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Hammurabi vs cryptocurrencies: anonymity of payments

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'If the agent is careless, and does not take a receipt for the money which he gave the merchant, he cannot consider the *undocumented money* as his own'.

The Law Code of Hammurabi (c. 1755-1750 BC)[1]

'What is needed is an electronic payment system based on *cryptographic proof* instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party'.

Satoshi Nakamoto (2008), *Bitcoin: A Peer-to-Peer Electronic Cash System*

Abstract

Anonymity of payments and privacy of the transactors had not been mentioned before the end of the 20th century, nor the anonymity was pointed out as a characteristics of money. The turnabout starts in the 1990s with the appearance of electronic money, then Bitcoin in 2008 and numerous cryptocurrencies in 2010s. Nowadays, monetary analysis place the anonymity into the most important characteristics of money, as the most decisive condition of payments' privacy. However, the research about anonymity of payments in history perspective shows that most transactions, cash or non-cash, had been documented, respectively not anonymous, Therefore, today's modern electronic payment systems in the world still rely on Hammurabi's principle of documented money and not on Nakamoto's idea about cryptographic proof.

The question arises how have all science authorities overlooked such an important characteristic of money and payments like anonymity over the centuries? How was the privacy of transactors kept despite the domination of non-anonymous documented payments? Why had anonymity always been underestimated and was linked only with everyday low value retail payments? General answer is that the anonymity of payments is not essential since the privacy of transactors was implied until 1940s. This is also the answer to the first question. Whether to trust Smith, Thornton, Jevons, Menger, Wicksell, Friedman and other researchers of money or the anonymous Satoshi Nakamoto and the promoters of data sharing and Open Banking. The author of this text had no dilemmas about the choice starting from the title itself.

Key words: *anonymity of payment, documented money, proof of payments, means of payment, cash, transaction accounts, cryptocurrencies, retail payments, data sharing, open banking.*

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Introduction

The anonymity of payments and privacy of transactors had not been mentioned in the papers about economy until the end of the 20th century, nor the anonymity had been stated as a characteristic of any form of money. Simply, the words anonymity and privacy could be hardly traced from Hammurabi to 1990s. The twist started with the introduction of electronic money for wider public and the suppression of cash from retail transactions. However, the full reversal was initiated in 2008 when an anonymous author (or authors) Satoshi Nakamoto published its world famous paper *Bitcoin: A Peer-to-Peer Electronic Cash System*. Bitcoin was practically implemented as *a decentralized payment protocol based on the cryptographic proof* and soon after a whole range of other cryptocurrencies was launched whose number keeps growing even today. In this way, the topic of anonymity of money and the privacy of payments was forcefully imposed on the economists, bankers and other experts, as well as wider public.

The issuers of cryptocurrencies from fintech sector pointed out from the start the anonymity as the key proof of the crypto money superiority against the commercial bank money. Central bankers did not worry about the usurpation of exclusive names *currency* and *coin*, since the idea of issuing digital money for public by central banks had not been even theoretically discussed until the half of the last decade. Commercial banks were passive observers because it soon showed that cryptocurrencies are speculative assets with an extremely volatile market value being used least of all for payment purposes. It looked like the anonymity of payments and its improvement in the future would preoccupy the attention of numerous issuers of competing cryptocurrencies and their investors, without any visible influence to the banking sector.

The new wave of innovations was started by the *stablecoins* projects, whose main promoters were the leading bigtech platforms with billions of members, everyday users of their services. It forced technologically inert central banks to start thinking about their own digital currency – central bank digital currency (CBDC).[2] Symbolically, the world's oldest central bank– Sveriges Riksbank – first started the research of their own *e-krona* for public.' An eruption of CBDC projects was started in June 2019 when Facebook disclosed its intention to issue its own global stablecoin. Understandably, most central banks have been focusing on retail CBDC for public' (Vuković, 2021, p. 1). In the initial phase, all of these central banks emphasized anonymity as the key feature of future CBDCs for lower value retail payments, thus announcing their response to the bigtech threats. In this way, anonymity has become the centre of the triangle cryptocurrencies-stablecoins-CBDCs and the crown argument in the competitive race between three sectors - fintech, bigtech, and banking.

Today, most monetary analyses classify anonymity into one of the most important attributes of money which decisively influences the privacy of payments. Is this an extraordinary monetary innovation or an attempt masked by cryptography from cryptocurrency issuers to take over at least a share of seigniorage and a bigger share of business payments from the privileged banking sector? The fact is that all existing electronic payment systems in the world, retail and wholesale, still reside on Hammurabi's principle of *documented money* and not on Nakamoto's idea about *cryptographic proof instead of a trusted third party*, which undoubtedly negates any special significance of anonymity for money transactions.

Anonymity has always been related to the cash in low value retail payments. 'One of the most commonly cited consequences of the disappearance of cash is the loss of anonymity in transactions. Safeguarding transaction privacy is of crucial importance for any democratic society, but this has already been sacrificed in the war on terror, crime, and tax evasion' (Vuković, 2020a, p. 4). Therefore, this cryptographic glorification of anonymity from 2008 seemed anachronous. However, colossal media promotion of cryptocurrencies set anonymity to the pedestal where it has never been. It was especially contributed by the ungrounded equalisation of (pseudo) anonymity of payments and privacy of transactors. Non-anonymity of payments is not the threat to privacy, but the *data mobility* hiding open *access* and anarchic *sharing of data*.

The importance of anonymity given by the fintech and bigtech entities was apparently hypertrophied to serve marketing purposes. Similar emphasis of anonymity in the papers of numerous researchers of digital money does not have a strongpoint in the monetary history and modern payment systems. Finally, there is no identity between anonymity of payments and privacy. The rest of this paper is going to analyse these claims and prove them.

The remainder of this paper after is structured as follows: Anonymity of payments in history perspective (Section 2), *The money that trade created* (Section 3), Anonymity of payments in the monetary theory and banking (Section 4), Cryptographic glorification of anonymity in payments (Section 5), Anonymity and privacy: is anonymity essential? (Section 6), What is the problem: non-anonymity or data sharing? (Section 7), What is the solution: anonymity or data sharing regulation? (Section 8), Perspectives of anonymity in payments (Section 9) and Conclusions (Section 10).

Anonymity of payments in history perspective

The existence of *documented money* can be seen as early as the 18th century BC in the Old Babylonian Empire. Its significance, method and extent in the ancient trading is explained by the *Law Code of Hammurabi*. This earliest legal code in the world obliged agents and merchants to issue and receive *receipt for the money* (§104 and §105). Similar obligation was determined for keeping deposits: 'If anyone gives another silver, gold, or anything else to keep, he shall show everything to some witness, draw up a contract, and then hand it over for safe keeping' (§122).[3] The anonymity of money transactions in King Hammurabi's Babylon was apparently underestimated.

From coinage discovery, the anonymity of payment was mostly the trait of bronze coins. 'Bronze gave no trouble since it was reserved for *small denominations for local use*' (Finley, p. 167). Due to its insignificant intrinsic value, there was no need for money-changers to test their weight and purity, unlike the coins from precious metals. The use of gold and silver coins during antiquity, gifting or heritage purposes was mostly documented or non-anonymous.

The appearance of deposit receivers – *trapezites* in Athens in the second half of the fifth century BC and *argentarii* in Rome in the late fourth century BC (Andreau, p. 30),[4] testifies about the early cases of documented banking transactions in antiquity. It is redundant to prove that that time's banking and nowadays' transactions with money deposits could not be anonymous although they were performed by placing cash in the form of gold and silver coins at that time. The transactions

were documented in a *banker's register of account*, which '[…] was required by law to be produced whenever a client was involved in a law-suit […]' (ibid, p. 46).

Moses Finley has confirmed authoritatively several times: 'There was endless moneylending among both Greeks and Romans, […]' (Finley, p. 141, 198). It is clear as in the case of deposits, that these *endless* loan transactions had to be evidenced in the above mentioned *banker's register of account*.[5] Such practice was in accordance to the Roman legal system, which did not recognise anonymous deposits and loans.

The same non-anonymity could be seen in the payments for estates and other properties of all shapes and sizes. "Or to take a historical case, how, mechanically speaking, did Cicero pay the three and a half million sesterces he laid out for his famous house on the Palatine, at a time when Rome had practically no gold coinage? […] That would have meant packing and carrying some three and half tons of coins through the streets of Rome. […] Without much doubt, these were at least for the most party documentary transactions' (Harris, p. 175-176).[6]

Most of other high value payments– at auction sales, for tax[7], transport, insurance, manufacture, wholesale, housing, and similarly, was not anonymous as well, because it needed to have a *proof of payment*. Expectedly, all payments of public authorities for the army, public events and public buildings were also documented.

The biggest rise in the anonymity of payment started after the fall of Rome, in the late fifth century and lasted all the way to the tenth century. It was Early Middle Ages or Dark Ages, marked by the dramatic decline of all economic activities, especially trade and coinage. In Western Europe the hardest was in Britain: 'Not for 200 years, until the seventh century, were coins again used in Britain as money, […]' (Spufford, p. 9). Hard shortage of money struck all other parts of former Western Roman Empire, except the areas that were governed by Byzantium, such as Sicily. 'What sort of an economy was it with only a diminishing gold coinage and neither silver nor copper? With the disappearance of urban life and the shrinking of trade, the role left for the gold coinage was becoming non-commercial' (ibid, p. 14).

However, the disappearance of money could not stop the trade completely even in long distances. 'There is considerable evidence that in the 'Dark Ages' goods were exchanged over quite long distance without the intermediary use of money at all' (ibid, p. 17).[8] Compared to the barbarians, Byzantium continued to use coins in everyday transactions and follow the Roman tradition of *proof of payment* for higher value payments. China also did not interrupt everyday usage of coins of all kinds, metal and non-metal, nor the practice of documented money in trade transactions.

The rise of coins in circulation 'when the flood of new silver became available in the late twelfth century Europe' (ibid, p. 243) could not facilitate large transactions, which were carried out in paper and settled in bar silver (ibid, p. 235). It was the start of a unique *commercial revolution*, based on clearing and settlement methods in transactions and documented payments. These non-anonymous payment methods were promoted and developed on the well-known medieval fairs, before all in Champagne, Lyon, Piacenza, Besancon, and Medina del Campo. A significant

contribution to clearing and settlement methods was given by the constant colonies of north Italian merchants on the East Mediterranean, whose settlement started in the twelfth century.[9]

The major support of this commercial revolution were moneychangers, starting to perform receiving of deposits in coins and bars and document them in their ledgers on the accounts of their depositors. It allowed them to transfer funds from one account to the other according to their clients' orders. There was a *notarial register* in Genoa in which it registered the *transfer between accounts in different banks in the city*[10] from 1190 to 1192. The same practice was gradually accepted by their fellow colleagues and major competitors in Venice. 'Before the third decade of the fourteenth century the Venetian moneychangers had developed into recognized keepers of deposits, while a little later they were settling the debts of their customers by book transfers of credit' (Richards, p. 1). All transactions documented in books of moneychangers were not just an official record, but a *legal proof*.[11]

By founding three public banks in Europe in the late 16th century and early 17th century – Venice's Banco di Rialto (1587), Bank of Amsterdam (1609) and Bank of Hamburg (1610) - a real *payments revolution*[12] started. Monetary chaos throughout Europe was thus contained, unit of account stabilised, while the deposit money or *bank money* (deposits in public banks) made large payments simpler and safer.[13] Payments with bank money[14] through public banks as trusted intermediaries, by their nature were non-anonymous.

By the end of 17th century and throughout 18th century, Britain took over in the payments innovation. 'The increased use of cheques is a striking feature of London private banking in the latter half of the eighteenth century' (Richards, p. 192). The evolution of interbank payments gave birth to The London Bankers Clearing House in the 1770s, which allowed private bankers to finalize clearing and setting between depositors by corresponding mutual transactions.[15] For settlements after interbank clearing Bank of England notes were exclusively used, which were replaced by Bank's cheques in 1854 (Vuković, 2020b, p. 6). Assuredly, all of these transactions were multiply documented, which removed the last cloaks of anonymity about large payments in London, predominant world financial centre. The example of London was followed by the largest cities in the UK, US and other states.

The country clearing was instituted in November 1858 '[...]which more than all else has brought about the almost universal use of checks in England, to the exclusion of notes and coins' (Holland, p. 280). This was a blow to the anonymity of retail transactions, but nobody thought in those days that the use of checks jeopardized someone's privacy.

The tendency of dropping the share of coins and banknotes, as the means for anonymous retail payments was evident throughout the world until the end of the 20th century. The appearance of electronic/digital money in the world networked by the Internet resulted in the loss of any remaining anonymity of payments and revealing personal privacy of the individuals.

Due to the clarity of this short review of anonymity of payments in history perspective, only the fundamental influence of trade to the evolution of money was pointed out as well as the development of payment methods and the anonymity of transactions and transactors. The next section of this paper is dedicated to the influence of trade.

The money that trade created

The title of this section is the paraphrase of the book title *The world that trade created*, by the authors Kenneth Pomeranz and Steven Topik. Trade has even more formed money (metal, deposit, paper and electronic/digital) and methods of payments (without intermediators or anonymous transactions and with intermediators or non-anonymous transactions), but the appreciation of its influence mostly remained '[…] among the trading world' (Thornton, p. 94).[16]

Money was before all invented for the purposes of trade, which is shown and proved by the Code of Hammurabi. From the early beginning in the ancient Babylon, the merchants and agents had to issue and receive the *receipt for money*, because *undocumented money* did not represent the proof of payments, nor they could regard it as their own.

The invention of metal coins in the seventh century BC undoubtedly had to increase the need of merchants and other transactors for the *proof of payments* in high value transactions. However, there was an intrinsic problem - coins had never been favourable for high value transactions, no matter the denomination, the content of precious metals or their condition. Even in rare cases when they were of appropriate quality and quantity for high value payments, a difficult problem was their physical transport, security quality checking and counting. These problems were not the subject of *the observation of public* and many researchers.

Finley stated about *the autonomous Greek state* that they had '[…] the persistent failure to provide coins of sufficiently large denomination to be adequate for large payments' (Finley, p. 167). However, those coins could not be secured by any other state ever, even when they were coined from almost pure gold. The sufficient proof was the already mentioned Cicero's house on the Palatine, for which he would have to pay about 300 kg of coins in gold. It was obvious that no *coins in large denomination* could have never solved the problem of *large payments*. Merchants first realised that the largest denomination were not *adequate* for their wholesale payments. Some pieces of suitable gold coins had to weigh about 200-300 grams, which again would not diminish the problem of transferring hundreds of kilograms of coins and gold bars.

The *trapezites* in Athens and other policies and *argentarii* in Roman Empire significantly alleviated these problems by changing the money, checking the weight and the content of coins, accepting deposits in coins and bars and leading the register of account. Without their engagement, it would be unthinkable to imagine *endless money lending among both Greeks and Romans*. For the purposes of high value payments in ancient times, the techniques of payments and methods of their documentation were perfected.

The above mentioned facts cannot diminish the civilizational and economic influence of coins and coinage from the seventh century BC. The perception of money for every individual was related to the coins for over two and a half millennia; their intrinsic value, denomination and credibility of users. The Barbarians took over a millennium to grasp unique functions of Greek and Roman coins as the means of payment and unit of account (*numeraire*). Until the 19th century, only fulfilled coins were regarded as money, while all other means of payment were classified into representative money - tokens, banknotes, and money of account (Jevons, pp. 194-205). Coinage or coining is even today a royal attribute, or a sovereign prerogative, testified by the government's mints as live monetary fossils. Finally, the expansion of trade from early antique, especially retail in urban areas would be unthinkable without coins.

At the beginning of the 11th century there was a fascinating innovation in China: 'By 1024 – centuries before anything comparable in the West – we find Chinese governments printing recognizable paper money. [...] Paper money was ideal for large-scale domestic trade, and made considerable headway against coins of all sorts' (Pomeranz and Topik, p. 15). Unfortunately, this paper money in large denominations, created for the purposes of trade was not suitable for wholesale payments. One of the essential lacks was the anonymity of payment and they needed to be specially documented.

The practice of payment with *transfer between accounts in books of different moneychangers,* first in Genoa in the late 12th century, and then in Venice, extremely facilitated the performance of large transactions, especially the trading ones. Clearing and settlement between the traders at medieval fairs contributed to the perfection of this non-cash payments practice. The pervasion of the acquired knowledge was unstoppable, because the merchants and moneychangers on these fairs also originated from Genoa and Venice, as well as other North-Italian and West European cities, mostly Flanders. The reduction of cash payments and consequently the reduction of quantitative and qualitative limitations forced by coins strongly encouraged wholesale in Medieval Europe.

Despite the influence of North-Italian merchant colonies at the East Mediterranean and the Black Sea, wholesale payments in cash remained important in trading with the Byzantine Empire, the Muslim world, and, indirectly, the Far East. Constant and enormous deficit in this international trade was covered by the proportional outflow of coins and bars, mostly silver. This made trading transactions hard in that time's Europe and led to the bankruptcy of many private bankers. Most bankruptcies occurred in Venice, the trading centre between Medieval Europe and the Orient, with the highest outflow of silver and gold coins. In search for the solution of this escalating problem during the 15th and 16th century, Venice Banco di Rialto was founded in public ownership.

Banco di Rialto showed that the deposit money is the solution for the problem of coins in large payments. Bank of Amsterdam improved this solution and provided security by payments with the bill of exchange throughout Europe almost until the end of 18th century.[17] Without these perfect methods of wholesale payments, the rise of European and global trade in the 17th and 18th century would be significantly slower.

It is intriguing that the *payments revolution* started in the period of *torrent of silver* from the New World. The abundance of silver was accompanied by the unseen chaos until then with enormous quantity of mints, unpredictable fluctuations in myriads of units of account, growing prices and official and unofficial devaluation of coins.[18] This chaos was contained by the public banks with their own solutions for safer and more efficient wholesale payments and directed the evolution of all forms of money and payment methods to non-cash transactions with deposit money, finalized in mutual clearing and interbank settlement.

Adam Smith was one of the researchers who clearly made distinction between wholesale and retail transactions as '*two different branches of the circulation'*, each with their own unique characteristics (Smith, p. 306).[19] He was one of the first to notice *intrinsic superiority of bank money to currency*, as well as its other advantages for high value payments. "It is secure from fire, robbery, and other accidents; the city of Amsterdam is bound for it; it can be paid away by a simple transfer, without the trouble of counting, or the risk of transporting it from one place to another' (Smith, p. 447-8). In this way, the trade continued to free itself from the burden of intrinsic value of coins during the 17th and 18th century and reached the volume of total turnover incomparably higher than the value of precious metals in all forms, monetary and non-monetary.

Most of the deficiencies that made coins almost unusable for wholesale and large payments in general, banknotes could not solve. Paradoxically, banknotes were devised exclusively for trade and wholesale payments, which was testified by their extreme denominations. 'By 1745 notes were being printed in denominations ranging from £20 to £1,000.[20] […] notes for £5 in 1793 and notes for £1 and £2 in 1797' (BoE, 1969, p. 216). The fate of these banknotes was the same as in China centuries earlier, with the difference that London traders had deposit money as the alternative and not coins and bars.

The private bankers in London, who are the chief holders of Bank of England notes (Thornton, p. 222), used them primarily for setting their clearing transactions. It was the biggest contribution to of banknotes to the trading and other large payments in the monetary turbulent period in the 18th and the first half of the 19th century. After Bank Charter Act 1844, there was a continuous drop of using banknotes even in retail transactions (Clapham, p. 270).[21] The issue of banknotes with large denomination ceased by 1943 (BoE, 1969, p. 222).

This short account of the evolution of banknotes issued by the Bank of England, as well as other central banks around the world, can lead to the conclusion '[…] that banknotes are inferior to other forms of money as the means of payment. The truth is in fact quite the opposite: banknotes are the perfect form of money, but their use is severely curtailed by one characteristic: they are not suitable for wholesale payments' (Vuković, 2020b, p. 15).

The innovations in payments using deposit money during the 19th and 20th century were primarily introduced for the purposes of wholesale transactions. However, despite the domination of these kinds of payments[22] their influence on the evolution of money and methods of payments, they do

not attract the attention of numerous researchers. The example of this is the talk about the possibility of introducing wholesale CBDC, lead in the second half of the last decade.[23] It took several years to come to the conclusion that central bank money in digital form already exists and that it functions as central bank reserves.[24]

Anonymity of payments in the monetary theory and banking

Bearing in mind the *payments revolution* started at the beginning of the 17th century, it is necessary to consider the anonymity of payments in the monetary theory and banking of this period by reviewing relevant papers from the most influential researchers of money and methods of payments.

Richard Cantillon, one of the best experts about money before Adam Smith, thoroughly analysed the circulation of money, banks and their credit and many other monetary phenomena. He especially investigated advantages and disadvantages of metal money, but without a single reference to the anonymity.[25]

David Hume was a metallist, sincerely attached to metal money, sceptical about '*institutions of banks, funds, and paper credit*', whose philosophical and economic works did not mention the trivial anonymity of his favoured means of payment.[26] His countryman, Adam Smith, was less sceptical when he performed a comparative analysis of public bank money to coins and systemised the advantages of paying with transfers between deposits (see the quotation from the previous section). Thereby, Smith did not make any remarks that could relate to the (non)anonymity of money.

Henry Thornton knew best that the dominant way of payment is performed '[…] Merely by the transfer of the debts of one merchant to another, in the books of the banker […]'.[27] David Ricardo, his contemporary and colleague from the beginning of the 19th century also testified that '[…] payments were made by checks on bankers; […] and that to the amount of millions daily […]'.[28] However, neither of them mentioned the problem of anonymity or similar consequences of paying *by the transfer in the books of the banker*, nor the advantages of anonymity in payments with coins and banknotes.

The leaders of the rivalled Currency School and Banking School, Loyd and Torrens on one side and Took and Fullarton on the other, were focused on money creation with rules (currency principle) or discretion and flexibility (banking principle). At the peak of the argument, in 1840s, each side put their arguments and counter-arguments, but (non)anonymity was out of their point of attention.

Carl Menger's research 'means of payment', primarily coins and other 'variety of money' from 1870s, presented in his work *The Theory of Money* does not contain the word *anonymity* nor *privacy* whether as a money feature or the process of payment (Menger). Extensive research by Stanley Jevons from the same period - *Money and the Mechanism of Exchange*, does not contain

these two words as well (Jevons). There are also no associated words, such as data secrecy or (un)traceability. John Stuart Mill in his well-known work *Principles of Political Economy*, reflects on the functions of money like most of the researchers, and as *the requisites for a perfect money* he leads Jevons' seven *properties*,[29] where none of them can be related to the anonymity and privacy.

Knut Wicksell, one of the pioneers of modern monetary analysis, investigated in detail small payments, banknotes, coins of small denomination, and the practical organization of currency, but he did not deal with the difference between anonymity and non-anonymity (Wicksell, 1935). Alfred Marshall, the prof, considered that '*the terms "money" and "currency"* consist of *all coined moneys and notes printed on paper, and issued by Government, other competent authority or banks*'. [30] However, he and his contemporary Wicksell did not allege that the money transactions defined in this way are anonymous.

Irving Fisher, tireless pioneer of monetary economics, in the first part of his most famous book *The Purchasing Power of Money*, observed *various circulating media* (money and bank deposits). He specified their *qualities*,[31] but not the anonymity.

At the beginning of his comprehensive work *A Treatise on Money*, John Maynard Keynes performs *the classification of money* and investigates *the forms of money* by specially analysing *predominantly Bank-Money* (*Demand-deposits* and *Time-deposits*).[32] Outward features of money, where (non)anonymity could belong to were obviously irrelevant for macroeconomic approach to the means of payment. At the same time, Joseph Schumpeter was writing his *Treatise on Money*, which finally got its shape and got published after his death. He was also focused on the *difference between bank money (checking deposits, time deposits, savings deposits) and coins or banknotes* without mentioning (non)anonymity of payments.[33] This money trait cannot be found in his life's work *History of Economic Analysis*,[34] from Plato and Aristotle to Keynes.

Influential after-war works about money; foundational *A Monetary History of the United States 1867-1960* by Milton Friedman and Anna Schwartz,[35] subversive *Denationalisation of Money* by Friedrich Hayek,[36] concise *Financial Intermediaries* by James Tobin,[37] and competitive *A Market Theory of Money* by John Hicks,[38] do not contain the traces about the anonymity of payment and the privacy of transactors.

Well-known books and textbooks about the theoretical and practical banking, as well as all previously mentioned papers about monetary theory do not contain the term 'anonymity of payment' - *The History, Principles, and Practice of Banking* (1882) by James Gilbart, one of the most renowned bankers during the 19th century and the promoter of Banking School, *The Theory and History of Banking* (1891) by Charles Dunbar, which was recommended for reading by Schumpeter or *Practical Banking Operation* (1921) by Loyd Langston.[39] Simultaneously, relevant publications of the National Monetary Commission (1908-1912)[40] about features of money and payments do not mention (non)anonymity.

The best-selling banking textbooks from the beginning of this millennium carefully consider modern payments and payment systems (wholesale and retail) – *The Economics of Money, Banking, and Financial Markets* (2004) by Frederic Mishkin,[41] *Commercial Banking* (2004) by Benton Gup and James Kolari,[42] *Bank Management & Financial Services* (2005) by Peter Rose and Sylvia Hudgins,[43] and Modern Banking (2005) by Shelagh Heffernan.[44] Similar to the older textbooks, they do not contain the word (non)anonymity or a synonym for this word.

Rediscovering of money and its features started with the forced invention of digital central bank money for public - CBDC. Private issuers of cryptocurrencies, compared to central banks, do not have obligatory features and they do not have to wait for official approval. They launched anonymity as the most important feature of crypto money and illusory proof of its competitive supremacy at currency markets. In this way, it was forced to all central banks as a foundational feature. Neither of the central banks that went into the research process or implementation of its CBDC missed to emphasize the anonymity as one of the most important features of their design.

Sveriges Riksbank was one of the first central banks to start researching and testing its digital currency for public *e-krona*, including some possible anonymous payments. In the second Report on e-krona project *anonymous payments* were presented among *seven possible properties*, but only for transactions with a value-based e-krona below EUR 250 (equivalently), while traceability was excluded only for small amount of money at prepaid cards (October 2018, p. 17).[45]

Central Bank of the Bahamas were the first to launch the Digital Bahamaian Dollar in circulation, non-anonymous, but with a user confidentiality protection by strict regulatory standards (Project *Sand Dollar*, December 2019, p. 10).[46]

Similar approach to the *privacy protection* has the Bank of Japan. 'Anonymity is one of the features of cash. This would be an important point to deal with if the Bank were to issue CBDC. In order for CBDC to be widely used as a payment instrument, unwavering design and operation are required for privacy protection' (Bank of Japan, October 2020, p. 14).

European Central Bank dispersed its approach to *user's privacy* protection in seven possible scenarios. "User's privacy can be protected to various degrees, depending on the preferred balance between individual rights and public interest. […] a digital euro should be easy for vulnerable groups to use, free of charge for basic use by payers and should protect privacy' (ECB, October 2020, p. 27, 48).

Anonymity and privacy were left out only in the common *Report no 1* Group of seven central banks and BIS – *CBDCs: foundational principles and core features* (October 2020), although besides *Core features* it has *Instrument features*, *System features* and *Institutional features* (ibid, p. 10-11). Only in the *Report no 2 - CBDCs: system design and interoperability* (September 2021), among **motivations** of central banks, on the penultimate sixth place is the amorphous formulation about *supporting privacy* (ibid, p. 5). Simultaneously, in the *Report no 3 – CBDCs: User needs*

and adoption (September 2021), all six CBDC features were presented, *privacy* among them, from end-user consultations and research of the selected central banks (ibid, p. 6).[47]

Bank of England specially considers *Data and privacy protection for new forms of sterling digital money*. 'Privacy and data protection issues are design and operational aspects for new forms of digital money. This is because of the flows of information they involve' (Bank of England, June 2021, p. 30).

The design of e-CNY, Chinese version of CBDC, is mainly founded on seven features, where anonymity (managed anonymity) was classified in fifth place (PBOC, July 2021, p. 7).[48]

In the Study for the European Parliament, at the beginning of 2022, privacy was emphasized as *a feature of money* which *gives money part of its value* (Brunnermeier and Landau).[49] At the same time, the IMF's researcher ranked anonymity on the third place between five *Design features of CBDC projects* of the six central banks (Soderberg, p. 15).

Board of the Fed stated protection of privacy as the first condition of a potential CBDC in future: 'CBDC, if one were created, would best serve the needs of the United States by being privacy-protected, intermediated, widely transferable, and identity-verified' (Federal Reserve System, January 2022, p. 13).

Australian CBDC pilot focuses on two privacy models: a *fully-private* option and a *semi-private* option (September 2022).[50] In *Staff Analytical Note* from Bank of Canada eight criterions are stated for retail CBDC (Darbha, October 2022, p. 16).[51] Here privacy is in the first place.

This short review of the chosen central banks and their opinion about anonymity and privacy of low value payments using CBDC reflect the opinion of most of the central banks around the world. Simultaneously, it clearly shows the reaction of monetary authorities on the threats of new issuers of stablecoins and cryptocurrencies from bigtech and fintech sectors. Unlike central banks, commercial banks are not so worried about the anonymity or privacy. In the segment of small transactions, cash is still competitive and commercial banks are still the most dominant providers of payment services and unavoidable intermediaries between non-banking providers on one hand and clearing houses and central banks on the other.

Cryptographic glorification of anonymity in payments

Anonymity as the most important feature of money and payments was discovered by the issuers of cryptocurrencies. The remaining features were less important for supporting marketing promotion of their crypto-money. This is the reason why they did not call it, for example, investment-currency (which would be closest to the truth) or decentralized-currency (which would also be closer to the truth). Simply, nothing could be more effective than the prefix crypto and the promises of anonymous payments.

The expansion of cryptocurrencies from Bitcoin appearance until today has been founded on the aggressive pointing out of anonymity. It is hard to imagine that this whole industry would appear and survive without the attribute of anonymity. 'The modern financial world has seen a significant rise in the use of cryptocurrencies in recent years, partly due to the convincing lure of anonymity promised by these schemes' (Amarasinghe et al, p. 1).

Market penetration of new issuers was not bothered by the fact that the initial Nakamoto's idea was fundamentally changed in the process of implementation. The third side was not eliminated (*miners*),[52] anonymity was reduced to *pseudo anonymity*,[53] Bitcoin did not become the means of payment, but extremely *speculative investment*, while cryptographic proof did not replace trust outside crypto networks. Despite everything, these independent issuers enjoyed full freedom of issuing "their" currencies with some unknown coverage. They were abolished from the regulations about innovations with a vague outcome and unrestrained Hayekian currency competition.[54]

The glorification of anonymity of payments was not only in the function of market penetration and higher volume of sold cryptocurrencies, but in its setting as the indispensable precondition of the competitiveness of every new cryptocurrency. 'Therefore, anonymity is going to be a requirement for any crypto currency in the future that tries to replace existing systems' (Maurer, p. 2145). By expanding this imperative, anonymity becomes the prerequisite for the efficiency of currency systems including the traditional centralized systems. 'The absence of an acceptable level of anonymity and privacy could hinder the effectiveness of any currency scheme. Many traditional currency schemes are centralized systems where customers depend on another party to preserve the privacy of related information' (Amarasinghe et al, p. 2). The foundation of these conclusions was considered in the next sections.

The prefix crypto remained the trademark of the whole industry until today and the anonymity of transactions became one of the key attributes for attracting new holders. This is confirmed only by some rare surveys: *anonymity properties of cryptocurrencies* are between *the most important reasons* for their buying, according to the relevant Survey of the Federal Reserve Bank of New York from May 2018 (Hundtoft et al).[55]

Odes to the cryptocurrencies and their anonymity of payments came from some of the leading international organisations during the 2010s. 'Ten years after an ingenious experiment to create a cryptocurrency that allows secure and anonymous digital transactions to take place without the involvement of central banks or commercial banks, cryptocurrencies have become a multibillion-dollar industry' (World Bank Group, 2018). With all dissociations about their *serious limitations*, these compliments additionally contributed to the popularity of decentralised anonymous transactions. Thus, anonymity became widely accepted as one of the most important features of money and payments, although it was not mentioned until the 1990s in monetary theory and banking.

Anonymity and privacy: is anonymity essential?

Fundamental question is whether the privacy of transactors is possible without the anonymity of payments? The history of money and payments, presented in the previous sections gives an indisputable answer: YES! Explosive growth of cryptocurrencies negates slightly forgotten historical facts; that is the reason why there are additional explanations of the relationship between privacy and anonymity of payments.

The confusion is undeniably the first word in considerations of anonymity and privacy, as well as their interdependency. Is the anonymity of payments the condition of privacy, as the issuers of cryptocurrencies claim or is it the other way round as some researchers claim? 'Untraceability (or anonymity) makes it difficult to identify to users that are involved in a transaction. Full untraceability is hard to achieve without privacy which entails hiding the existence and details of a transaction' (Hull and Sattath, p. 13). Therefore, privacy is a complete anonymity? The problem is additionally complicated by the simultaneous use of terms of anonymity and privacy for transactions and transactors. In theory, anonymity is the *feature* of transactions, and privacy is the *right* of transactors. In practice, it is reversed – the anonymity of transactors and privacy of transactions.

It is a widespread opinion that privacy can be secured by anonymity of transactions for all people and entities, including the other participant in the transaction and the provider of payments! 'The demand for privacy is an important flip side to the story – […] it becomes more and more tempting to forestall the problem entirely by making it impossible for the transactors to find each other after the deal goes through – that is, by *instituting anonymity in the transaction* […] The third source of demand for privacy is for protection from the payments providers' (Kahn, p. 338-9).[56]

The instituting anonymity in every documented / recorded transaction would be hardly doable even with some comprehensive standardisation of transactions. The same stands for the protection from the payment providers. The substitute for such unachievable anonymity already exists – the responsibility of other participant in the transaction and the provider of payments: 'Simply that the information in my payments records not be exploited to my detriment' (ibid). If this responsibility is legally sanctioned, as most authorities do, third persons and entities should not have an unauthorized access to the transaction data. It is shown in these cases that the anonymity of payments is not the condition for the transactors's privacy.

It is certain that every emphasis on anonymity of payments implies the existence of *anonymous data*, where the identity has been removed. Personal data are contrary to this. 'Personal data, or personal information, means any information about an individual from which that person can be identified'.[57] Ensuring the anonymity of data in today's hyper-networked world is only doable as the full untraceability.

Therefore, it is understandable why the widespread opinion is that only cash payments provide privacy. 'Privacy in payments is a feature inherent to the use of cash, but transactional usage of

cash is in decline. […] One remedy to the current trend in declining privacy in payments would be the widespread adoption of a digital cash substitute that offers users a similar level of privacy in payments as physical cash' (Garratt and Oordt, pp, 2, 32). The root of this prejudice is that all cash transactions are undocumented. On the contrary, numerous cash payments in the past, and even today, are officially or unofficially documented, which means they are not anonymous. Some documents about these payments were given to the third persons meaning that the transactors lost their privacy in a certain manner. Documented cash payments that remained recorded with the other contracting party and payment provider kept the privacy of the transactors. All examples lead to the conclusion that not all cash payments were anonymous.

For the illustration purposes, once you could buy a car for cash (formally possible even today, because there is no legal limit about the quantity of cash you can own with the obligation of the seller to inform AML/CFT authorities, introduced in the1990s), but it was unthinkable not to get a receipt as a proof of payments or the ownership proof. It means that every such similar cash transaction was documented or non-anonymous.

Today most of the individual transactors do not think about their privacy and do not think that *anonymity essential*. In the *Study on New Digital Payment Methods*, commissioned by the European Central Bank, privacy was classified among *Desirable features* (Kantar, p. 6). Perceptions about financial privacy are not surprising. 'It is worth noting that many participants among the general public and the tech-savvy reported not thinking about privacy when making payments: there is a general assumption that much of their purchasing is tracked. Many, particularly the tech-savvy, felt it impossible to have a private digital transaction' (ibid, p. 29). Indicatively, compared to the privacy, relatively low number of people support the anonymity of payments. 'Notwithstanding the attention to privacy, both citizen and professional respondents support the requirements to avoid illicit activities, and only less than one in ten citizens are in favour of anonymity' (ECB, 2021, p. 3).

The authors of this Study missed the explanation of *not taking care about privacy* during the transactions. The explanation is supported by another survey, made in August 2019 in the Netherlands, land with a traditional retail payments market. 'It is noteworthy that a high share of respondents indicated they would certainly not agree to date usage by a company other than their own bank. These shares range between 81% and 89%' (Bijlsma et al, 2020, p. 10). It is apparent that most transactors believe that their bank respects the privacy of their clients and that they do not have to think about this. It is evident that trust remains the most important word in banking and defines a bank (*"bank is trust"*).

It looks like this trust to some extent contributed to the famous paradox of privacy. 'The apparent dichotomy between privacy concerns and actual privacy behaviors […] a phenomenon that while people claim to be very concerned about their privacy, they nevertheless under take very little to protect their personal data that contains privacy information' (Uno et al, p. 8). However, the suggestion is incorrect '[…] that people's concern for protecting their privacy is not innate, but

rather a developed preference that is gradually formed through the use of digital services' (ibid, p. 9). People have a certain preference for privacy from the ancient times, although not especially expressed, but rather implied. Digital services, packed with the promises of anonymity, dramatically weakened the sense of people for their privacy in the last thirty years. Nevertheless, digital technology is not the main reason why transactors are threatened by the loss of their privacy, but the owners of technology– payment providers, bigtech and fintech entities and other financial institutions – which do not care about the damage they cause to the users of their services.

All previous considerations confirmed, over and over, that privacy is the matter, and not anonymity. Compared to the practically utopian and legally forbidden *full untraceability*, the real option is *a strong privacy posture*, for individuals, and companies and institutions as well. 'Privacy refers to how many details the system entities know about user transactions. It also covers how much one institution knows about the data of other institutions. A strong privacy posture means that user data are visible only to the user and as few institutions as required' (Darbha, p. 9).

At the end of this section, it is necessary to emphasize that crypto-issuers appoint the attribute of anonymity to all transactions with their currencies. Compared to them, central banks tie anonymity only to the everyday transactions of low value. These kinds of transactions make a small share of the total retail payments of individuals, but they may contribute to the protection of minimal privacy. Beside this, retail CBDC with the possibility of low value payments off-line and on-line, without bank accounts, are the most important for billions of unbanked people all over the world (Vuković, 2021). This billions population, consisted of the most vulnerable groups in all countries, care for the anonymity of their low value transactions and the accessibility and simplicity of using cash-like digital means for off-line and on-line payments.

For retail transactions of medium and high value, as well as for all other wholesale payments, privacy of transactors and the proof of payments are important. The responsibility for these two attributes is primarily the obligation of payment providers, but other transactors (payee or payer) should not jeopardize or misuse them.

It is undeniable that non-anonymity of transactions in the existing regulatory system is not the threat to the privacy of transactors and the question arises what the problem is. What keeps collapsing the privacy of transactors by revealing their transaction and financial data to the third persons? The answer is obvious: uncontrollable and unauthorized sale of all personal data under the misleading name of *data sharing*.

What is the problem: non-anonymity or data sharing?

Argumentative abolition of non-anonymous transactions from responsibility for privacy breaching of transactors indicates that these problems are caused and multiplied by data sharing. Twenty years ago, similar activities were called *credit information sharing* between credit bureaus and commercial banks on the basis of reciprocity (Jappelli and Pagano, 2005). By the volume of sharing and influence on debtors' privacy these activities are harmless compared to data sharing,

although they have a long tradition of 120 years (Hunt, 2005). On the other hand, explosive growth of banking business in the US and the rest of the world, from consumer credits to credit cards, would be unthinkable without *credit information sharing*. Some possible harmful consequences were prevented by the appropriate regulations and monitoring. 'Credit information provision finds an obvious limit in the set of legal provisions designed to protect confidential information, or individual privacy' (Jappelli and Pagano, p. 23). Therefore, *credit information sharing* is not a threat to the privacy of individuals as well as it was not a threat in the past.

Most institutions, policymakers and analysts use the term data sharing without any explanations of the meaning by misusing the Latin sentence „*nomen est omen*". *Data sharing* is not what is normally considered, so it is necessary to determine its real meaning.

The most thorough definition of data sharing so far was given by BIS Representative Office for the Americas in own Report on API standards for data-sharing, from October 2022. 'This report defines data-sharing as the provision of data by a data holder to a third party with the consent of the data owner. Data-sharing also includes the reuse of data based on commercial and non-commercial data-sharing agreements. Data-sharing incorporates a collection of practices, technologies, architecture, cultural elements and legal frameworks that relate to digital transactions of any kind of information sent between individuals or organisations' (BIS, 2022). Key words of this definition are *the consent of the data owner*, which is a prerequisite for data sharing. However, data sharing is exponentially growing, mostly without anyone's consent or with some cookies, without any regulation or monitoring in the endless cyber space. Nevertheless, let us get back to the definitions.

'The revised Payment Services Directive (PSD2) has enabled the emergence of new business models based on the sharing of payment account data ('Open Banking'), such as payment initiation services (PIS) and account information services (AIS). It has also improved the general level of the security of payment transactions through the implementation of strong customer authentication (SCA)' (European Commission - Retail Payments Strategy for the EU, 2020, p. 15). A careful reader will probably notice unfounded insertion of the phrase *the security of payment transactions* after data sharing, but not thanks to *Open Banking*, but because of the implementation of *strong customer authentication*!? Could SCA be implemented without data sharing or is this the reason for introducing *strong authentication*? Of course, everything serves to the *Innovative and competitive retail payments markets* (ibid).

Some more reflections about the definitions. Despite it *has enabled the emergence of new business models based on the sharing of payment account data*, PSD2 does not mention data sharing on three and a half pages of definitions (pp. 57-60)? The second relevant EU Directive - *The General Data Protection Regulation* (GDPR), does not define data sharing as well. However, much bigger problem from non-defining data sharing is the discordance of these two directives about the fundamental condition - consumer "consent". 'Another unresolved issue is privacy and data protection. […] Some GDPR provisions seem to contradict PSD2 rules, particularly about what

constitutes consumer "consent". […] PSD2 may be read to allow profiling, outlawed under GDPR (Oliinyk and Echikson, p. ii).

Besides this contradiction, there is a general incompatibility of these two directives. 'The General Data Protection Regulation (GDPR), the most stringent worldwide, restricts the use of personal data, while the Revised Payment Services Directive (PSD2) fosters safe data sharing to facilitate competition and innovation. […] In fact, the current legislation in the European Union introduces an asymmetry between incumbent banks that must share the data of their clients if they wish so according to the PSD2, and the platforms that are not under a symmetric obligation under PSD2' (Duffie et al., p. 26). In this process of transferring transaction data, banks and other payment providers are always squeezed between these two directives.

Clear views about the problems of *data sharing* are given in the replies of EU respondents at the last public consultation on the review of PSD2 from period May – August 2022. 'However, citizen respondents are concerned to share financial data due to a lack of trust which stems from concerns over privacy, data protection and digital security, and a generalised sense of not being able to control how their data is used. An overwhelming majority of citizens responding to the public consultation believe there are security and/or privacy risks in giving service providers access to their data (84%). Moreover, most citizen respondents do not believe that financial service providers that hold their data always ask for consent before sharing those data with other financial or third-party service providers (57%)' (European Commission, 2022). This unconcealed distrust of the EU citizens to data sharing did nothing to discourage policymakers into promoting *Open Banking*, *Open Finance* and other similar *Open* initiatives.

On Daedalus' wings of PSD2 liberalization of data sharing, post-Brexit UK authorities first flew in 2017 with the initiative of *Open Banking*.[58] Therefore, the experience of the UK is especially instructive for researching transactors' privacy in the cases of data sharing.[59] 'The CMA went beyond PSD2 by not just requiring the major banks to facilitate data sharing but requiring that they adopt *common* and *open* API standards, data formats and security protocols' (Land and Roberts, p. 4). This was the opportunity for a real fintech triumphalism openly expressed in February 2021: 'We pioneered Open Banking, which has now taken the world by storm and we launched the Global Innovation Network to bring the international regulatory community together in order to test innovative fintech solutions' (John Glen, Economic Secretary to the Treasury).[60]

In October the same year, Alison White's report was published, with some very harsh criticism after a one year of *an independent investigation*. Then in November, CMA admitted some oversights in projecting and implementation of Open Banking initiative and functioning of the key entity – *Open Banking Limited*.[61] During 2022, there were CMA reports in which they further analyse determined problems and offer findings and appropriate recommendations.[62] All of these reports openly or directly reveal the domination of fintech promoters in projection and implementation of Open Banking remedies and an inadequate representation of consumers and

SMEs.[63] It was seen what are the risks of a hasty implementation of data sharing, not only for the privacy of transactors, but also for the financial stability of every country.

American approach to Open Banking initiative was not so rigid and compulsory as in the European Union and the United Kingdom. 'Over the last several years, U.S. FIs and TPPs have been monitoring open banking and API developments in Europe and other countries. […] While regulation is driving open banking in other countries, U.S. regulators are letting the market drive this shift' (Pandy, p.4-5). Despite not being obligated, in 2018, *approximately 20 U.S. FIs have open banking portals to facilitate third-party provider (TPP) access to consumer financial and other data* (ibid, p. 3).

So far, there were no reports about some significant privacy breaching of transactors in the US because of data sharing, perhaps because of not including FIs into *open banking* activities. The legislation about consumer privacy law has a primary role in this. According to American Bankers Association *Existing privacy laws already regulate information sharing*. 'Some 20 different federal laws already regulate information sharing and provide consumers with a plethora of privacy protections. Five, in particular, play principal roles in regulating information sharing by financial institutions (ABA, 2022).[64]

Privacy protection in business data sharing was effective in East Asia, although the regulators there had the contrary approach from the EU and UK authorities. 'For example, countries in the EU have tended to adopt OB regimes with mandatory data sharing by banks but without regulator-supplied technical standards. In contrast, East Asian countries have favored voluntary participation but spelled out detailed technical standards' (Babina et al, p. 3). However, potential transactors' privacy breaching represents a tip of an iceberg of negative externalities, which already causes unconstrained and poorly regulatory controlled payments data sharing.

There are numerous evidences about the adverse external effects of data sharing, since in the conflict of privacy and efficiency, the consumers undoubtedly suffer. 'Firms can operate more efficiently if they can get a hold of customers' data, but at the same time they can use it to influence preferences, extract more consumer surplus with price discrimination and impair the safety of consumers' information (that is, the risk that it is acquired or used illegally)' (Duffie et al., p. 26).

Beside these externalities, extreme problems of multiple market discrimination and unique ostracism are evident. 'Even consumers who opt out of sharing are potentially harmed, as opting out sends a negative signal to banks and fintechs' (Babina et al, p. 33). Fintechs can constrain them or even remove from the platform, which implies the *risks of being cut out of markets* (ibid). Banks can only doubt that they hide their transactions from the financial institutions that do not perform information sharing with the credit bureaus and if they accept data sharing, they will be considered disloyal clients. In any of these two cases, they will be treated cautiously. Unfortunately, these threats to all users of banking services are not the subject of conversations.

The culture of respecting transactors' privacy, which prevailed for a millennium, coexisting with the documented non-anonymous transactions, weakened the sense of public for the importance of such civilization benefit. The resistance of banks and companies to endangering the privacy of their business was immeasurably stronger than the preferences of individuals for the privacy of their personal transactions and finances. Under the IT revolution from the 1990s, this corporative resistance gradually became weaker with the growing technological possibilities of gathering, processing and sharing the data. Flexible legal regulations contributed to data sharing in most of the countries to *permit almost any consensual collection and resale of personal data* (Froomkin, p. 1539-40).

Despite everything, dominant payment providers – banks still take care of the privacy of their clients. Therefore, non-anonymity of payments is irrelevant for the users of their payment services. Traditional credit bureaus, which collaborate with banks by performing *credit information sharing*, also do not jeopardise the privacy of transactors. Data sharing, spreading contagiously from the 1990s and aggressively breaches our privacy and payment transactions is to be blamed.

There are more indirect causes for privacy breaching: uncontrollable data gathering, their inexpensive and thorough processing and above everything the sale of all personal information using the misleading name of data sharing. Data sharing market cannot vanish and the development of IT sector and the flood of inventions cannot be constrained or forbid our data from being collected and us being monitored. What is the solution?

What is the solution: anonymity or data sharing regulation?

The research presented in the previous sections shows that anonymity of payments has never been about the protection of transactors excluding small retail transactions in cash. Despite of this millennium long experience, glorification of anonymity of payments will surely be continued in the following year, possibly decades as well. It is enough to state the promises of crypto innovators about *untraceability* and *unlinkability* of transactions as well as the solutions for the privacy of transactors. It is necessary to expose the fiction of anonymity.

Every economic transaction includes at least two parties (seller and buyer) and an unavoidable payment intermediary (payment services provider). All of these transactions imply proof of payments and documentation, except in the cases of everyday small payments. This is an inextricable problem for every attempt to achieve anonymity of payments by technological innovations such as cryptocurrencies. Simply, the other contracting party must know who made a payment (identification data), the amount, date and for which purpose (transaction data). The other party does not need to know your account number or the name of your bank, but your payment provider must know this and other related ID and transaction data. There are no algorithmic techniques to circumvent or avoid such two-sided construction, even if the payments in some indefinite future start performing directly, from one account to another. Even if the intermediary is eliminated in some manner hypothetically, the other side in the transaction cannot be eliminated.

This detail remained invisible to the all crypto designers, starting from Nakamoto. In order to be able to know who is behind the payment, one must know who is behind the pseudonym. Simply speaking, pseudo-anonymity does not exist in economy. Quasi-economic activities sanctioned by AML/CFT legislations do not take part in the framework of this research.

Alternative to the utopian anonymity of payments is regulation of data sharing, which imposes itself as the most efficient solution for transactors' privacy protection. Such solution implies access and data processing regulation of payment data, despite the authoritative conclusion that these are unreal myths. 'Myth: The major privacy risk is from unauthorized access to information. […] Myth: Privacy can be adequately protected by removing personally identifying information from records to be released' (Abelson, 2013). It is clear that *conflating security and privacy* and misuse by people who have been granted authorized *access* (ibid) cannot be predicted, but this does not mean that we should give up from strengthening security and privacy nor give up from the access authorizations to payment data (PSD2: *strong customer authentication*). It is also clear that the possibilities of re-identification are endless on the Internet, but it does not cancel the practical use of de-identification procedure.

Limitation of information access still remains a good method of privacy protection, which banks use for centuries. Past practice included the *Declaration of Secrecy* for the officers (Gilbart, p. 101).[65] These declarations in a modernised shape are used by most of the banks and companies as well. Thanks to this simple method, banks are the most successful in transactors' privacy protection, so this is the reason why most people accept data sharing only with their own banks (about 85% according to the previously mentioned surveys).

The designer of Bitcoin critically emphasized this way of achieving anonymity in banking and any involvment of *the trusted third party* in transactions (Nakamoto, p. 6). This is incorrect, as explained at the beginning of this section, but useful to the cryptographic supporting of the fiction about the anonymity of payments. However, exactly his demands to introduce *an electronic payment system based on cryptographic proof instead of trust* and to *preclude* traditional banking model limiting access to information, implemented PSD2 and Open Banking! By the implementation of Nakamoto's suggestions into PSD2 rules and Open Banking initiative, data sharing *deregulation* was performed under the political slogan of market liberalization of payment services and its complete opening for the innovative fintech and bigtech competitors.

'We have proposed a system for electronic transactions without relying on trust' (ibid, 8). This kind of negating the need of *trust* in banking, especially payment, represents practically unachievable economic nihilism. Consumers have completely contrary opinion from Nakamoto and the initiators of Open Banking. 'Support for payments data usage is highest if the data user is one's own bank. Only a minority of the consumers would give consent to other banks they are not consumers of or to newcomers in the payments market. […] Newcomers need to work on gaining people's trust, and show that their payments data is safe with them' (Bijlsma et al, 2020, p. 33). It

is understandable that Open Banking is unachievable without trust, but it is difficult to imagine how and when will the fintech newcomers acquire necessary trust of the consumers.

Compared to them, bigtech companies already have billions of users that they use for unlimited data sharing including their personal and payment information. Bigtech IT monopolies use the weakneses of the existing privacy protection regulative, based on *notice* and *user choice*. 'Choice, whether opt-in our opt-out are meaningless if the choice is not informed. "User choice" has become a way for industry to shift blame to users' (Abelson, 2013).

The same stands for *the consumer's consent*, the foundation for PSD2 and Open Banking. Consumers as a rule do not know exactly or do not understand what their consent is related to. Even worse, banks do not know exactly what their clients agreed to; firstly, is it the access by the Third party to all the payment transactions or to the account balance? Secondly, what is the connection between authentication and the consent of the consumer? What is exactly *explicit* consumer's consent for PSD2? And finally, what happens with the acquired consumers' payment data? 'In a pure access restriction system, those who obtain access to the data, legitimately or not, can use the data without restriction' (Kagal and Abelson, p. 2). These expressed doubts reflect on some of the most evident problems of data access regulation and control, which prove that the '[…] access control in itself is inherently inadequate as a framework for addressing privacy […]' (ibid).

One of the most inspiring exploration of data privacy protection, using field experiment data from the MIT digital currency experiment, additionally exposes an incorrect focusing on privacy policy. 'The privacy policy of both the US and OECD has focused on the idea that with enough transparency and enough choice consumers would make better privacy decisions. […] Our finding that small incentives, costs or misdirection can lead people to safeguard their data less can have two interpretations. On the one hand it might lead policy makers to question the value of stated preferences for privacy when determining privacy policy. On the other hand, it might suggest the need for more extensive privacy protections, from the standpoint that people need to be protected from their willingness to share data in exchange for relatively small monetary incentives' (Athey et al, p. 17-18). The last finding *that people need to be protected from their willingness to share data* is fascinating, but vague – is this the suggestion to increase monetary incentives or to protect the people from their own behaviour in payment transactions. In the first case, the question arises about the way of determining 'sufficient' monetary incentives bearing in mind different sorts of payment data, preferences of the transactors to their own privacy and the individual *reservation prices* of every collector. Despite everything, recent surveys have shown the average: 'The necessary compensation for non-anonymously sharing data is on average 72 euros per month' (Bijlsma et al, 2021, p. 25).[66] There are no rational solutions for this, because it is impossible to protect people from their own destructive actions.

The insufficiency of data access regulation and control for privacy protection of the consumers are visible by data sharing regulations, or more precisely *responsible use of payments data*, as the most

powerful weapon in the battle for payment privacy. The concept of *responsible use of data* is not new and it is known as 'Information accountability: When information has been used, it should to possible to determine what happened, and to pinpoint use that is inappropriate' (Abelson, 2013). It is irrational to consider 'information accountability as an alternative to secrecy' (ibid), but more as the complement.

Despite the existence of numerous rules and laws that determine how payments data is used and shared, and developed *technology to support information accountability* (Abelson, 2013), privacy of the transactors is getting worse. The primary cause of this trend is the liberalisation of the regulatory framework of data sharing exposed as a radical de-regulation. Obvious examples are the revised Payment Services Directive (PSD2) and Open Banking initiative, whose implementation is stuck between the distrust of majority of transactors and obstructive technical standards of the banks (API standards for data-sharing). Regulatory leading of consumers to step away from their trusted payment providers and forcing of banks to data sharing jeopardize the transactors' privacy and the financial stability of economies, even the large ones.

The expected effects of fintech innovations in payments and growing market competition can hardly justify the collapse of the traditional payment system: trust in the payment intermediaries and privacy of transactors. Independently of (un)successfulness, policymakers will definitely persevere in the further implementation of liberal regulations on payment data sharing. They decide in the name of the society '[…] the choice of a measure of value, of a monetary system, of currency and credit legislation – all are in the hands of society, […] Here, then, the rulers of society have an opportunity of showing their economic wisdom – or *folly*. Monetary history reveals the fact that folly has frequently been paramount; for it describes many fateful mistakes. On the other hand, it would be too much to say that mankind has learned nothing from these mistakes' (Wicksell, p. 3-4). It is apparent that with the failed data sharing regulation monetary history repeats itself once again.

Perspectives of anonymity in payments

All the evidence presented in the previous sections showed that the anonymity only marked everyday cash payments of low value, while other larger cash payments were usually documented as well as all non-cash payments. Non-anonymity is especially important for trade payments. 'It would be sufficient to say that anonymity has never been desirable for wholesale payments, which in fact require proof of payment, and this entails the involvement of payment intermediaries' (Vukovic, 2020b, p. 16).

The proof of payment is needed for many other kinds of payments – for purchasing houses, flats and other real estate, investing in shares, bonds and other securities, buying cars, appliances and different kinds of insurance, services, taxes and many other payments, which make up most of our payment transactions. The proof of payment is not needed only for everyday transactions of low value. This proof of payment is exactly Hammurabi's *receipt for the money* that constructs

documented money, contrary to the anonymous payments based on *undocumented money*. It looks incredible, but *The Code of Hammurabi* remains modern and appropriate even after 3770 years from its publishing.

The suppression of cash from everyday use affects the future of anonymous payments of low value. Since cryptocurrencies fail to become general means of payment, because they do not perform the function of means of trade, the persepectives of anonymous payments stay related to the use of banknotes and coins. At the first glance, it can be concluded that the disappearance of banknotes and coins would facilitate the development of *new cashless society*. However, this is only an illusion. 'The new monetary order of the cashless economy hides a built-in construction error: the abolition of cash, which guarantees the stable nominal value of money. The absence of stable nominal value removes two of money's fundamental functions, unit of account and measure of value' (Vuković, 2020a, p. 7).

The connection between retail transactions of low value and cash as their means of payment determines their joint future. If they disappear, they will disappear together. And the disappearance of cash would cause the genetic code of money to disappear as well. Central banks will be no longer responsible for nominal value of money, so *£10 will not always be £10, €10 will not always stay €10, nor will $10 always remain $10* (ibid, p. 8). It is apparent that a certain minimum of anonymous cash payments is desirable for all countries, no matter the technological growth and development. Without them, intrinsic properties of money would be lost as well as its essential functions materialised in the form of banknotes and coins.

Anonymity of retail payments can be achieved using digital technologies and base variants of CBDC without opening transaction accounts at payment providers. Such CBDCs have the biggest limitations in payments, but they can also function in on-line and off-line regime without identity checking. The tested examples are the least-privileged wallets of Chinese e-CNY. 'The least-privileged wallets can be opened without providing identities to reflect the principle of anonymity' (PBOC, p. 9). The possibility of circulating without mobile phone or Internet makes these digital means of payments ideal in the cases of energy failure and natural disasters, as well as *for needs unbanked and underbanked people* (Vuković, 2021, p. 12). These base CBDCs are not the perfect substitutes of physical cash and they cannot preserve nominal stability of money and all its functions.

Conclusions

The anonymity of payments and transactors' privacy was not mentioned until the end of 20th century and the anonymity was not mentioned as the money feature. The twist begins in 1990s with the appearance of electronic money and the total reversal in 2008 with the Nakamoto's announcement of Bitcoin. This *decentralized payment system, based on cryptographic proof*, forcefully imposed the topic of anonymity and privacy of payments.

Other fintech issuers also emphasized the anonymity of payments as the proof of superiority of their cryptocurrencies compared to the commercial bank money. Then, *stablecoins* followed, the projects of bigtech platforms and finally central bank digital currency (CBDC). In this way, the anonymity of payments became the attribute of competiveness in the rivalry of fintech, bigtech, and banking sector.

Today, most monetary analyses put anonymity into one of the most important money features, which crucially influences the privacy of payments. However, it was the means of market promotion of cryptocurrencies rather than extraordinary monetary innovation. The existing electronic payment systems in the world still reside on Hammurabi's principle of *documented money* and not on Nakamoto's idea about *cryptographic proof.*

The significance of anonymity given by the fintech and bigtech entities was hypertrophied into marketing purposes. Similar emphasize of anonymity in the papers of many researchers of digital money does not hold a stance in monetary history and contemporary payment systems and there is no equality between anonymity of payments and privacy.

The investigation of anonymity of payments in history perspective showed that most of the transactions, cash or non-cash were documented or non-anonymous. Exactly this is the reason why banknotes of large denominations, issued for the trade purposes, did not manage to hold on in China from the 11th century or England during the 18th century. Anonymity of payments attracts the attention of the monetary theory and banking only at the end of the 20th century with the appearance of electronic money.

The fundamental question is whether the transactors' privacy is possible without the anonymity of payments? The history of money development and payments gives unequivocal answer: YES. All previous considerations have confirmed that privacy is essential, and not the anonymity. The privacy of transactors is jeopardised by the uncontrollable sale of all personal information by the misleading name of *data sharing*. It is therefore understandable the unconcealed distrust of the public towards data sharing. Previously mentioned surveys show that about 85% of all transactors have the aversion towards the revealing of their payment information.

The regulation of data sharing imposes itself as the alternative to the utopian anonymity of payments, as the most efficient way for protecting transactors' privacy together with the regulation of access and payment data. However, despite numerous rules and laws and developed *technology*, data sharing and inappropriate use even more erodes privacy. The primary cause is the liberalisation of data sharing framework or radical deregulation. The most obvious examples are the revised Payment Services Directive (PSD2) and Open Banking initiative, which fulfilled Nakamoto's request that *precludes* traditional banking model limiting access to information. Using the political goals to liberalise the markets of payment service and strengthen the completion, the foundations of the payment system are infringed – trust in the payment intermediaries and transactors' privacy.

The connection between anonymous retail transactions of low value and cash as the means of payment determines their common future. If they disappear, they will disappear together and with the disappearance of cash, the genetic code of money will be lost. It should be stated that a certain minimum of small anonymous cash payments is desirable for all countries, no matter their technological development.

The anonymity of everyday retail payments can be achieved using the digital technology as well with the base variants of CBDC without opening transaction accounts at payment providers. Off-line use makes this sort of digital money ideal in the cases of possible disasters, as well as *for the needs unbanked and underbanked people*. However, base CBDCs are not the perfect substitutes of physical cash and they cannot keep nominal stability of money and all of its functions.

At the end, the question arises on how such scientific authorities during the past centuries failed to perceive such an important money and payment feature such as *anonymity*? How was the transactors' privacy kept in practice despite the domination of non-anonymous documented payments? Why had anonymity always been underestimated and was linked only with everyday low value retail payments? The most general answer is that anonymity is not essential, but the privacy of transactors, which was implied until 1940s. This is simultaneously the answer to the first question as well. Whether to trust Smith, Thornton, Jevons, Menger, Wicksell, Friedman and other previously cited authors or the anonymous Satoshi Nakamoto and the promoters of data sharing and Open Banking. The author of this paper had no dilemmas, starting from the title.

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[1] The Law Code of Hammurabi (c. 1755-1750 BC), rule 105, the L.W. King's translation (1915).
[2] Stablecoins initiatives of leading bigtech platforms were simply a trigger for CBDC projects. 'Motives of central banks for the implementation of CBDC can be expressed in the form of four basic motives: 1) global currency competition, 2) duopoly or oligopoly markets structure, 3) the dominance of foreign payment providers and 4) declining of cash in circulation. Certain banks are led by all motives, most are encouraged by two to three motives, while the Fed isn't encouraged by any of them. The initiating motives of central banks account for their attitude concerning CBDC. Primary goals of central banks – stable national currency, financial stability and payment system security and efficiency – are in the background of these motives' (Vuković, 2021, p. 4).
[3] The Law Code of Hammurabi, rule 104, 105, and 122.
[4] 'They were known as 'trapezites' and the word used to denote their business was *trapeza* (literally 'table'). Similar professionals first installed themselves in the Forum in Rome between 318 and 310 BC (Andreau, p. 30).
[5] 'The client had deposited his money with the banker; he could either leave it on deposit or withdraw it whenever he wished, or else he could ask his banker to make payments with it. This link was thus manifested by a series of operations conducted by the banker and by the records of those operations that were entered on the register. All those operations put together constituted the deposit account of his client, his *ratio*. […] A banker would advance loans and these would figure in the deposit accounts. […] the tablets of Lucius Caecilius Jucundus, in Pompeii, record seventeen cases of loans advanced by the banker Jucundus to buyers at auction sales' (Andreau, p. 39-40, 44).
[6] 'One underlying reason for this growth in documentary transactions was clearly that in a Mediterranean-wide empire it was dangerous as well as inconvenient to send large sums of specie backwards and forwards over long distances – it was of course known to be risky to transport large sums of coin by sea, and both officials and private citizens probably tried to avoid it whenever they could. We have noticed that shipwrecked trading ships seldom seem to have carried many coins in high classical times (Harris, p. 198).
[7] In the house of before mentioned *argentarius* Jucundus in Pompeii 153 tablets were found of which about fifteen relate 'to *tax* allocations agreed between the colony of Pompeii and Jucundus' (Andreau, p. 35).
[8] 'Before they entered the empire, the barbarian peoples had developed a tradition of 'gift-exchange', which was suited to a virtually moneyless society. This tradition of 'gift-exchange' survived after the barbarians had conquered the western provinces of the empire, and indeed lasted, in an extremely attenuated form, as late as the ninth century' (Spufford, p. 17).
[9] 'Colonies of resident Venetian, Genoese and Pisan agents came to live permanently from the twelfth century at Acre, Alexandria and Constantinople. […] Later still, by the end of the thirteenth century, they were to be found in the northern capitals, at Paris and London, and also at some of the greater ports with wealthy hinterlands, such as Bruges, Seville, Barcelona and Montpellier' (Spufford, p. 252).
[10] 'In Genoa, the most precocious centre for such local banking-activities, the notarial register of Guglielmo Cassinese (1190-2) indicates that local payments could be made not only by transfer between accounts within the same bank, but also by transfer between accounts in different banks in the city. This was possible because the bankers maintained accounts in each other' banks' (Spufford, p. 256).
[11] 'Bankers generally continued to be moneychangers […]. Consequently, moneychanger-bankers could provide good coin for disbursements and check the quality of coin received in payment. A second advantage of using a bank as cashier was that the banker's books provided a record of transactions and, if necessary, legal proof. Bankers' books enjoyed the status of public records, much like the registers of notaries, […]' (Kohn, p. 3).
[12] Founding of public banks in Venice and Amsterdam represented the start of building modern banking system:'The operations of banking, as the system has been developed in the last three century, […]' (Dunbar, 1891, pp. 1, 4).
[13] 'The Bank of Amsterdam represented the peak of development of public deposits bank: it was modelled after Venice's Banco di Rialto (1587), and followed by the Hamburger Bank or Bank of Hamburg (1619). Even though the immeasurable contribution made by these banks to the monetary stability of early 17th

century Europe has been explored only partially, it is beyond question that they created an environment in which banknotes could emerge. Most of these public banks were not doomed to fail by the superiority of note issuing banking: most were swept away only by the Napoleonic wars' (Vuković, 2020a, p. 4-5).

[14] 'This method of debt settlement between individuals by book transfers from one deposit account to another was termed on the Continent payments in "bank money". It was one of the outstanding characteristics of the Bank of Amsterdam' (Richards, p. 234-235).

[15] 'About this time, according to a clearing book dated 1777 […] there seem to have been 33 banks in the Clearing House' (Holland, p. 269).

[16] 'Bills, since they circulate chiefly among trading world, come little under the observation of the public. The amount of bills in existence may yet, perhaps, be at all times greater than the amount of all the bank notes of every kind, and of all the circulating guineas' (Henry Thornton, p. 94).

[17] 'In a very short space of time Amsterdam became the relay for European trade and payments for the next 150 years until it was overtaken by London in trade about 1730 and in money dealings during the Napoleonic Wars. Like financial centers before it, it innovated in trade in finance' (Kindleberger, p. 39).

[18] 'Until the innovation of milled edges in the 1660s, coins were typically clipped, sweated (or rubbed), and adulterated, as well as worn in normal use. Some passed at their nominal values; others were so deteriorated that they had to be tested and weighed before the recipient was willing to accept them' (Ibid, p. 22).

[19] 'The circulation of every country may be considered as divided into two different branches; the circulation of the dealers with one another, and the circulation between the dealers and the consumers. […] The circulation between the dealers, as it is carried on by wholesale, requires generally a pretty large sum for every particular transaction' (Smith, p. 306).

[20] 'The denominations were £20, £30, £40, £50, £60, £70, £80, £90, £100, £200, £300, £400, £500, and £1,000' (Bank of England, 1969, p. 216).

[21] 'Peel's Act became a class-room theme, while with every decade the bank note became less and less important' (Clapham, II, p. 270).

[22] The domination of these transactions has been rapidly growing during the last two decades, which is shown by the BIS Annual Economic Report 2020: the value of total wholesale transactions is 161 times greater than that of retail transactions, whilst average value per transactions is 1,100 times greater (Vuković, 2020, p. 15).

[23] 'Introducing a wholesale CBDC that is comparable to traditional central bank reserves into interbank payment systems could potentially improve efficiency and risk management in settlement' (BIS-CPMI Markets Committee (2018), Central bank digital currency, March 2018, p. 8).

[24] 'The discussion on the wholesale version of central bank digital currencies – wholesale CBDC for short – is often prone to confusion, however. Wholesale CBDC is generally presented as something new, made possible by the emergence of distributed ledger technology (DLT). But wholesale CBDC has existed for decades. And it has provided efficient digital infrastructures for the settlement of transactions between banks in central bank money. […] Today I would like to demystify this concept of wholesale CBDC' (Fabio Panetta (2022), Demystifying wholesale central bank digital currency, speech by Member of the Executive Board of the ECB, 26 September 2022).

[25] Richard Cantillon (2010), *An essay in economic theory*, Mises institute.

[26] David Hume – Economic Essays: *Of Commerce, Of Money, Of Interest, Of Balance of Trade, Of Taxes, Of Public Credit.*

[27] 'Merely by the transfer of the debts of one merchant to another, in the books of the banker, a large portion of what are termed cash payments is effected at this time without the use of any bank paper, and a much larger sum would be thus transferred, if guineas were the only circulating medium of the country' (Thornton, p. 101).

[28] 'If no payments were made by checks on bankers; by means of which money is merely written off one account and added to another, and that to the amount of millions daily, with few or no bank notes or coin passing'. (Ricardo, p. 12).

[29] John Stuart Mill (1885), *Principles of Political Economy*, New York: D. Appelton and Company, p. 338. 'Before venturing, however, to discuss such complex questions, we must proceed to a preliminary

discussion of the properties in question, which may thus perhaps be enumerated in the order of their importance: 1. Utility and value. 2. Portability. 3. Indestructibility. 4. Homogeneity. 5. Divisibility. 6. Stability of value. 7. Cognizability' (Jevons, p. 31).

[30] Alfred Marshall (1929), *Money Credit and Commerce*, London: Macmillan and co., p. 12.

[31] Irving Fisher (1912), *The Purchasing Power of Money*, New York: The Macmillan Company, pp. 8-12.

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[45] Sveriges Riksbank (2018), The Riksbank's e-krona project, *Report 2*, October 2018.

[46] Central Bank of the Bahamas (2019), Project Sand Dollar: A Bahamas Payments System Initiative, December 2019.

[47] Group of central banks - Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Bank of England, Board of Governors Federal Reserve System - and Bank for International Settlements, *Report no 1 – CBDCs: foundational principles and core features* (October 2020), *Report no 2 – CBDCs: system design and interoperability* (September 2021), and *Report no 3 – CBDCs: user needs and adoption* (September 2021).

[48] 'E-CNY is the digital version of fiat currency issued by the PBOC and operated by authorized operators. […] The design of e-CNY mainly considers the following features: 1. Identifiable both as an account-based and a value-based system; 2. Non-interest accrual; 3. Low costs; 4. Settlement upon payment; 5. Anonymity (managed anonymity); 6. Safety; 7. Programmability' (PBOC, p. 3, 7-8).

[49] 'In sum, privacy gives money part of its value. […] Therefore, pursuing privacy as a feature of money is certainly a valid policy objective. Should a digital euro be launched, its privacy features will be a major driver of its acceptability and trust' (Brunnermeier and Landau, p. 24).

[50] 'A fully-private option offers visibility to end users of use case providers of only their own balances and data. A semi-private option enables use case providers to offer visibility of balances and data to end users of other use cases (if helpful)' (Reserve Bank of Australia and DFCRC (2022), Australian CBDC pilot for Digital Finance Innovation, *White Paper*, September 2022, p. 11).

[51] 'The five retail CBDC archetypes. *Criterions*: Privacy, Compliance, Visibility, Scalability, Resilience, Extensibility, Online payments, and Offline payments' (Darbha, p. 16).

[52] 'Yet each of the validators or 'miners' updating the blockchain can determine which transaction are executed and when, thus affecting market prices and opening the door to front-running and other forms of market manipulation. These intrinsic shortcomings of permissionless blockchain technology are well known in the field of computer science and the cryptocurrency industry' (Auer, Raphael, Jon Frost, and Jose Maria Vidal Pastor (2022), Miners as intermediaries: extractable value and market manipulation in crypto and DeFi, BIS Bulletin, No 58, June 2022, p. 1).

[53] 'Since all transactions are public, blockchains must feature pseudo-anonymity. […] This means that if a user's address is identified, it is possible to trace the full history of that user's transactions – thus violating user privacy' (Boissay et al (2022), p. 2).
[54] By the way, Hayek saw banks as chief currency competitors and misunderstanding of bankers about his idea as the biggest obstacle.
[55] 'We asked survey participants to identify the most important reasons for buying cryptocurrencies, or choosing not to. The most-cited reason for buying was that cryptocurrencies are a "good investment." Many buyers also pointed to the **anonymity properties of cryptocurrencies** and their lack of trust in the existing financial system – factors that were mentioned almost the same number of times' (Hundtofte et al (2019).
[56] 'In other words, one aspect of the public's demand for privacy is demand for security and safety in the payments systems they use' (Kahn, p. 339).
[57] Payment Systems Regulator (2020), Data Privacy Notice V1.0 (the UK), November 2020.
[58] 'Open Banking allows consumers and small business to share their bank transaction data securely with trusted third parties who can then use this information to provide them with services that save them time or money. The UK was the first country in the world to implement open banking but now around 60 jurisdiction have either adopted it or are seriously considering doing so' (Land and Roberts, p. 3).
[59] 'While the specifics of government OB efforts vary dramatically, the United Kingdom's (UK) Open Banking Initiative provides an instructive introduction: in 2017, the UK's Competition and Markets Authority introduced one of the first OB initiatives, with the aim of increasing innovation and competition in the retail banking sector' (Babina et al, p. 8).
[60] Foreword in Ron Kalifa (2021), Kalifa Review of UK Fintech, Independent report, February 2021, p. 3.
[61] CMA (2021), Update on Open Banking, *Corporate report*, Competition and Markets Authority, November 2021.
[62] Kirstin Baker (2022), Open Banking Lessons Learned Review, Report, *CMA 159*, Competition and Markets Authority, May 2022.
[63] CMA (2022), The future oversight of the CMA's Open Banking remedies – Response to consultation, *CMA 152*, Competition and Markets Authority, March 2022.
[64] '1. Gramm-Leach-Bliley Act of 1999; 2. The Fair Credit Reporting Act; 3. The Electronic Fund Transfer Act; 4. The Right to Financial Privacy Act; 5. The Telephone Consumer Protection Act (ABA, 2022).
[65] '*Declaration of Secrecy* (a form for the officers) […] And we do hereby severally pledge ourselves, and as inviolably as if we had taken our oaths thereto, that we will observe the **strictest secrecy** on the subject of all transactions of every description of the company with their customers for the time being, or with any other bodies or persons whatever, and on the subject of the state of the accounts of all bodies and individuals, from time to time, having accounts with the said company' (Gilbart, p. 101).
[66] 'It is relatively high for women, old people, less educated people, and people with a low income. For example, the compensation needed is 93 euros for people aged 45 or above and 45 euros for younger people. The compensation is relatively low for people with a high level of digital literacy, who use social media more a lot and / or are frequent users of webshops. For example, people who use social media more than once a day need a compensation of 56 euros for non-anonymous usage of their data, whereas people who never use social media such as Instagram, WhatsApp, Facebook, Twitter or YouTube require 132 euros. The compensation need is relatively high for people with little trust in the data-using firms. For example, it is 89 euros for people who distrust BigTechs and 9 euros for people who trust BigTechs' (Bijlsma et al, 2021, p. 25-26).