting rebates/ discounts would greatly reduce the blockchain attractiveness as it will be visible by all	**Unlikely** access to blockchains is free and easy, switching costs are low and, as of today, blockchain do not enjoy real power on the market	**Unlikely** price discrimination will deter incentive to use the blockchain, because this is public information
PRIVATE BLOCKCHAIN	**Very likely** refusal to give access is one of the reasons why private blockchains exist	**Very likely** access to the blockchain could be subjected to conditions such as creating another account / using another blockchain	**Very likely** modifying the blockchain functioning can be made easily and effectively	**Likely** the price to use the blockchain can be easily changed anytime making it likely to see predatory pricing	**Likely** private blockchains allow numerous income-generating applications on the software layer while the platform layer also as a financial target	**Very likely** foreclosing competitors: increase the overall blockchain price for users + attractiveness	**Very likely** granting rebates could be used to incentivize some users to join and use to the blockchain	**Likely** switching costs may be high and the token effects may strengthen the power of private blockchains as a platform	**Very likely** discrimination between users is likely to be done if only as an incentive to join the blockchain or stay active on it

6.2.1. Exclusionary Practices

1. Refusal to deal. Outside of the blockchain, it is a common practice for the companies to refuse doing business with their rivals.[75] It would be difficult to do it on public blockchains, as the refusal to deal can only be made possible by modifying the access rules and deliberately or

[73] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 308-309;

[74] Ibid, p. 308;

[75] Justl, Jonathan M., Proving Refusal to Deal Liability: Three Emerging Alternatives to Aspen Skiing, 2017, available at: https://awa2018.concurrences.com/IMG/pdf/proving_refusal_to_deal_liability_1_.pdf;

exclusively preventing certain users from accessing a blockchain (in fact, this is inconsistent with the inherent nature of public blockchains, and by modifying the access rules, it would no longer constitute as a public blockchain).[76] Whereas, in private blockchain, only selected members have access to the network and certain operations, and for that reason, there are authorization schemes to identify who is entering the platform or who is creating smart contracts on the platform.[77]

The authorities governing the private blockchain, can adopt different access control mechanisms (such as the ones, where existing participants decide on the future entrants, or governing authority or consortium could issue licenses for access and participation) and engage in a refusal to deal by means of not only preventing certain users from accessing the blockchain, but also preventing them from reading the information on the blockchain and/or forbidding them from proposing new transactions.[78] The refusal to grant access is similar to granting licenses, namely, if obtaining a license to patents is deemed essential in order to compete on the market, holders of such patents are strongly encouraged to license them on fair, reasonable, and non-discriminatory (FRAND) terms to avoid any breach of antitrust law.[79] However application of the similar rules (or different rules with the same rationale) to the private blockchain, will again be inconsistent with its inherent nature, as private blockchain holders will be prohibited from setting certain access terms, other than reasonable and non-discriminatory terms.

Since 1970, the U.S. Supreme Court has addressed an alleged monopolist's duty to deal with competitors in five decisions: Otter Tail Power Co. v. United States (1973); Aspen Skiing Co.

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[76] Gwyneth Iredale, Public vs Private Blockchain: How Do They Differ?, 2021, available at: https://101blockchains.com/public-vs-private-blockchain/; see also: Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 310;

[77] Ibid;

[78] Ibid;

[79] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 310;

v. Aspen Highlands Skiing Corp. (1985); Eastman Kodak Co. v. Image Technical Services, Inc.(1992); Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP (2004); and Pacific Bell Telephone Co. v. Linkline Communications, Inc. (2009). In the first three cases the court ruled that defendant had duty to deal with competitors, whereas in the last two cases, the court held that the defendant had no duty to deal.[80] However Verizon Communications Inc. v. Law Offices of Curtis V. Trinko, LLP is considered to be a landmark case, which made it clear that the profit sacrifice test should be applied to the cases of refusal to deal in assessing the legality of the conduct, in particular, a profit-sacrifice test asks whether the alleged conduct is more profitable in the short run than any other conduct the company could have engaged in that did not have the same (or greater) exclusionary effects and if the alleged conduct is not more profitable, the firm sacrificed short-run profits and might have been investing in an exclusionary scheme, seeking to secure monopoly power and recoup the foregone profits later.[81]

However, the sole fact of proving that a company has sacrificed its profits in the short term is not sufficient to show a violation, as a company may want to temporarily waive its profits to build customer loyalty in the long term, which is not anticompetitive.[82] This could lead to the wrongful conviction of a pro-competitive practice.

In blockchain context, no-economic-sense test would be the best solution for evaluating refusals to grant blockchain access for anticompetitive motives.[83] According to this test, public authorities or judge is comparing the non-exclusionary profits from the allegedly illegal conduct to the profits the company would have earned from legal conduct, and if the non-

[80] Justl, Jonathan M., Proving Refusal to Deal Liability: Three Emerging Alternatives to Aspen Skiing, 2017, available at: https://awa2018.concurrences.com/IMG/pdf/proving_refusal_to_deal_liability_1_.pdf;

[81] U.S. Department of Justice, Competition and Monopoly: Single-Firm Conduct Under Section 2 of the Sherman Act (2008), available at: https://www.justice.gov/atr/competition-and-monopoly-single-firm-conduct-under-section-2-sherman-act-chapter-3;

[82] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 311;

[83] Ibid;

exclusionary profits are greater, the conduct would make economic sense without exclusionary effects and thus be legal, whereas if the non-exclusionary profits are less, the conduct would not make economic sense and thus be illegal.[84] This test can also be adapted to study issues that can occur on blockchain, namely, "if a trier of fact suspects that the effects created by the alleged practice, are pro- or anticompetitive, he/she must determine whether it is possible to distinguish between all the modifications made to the product, here the blockchain or the smart contract, and identify the economic justification for each."[85]

2. Predatory pricing. Predatory pricing is a method in which a seller sets a price so low that other suppliers cannot compete and are forced to exit the market, the seller will see initial losses, but eventually, it will benefit from driving competitors out of the market and raising its prices again.[86] On blockchain, pricing equals to the payment of transaction fees of the user, who is submitting a transaction to be registered into the chain, and predatory pricing would occur, if a dominant blockchain significantly reduces its transaction fee to eliminate a competing blockchain from the market and then increases the fee after the competitor exits the market.[87] Predatory pricing is highly unlikely on public blockchains, as majority of users would not be convinced to change the governance structure/protocol to facilitate the price changes, whereas, on private blockchains, it would be possible to change the governance structure/protocol anytime, without having the consent of the others, and thus, change the

[84] U.S. Department of Justice, Competition and Monopoly: Single-Firm Conduct Under Section 2 of the Sherman Act (2008), available at: https://www.justice.gov/atr/competition-and-monopoly-single-firm-conduct-under-section-2-sherman-act-chapter-3;

[85] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 312;

[86] Hutchinson, Christophe S., The Challenges of Blockchain Technology to Competition Law, Legal Issues in the Digital Age, no 1, available at: https://www.researchgate.net/publication/349256357_Potential_Legal_Challenges_for_Blockchain_Technology_in_Competition_Law, pp. 32–53;

[87] Ibid; see also: Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 316;

pricing.[88] This way, one private blockchain would be able to offer its users lower transaction fees in comparison with the other private blockchain and eliminate the competition.

3. Exclusive dealing. Exclusive dealing agreements are agreements in which one party promises to deal exclusively with another and, thus, not to deal with competitors of the other, denying such competitors the access to the goods or services and excluding them from the market.[89] Such terms may be included in the user agreement to be signed before using the blockchain.[90] It is unlikely that exclusive dealing will be imposed on a public blockchain for two reasons, firstly, because such terms would need to be integrated on the blockchain either in the start, or later, by the consensus of majority of users, and secondly, because, once a transaction is registered on a blockchain, users will not be incentivized to register the transaction on another blockchain due to the costs.[91] On the private blockchains, it would be easy to implement exclusive dealing, while the exclusion of competitors would increase the overall blockchain price for users and developers and attractiveness of blockchains by obtaining data that they alone can provide.[92]

6.2.2. Discriminatory Practices.

Discriminatory practices can be best described as one or several companies holding a dominant position of "applying dissimilar conditions to equivalent transactions with other trading

[88] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 316;

[89] Douglas, A. Melamed, Exclusive Dealing Agreements and Other Exclusionary Conduct—Are There Unifying Principles?, No. 2 Antitrust Law Journal, vol 73, (2006), available at: https://www.researchgate.net/publication/254130901_Exclusive_dealing_agreements_and_other_exclusionary_conduct_-_Are_there_unifying_principles;

[90] Hutchinson, Christophe S., The Challenges of Blockchain Technology to Competition Law, Legal Issues in the Digital Age, no 1, available at: https://www.researchgate.net/publication/349256357_Potential_Legal_Challenges_for_Blockchain_Technology_in_Competition_Law, pp. 32–53;

[91] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 317;

[92] Ibid;

parties, thereby placing them at a competitive disadvantage."[93] This was later interpreted by the European Court of Justice, by extending this notion of abuse to the converse situation of the application of similar conditions to unequal transactions.[94] There are several types of discriminatory practices, the most common of which is a price discrimination – "a term that economists use to describe the practice of selling the same product to different customers at different prices even though the cost of sales is the same to each of them. More precisely, it is selling at a price or prices such that the ratio of price to marginal costs is different in different sales."[95] Price discrimination can occur either by charging different customers different prices for the same product, or by charging only some customers the same price for different products.[96] Similar to the other cases above, price discrimination too can occur in the context of blockchain, however this is difficult to happen on the public blockchains as the transactions are visible to all the users, whereas it can easily occur on private blockchains, as the application of different terms to different users is an effective way to incentivize users to join, use and stay active on the blockchain, by offering lower prices.[97]

[93] Article 82(c) of Treaty establishing the European Community, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A12002E%2FTXT;

[94] ECJ, 17 July 1963, Italian Republic v Commission, 13-63, ECR-165 in the context of the ECSC Treaty, cited in: Geradin, Damien, Price Discrimination under EC Competition Law: The Need for a case-by-case Approach, The Global Competition Law Centre Working Papers Series, GCLC Working Paper 07/05, available at: https://www.coleurope.eu/research-paper/price-discrimination-under-ec-competition-law-need-case-case-approach

[95] Posner, Richard, Antitrust Law, Second Edition, University of Chicago Press, Chicago and London, 2001, pp. 79-80, cited in: Geradin, Damien, Price Discrimination under EC Competition Law: The Need for a caseby-case Approach, The Global Competition Law Centre Working Papers Series, GCLC Working Paper 07/05, available at: https://www.coleurope.eu/research-paper/price-discrimination-under-ec-competition-law-need-case-case-approach;

[96] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 320;

[97] Ibid;

7. Effectiveness of Antitrust Law

Anticompetitive practices that violate antitrust laws are usually detected and then stopped and sanctioned by the public authorities. However, doing so in relation to the blockchain technology is tricky, as identities of the perpetrators are anonymous, it is impossible to determine the relevant jurisdiction and remedy the anticompetitive practices due to the immutability of the blockchain.

Antitrust authorities have no ability to detect anticompetitive practices as well as the identification of users who engage in those practices, due to the privacy and pseudonymity of the users.[98] If new technologies develop, that enable tracking such practices and perpetrators by the public authorities, it would significantly affect the cornerstone "values" of the blockchain and change the nature of it. Therefore, it is highly unlikely, to implement such technologies on the blockchain. Besides, inherent nature of the blockchain creates a real barrier to antitrust enforcement authorities to remedy, delete or stop anticompetitive practices, since the network is distributed, and no one is in control, but at the same time everybody is, except for the authorities themselves.[99] Even if authorities will have a power to track the practices and determine the identities of the perpetrators, they will not be able to stop such practices. Immutability of blockchain ensures, that platform will continue to function (as long as the people who interact with it pay the transaction fees charged by miners who support the blockchain) and there is no server to shut down the blockchain, even if authorities impose strict regulation or penalties on the original parties who developed or promoted such blockchain.[100] In other words, if anticompetitive practices are implemented on

[98] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, p. 322;

[99] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 322-323;

[100] Ibid;

a blockchain and public authorities detect them, authorities will not be able to stop it and blockchain will continue to perform the transactions.

Anonymity of the parties creates another challenge as well - business transactions on the blockchain are encrypted and location of the transacting users (and thus, legal entities behind the users) is completely unknown, making it impossible to determine the relevant jurisdiction.[101] In contradiction with blockchains, determining the jurisdiction on the internet is simple and it is based on internationally recognized jurisdiction principles (territorial jurisdiction, effective jurisdiction, personal jurisdiction, passive personal jurisdiction, protective jurisdiction, and universal jurisdiction), namely, each internet user is subject to national legal regime, where they decide to create content and enable it online.[102] In technical terms, every computer or device that goes on the internet needs its own IP address and the main central authority, the Internet Corporation for Assigned Names and Numbers, manages and controls assigning and distributing such IP addresses and domain registrations in the regions and continents, making it easy to detect parties 'locations on the basis of the registrations of IP Addresses.[103] In case of blockchain, the data storage is virtually everywhere making it impossible to determine jurisdiction on the blockchain and its transactions.[104]

In traditional law, and in absence of any agreement stating otherwise, blockchain disputes would be normally settled by state courts, but in this digital economy not only it is impossible to determine the jurisdiction, but also there is no technical necessity for the stakeholders to be attached to any jurisdiction at all.[105] For that reason, self-regulation of the market participants

[101] Gürcan, Bedrettin, Jurisdiction on The Blockchain, 2020, available at: https://www.researchgate.net/publication/345176938_JURISDICTION_ON_THE_BLOCKCHAIN, pp. 16-17;
[102] Gürcan, Bedrettin, Jurisdiction on The Blockchain, 2020, available at: https://www.researchgate.net/publication/345176938_JURISDICTION_ON_THE_BLOCKCHAIN, pp. 16-17;
[103] Ibid;
[104] Breu, Stephan, Blockchains and Cybercurrencies Challenging Anti-Trust and Competition Law (December 1, 2017), available at: https://ssrn.com/abstract=3081914, p.5;
[105] Breu, Stephan, Blockchains and Cybercurrencies Challenging Anti-Trust and Competition Law (December 1, 2017), available at: https://ssrn.com/abstract=3081914, p.4;

may play an important role, one part of which could be dispute settlement by an arbitral tribunal, and other part of which could be compliance of blockchains with a potentially unwieldy number of legal and regulatory regimes and settle disputes in courts.[106] The success of the former approach solely depends on the enforcement. The states retain certain control over private arbitration with recognition and enforcement procedures, and as jurisdiction on the blockchain is not recognized by any state jurisdiction, it would be difficult to have the awards enforced.[107] The latter approach is also unclear, as the transactions may occur simultaneously in a few different places, which again makes it nearly impossible to determine the competent jurisdiction and even if jurisdiction were to be determined, state courts would not be able to decide any dispute fast enough compared to the rapidly proceeding blockchain applications without having any technological expertise to sufficiently understand the mechanism of blockchains.

8. "Law is Code" Paradigm

As demonstrated in the previous chapter, there are no effective ways to apply antitrust law to the blockchain, and almost every measure used before seems to be extreme and drastic in the context of blockchain, jeopardizing the blockchain technology and its true nature. Considering above, it appears necessary to code and integrate legal requirements into the technology itself - this is the concept of "law is code."[108]

Every digital platform is governed by software and algorithms that regulate our interactions and online communications and that are imposed by the private actors, meaning that we rely on technology as a means to directly enforce rules. Traditional legal rules stipulate what people shall or shall not do, whereas the rules imposed by technology determine what people can or

[106] Ibid;

[107] Gürcan, Bedrettin, Jurisdiction on The Blockchain, 2020, available at: https://www.researchgate.net/publication/345176938_JURISDICTION_ON_THE_BLOCKCHAIN, pp. 16-17;

[108] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 321-322;

cannot do, which eliminates the need for any third party enforcement authority to intervene after the infringement of the law, namely, instead of relying on ex-post enforcement by third parties such as courts and police, rules are enforced ex-ante, making them very difficult to be breached.[109] In addition to that, traditional legal rules are inherently flexible and ambiguous, whereas the technical rules are highly formalized and precise. The best example of code-base-rules is digital rights management (DRM) schemes, transposing the provisions of copyright law into technological measures of protection and restricting the usage of copyrighted works.[110]

All the above complies with the idea that "code is law," according to which the use of a technology is influenced by the way it is designed, however "code is law" is more descriptive than proactive, therefore it shall be supplemented with "law is code" regulatory approach.[111] Regulators should encourage blockchains to be designed in compliance with a "law is code" approach, this way, legal requirements of antitrust law will be integrated into the technology itself (regulatory infiltration), making it possible to avoid the frictions of blockchains with antitrust law.[112]

The following illustrations demonstrate how antitrust law works:

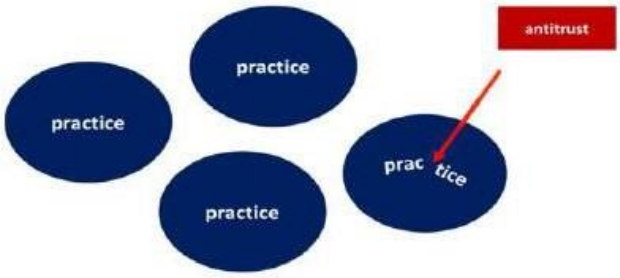
[109] Hassan, Samer and De Filippi, Primavera, The Expansion of Algorithmic Governance: From Code is Law to Law is Code, 2017, available at: https://journals.openedition.org/factsreports/4518, pp. 88-90;

[110] Rosenblatt, Bill, Trippe, William and Mooney, Stephen, Digital rights management: Business and technology. New York: M&T Books, 2002, cited in: Hassan, Samer and De Filippi, Primavera, The Expansion of Algorithmic Governance: From Code is Law to Law is Code, 2017, available at: https://journals.openedition.org/factsreports/4518, pp. 88-90;

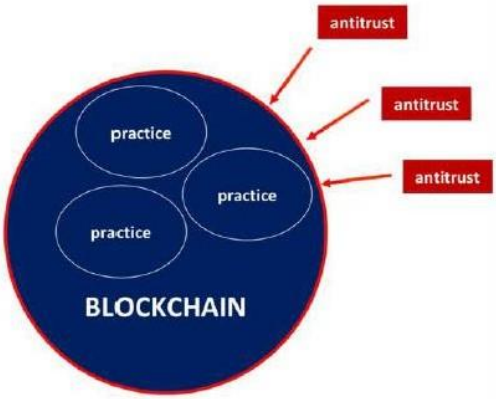
[111] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 326;

[112] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 326; see also: Hassan, Samer and De Filippi, Primavera, The Expansion of Algorithmic Governance: From Code is Law to Law is Code, 2017, available at: https://journals.openedition.org/factsreports/4518, pp. 88-90;

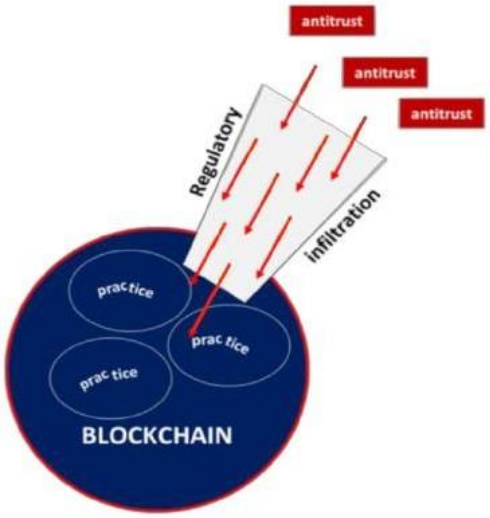
(1) outside the blockchain,



(2) on the blockchain, and



(3) on the blockchain when legal requirements are coded in it:[113]



[113] Ibid, pp. 327-328;

As per the illustrations, outside the blockchain, in case if unlawful practices occur, antitrust officials can easily investigate them and find the perpetrator, whereas on blockchain, antitrust law and its officials are ineffective since the technology is protected by its structure.[114] This is when the "law is code" comes into the picture, and by means of coding and implementing legal requirements, it prevents the users from violating antitrust in the first place, and when necessary, permits antitrust authorities to enter and sanction anticompetitive practices.[115] This way, regulators and enforcement bodies will be able to challenge the blockchain, without hindering its innovation and putting the technology at risk.

Conclusion

Due to the technical reasons, it is impossible for the antitrust regulations to catch up with the blockchain technology. As a result, regulatory infiltration is essential in the form of "law is code" and this way the antitrust regulations implemented on the technology will respect the five founding principles of the blockchains, namely, pseudonymity, distributed architecture of technology (meaning that no central point of failure exists and the harm from one person's reckless behavior is contained solely to that person), peer-to-peer transmission between the users, consensus (meaning, that creators must remain free to choose the consensus mechanism they wish to use), and data immutability. Challenges relating to the detectability of anticompetitive transactions, identity of perpetrators, and determination of relevant jurisdiction, can be resolved by means of "law is code" approach, where the software system of blockchain technology will ex-ante eliminate the existence of anti-competitive practices. As of today, it is still uncertain the way blockchain developers choose to resolve the existing challenges, however the choices made by them will have an enormous affect what values will be built into it and what users and society will gain from it.

[114] Schrepel, Thibault, Is Blockchain the Death of Antitrust Law? The Blockchain Antitrust Paradox (June 11, 2018), Georgetown Law Technology Review / 3 Geo. L. Tech. Rev. 281 (2019), available at: https://ssrn.com/abstract=3193576, pp. 326-328;
[115] Ibid;

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