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Disclosure of Anonymity in Modern Payments*

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Summary

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[1] and not on Nakamoto's idea about cryptographic proof.[2]

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.

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

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

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today. In this way, the topic of anonymity of money and the privacy of payments was forcefully imposed to 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.

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). An eruption of CBDC projects was started in June 2019 when Facebook disclosed its intention to issue its own global stablecoin. 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. 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.

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). 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).[3] 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).

'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* (Andreau, p. 39-40, 44). 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).[5]

Most of other high value payments– at auction sales, for tax, 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. Hard shortage of money struck all parts of former Western Roman Empire. 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' (Spufford, p. 17).[6] 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.

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 (Genoa, Venice). All transactions documented in books of moneychangers were not just an official record, but a *legal proof*.

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* 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.[7] Payments with bank money 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).[8] 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. 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.

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.

The money that trade created

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.

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. 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).[9] 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).[10] 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.

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. 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 number of mints, unpredictable fluctuations in multitude of units of account, growing prices and official and unofficial devaluation of coins. 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).[11] 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. […] notes for £5 in 1793 and notes for £1 and £2 in 1797' (BoE, 1969, p. 216). [12] 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),[13] 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).[14] 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[15] their influence on the evolution of money and methods of payments, they do not attract the attention of numerous researchers.

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 (*An essay in economic theory*), David Hume (*Of Commerce, Of Money, Of Interest*), Adam Smith (*An Inquiry into the Nature and Causes of the Wealth of Nations*), Henry Thornton (*An inquiry into the Nature and effects of the paper credit of Great Britain*), David Ricardo (*Proposals for an economical and secure currency*) - 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.

Most influential works from 1870s to 1950s: Carl Menger - *The Theory of Money*, Stanley Jevons - *Money and the Mechanism of Exchange*, John Stuart Mill - *Principles of Political Economy*, Knut Wicksell - *Lectures on political economy: Money*, Alfred Marshall - *Money Credit and Commerce*, Irving Fisher - *The Purchasing Power of Money*, John Maynard Keynes - *A Treatise on Money*, Joseph Schumpeter - *Treatise on Money* and *History of Economic Analysis*, does not contain the word *anonymity* nor *privacy* whether as a feature of money or the process of payment

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

Well-known older 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 best-selling banking textbooks from the beginning of this millennium carefully consider modern payments and payment systems (wholesale and retail). 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.

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, str. 1).[16]

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*),[17] anonymity was reduced to *pseudo anonymity*,[18] 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.[19]

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'.[20] By expanding this imperative, anonymity becomes the prerequisite for the efficiency of currency systems including the traditional centralized systems?

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.[21]

Odes to the cryptocurrencies and their anonymity of payments came from some of the leading international organisations during the 2010s.[22] 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? [23] 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! (Kahn, p. 338-9).[24] *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.

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).[25] 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.

Today most of the individual transactors do not think about their privacy and do not think that *anonymity essential*. 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' (Kantar, p. 6, 29).[26]

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).[27]

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).[28]

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).[29] 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).[30] Some possible harmful consequences were prevented by the appropriate regulations and monitoring. Therefore, *credit information sharing* is not a threat to the privacy of individuals as well as it was not a threat in the past. However, 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. But, 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).[31] Despite it *has enabled the emergence of new business models based on the sharing of payment account data*, PSD2 does not mention data sharing? 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 basic condition - consumer "consent".

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%).' (European Commission, 2022).

On Daedalus' wings of PSD2 liberalization of data sharing, post-Brexit UK authorities first flew in 2017 with the initiative of *Open Banking*.[32] In October 2021, Alison White's report was published, with some very harsh criticism after a one year of *an independent investigation*. During 2022, there were CMA reports in which they further analyse determined problems and offer findings and appropriate recommendations.[33] 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.[34]

American approach to Open Banking initiative was not so rigid and compulsory as in the European Union and the United Kingdom. 'While regulation is driving open banking in other countries, U.S. regulators are letting the market drive this shift' (Pandy, p.4-5).[35]

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).[36]

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).[37]

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.

Despite everything, dominant payment providers – banks still take care of the privacy of their clients. 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..

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. Limitation of information access still remains a good method of privacy protection, which banks use for centuries. 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. 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.

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). [38]

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).[39]

'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).[40] 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.

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).

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.

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. 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).[41]

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. 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. 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.

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] '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), rule 105, the L.W. King's translation (1915).

[2] '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*.

[3] Moses Finley (1999), *The Ancient Economy*, University of California Press.

[4] Jean Andreau, (1999), *Banking and Business in the Roman World*, Cambridge University Press.

[5] William Harris (2006), The Nature of Roman Money, In: *The Monetary Systems of the Greeks and Romans*, Oxford University Press.

[6] Peter Spufford (1988), Money and its use in medieval Europe, Cambridge University Press.

[7] '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, 2020b, The illusion of paper money as 'the dominant means of payment', DP 1, CBM *Research*, October, p. 4-5).

[8] Richard Richards (1958), *The Early History of Banking in England*, Frank Cass and Co.

[9] Stanley Jevons (1896), *Money and the Mechanism of Exchange*, D. Appelton and Co.

[10] Pomeranz and Topik (1999), *The world that trade created: society, culture, and the world economy, 1400-the present*, M.E. Sharpe, Inc.

[11] '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' (Adam Smith, 1776/1937, An Inquiry into the Nature and causes of the Wealth of Nations, Frank Cass and Co., p. 306).

[12] 'The denominations were £20, £30, £40, £50, £60, £70, £80, £90, £100, £200, £300, £400, £500, and £1,000' (Bank of England, 1969, The Bank of England note: a short history, *Quarterly Bulletin*, Q2, June, p. 216).

[13] Henry Thornton (1802), *An inquiry into the nature and effects of the paper credit of Great Britain*, Reprint, New York, 1965.

[14] 'Peel's Act became a class-room theme, while with every decade the bank note became less and less important' (John Clapham, 1970, *The Bank of England: A History*, II, p. 270).
[15] 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, 2020b, p. 15).
[16] Amarasinghe et al (2021), The Cryptographic Complexity of Anonymous Coins: A Systematic Exploration, *Cryptography*, No. 5, March, p. 2.
[17] '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.' (Auer et al, 2022, Miners as intermediaries: extractable value and market manipulation in crypto and DeFi, BIS Bulletin, No 58, June, p. 1).
[18] '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, Blockchain scalabity and the fragmentation of crypto, NIS Bulletin No. 56, June, p. 2).
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[30] Hunt (2005), A century of consumer credit reporting in America, WP 05-13, FRB of Philadelphia.
[31] European Commission (2020), Communication on a Retail Payment Strategy for the EU, Sept., p. 15.
[32] '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).
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