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An ontology of bitcoin

*Assessing the value of bitcoin through an analysis
of its inherent digital labour*

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1

Introduction

The recent surge of the value of 1 bitcoin (BTC) begs the question what it is exactly that explains this increase in value. What makes bitcoins valuable? And, consequently, why is a bitcoin worth so much more than, say, 1 Euro?

To answer these questions it is necessary to address why money in general has value. A research of this kind is a research partly into the concept of value maintained by a given population (an ontology), but also into the practical economic and scientific ways through which societies have dealt with the matter of quantifying the subjective aspect of value throughout history. This research utilises existing research into the ontology of bitcoin, most prominently that of Bjerg (2016). Following the reasoning that money has value because of a) a material component, b) a political component, and c) an institutional component, it will be made clear that any of these traditional ontologies of money are not sufficient to assess the ontology of bitcoin. This new type of currency merely adopts aspects of previous currency systems, but takes the shape of a protest or critique on existing money transfer systems.

I maintain that the value of bitcoin, as well as its steady increase, should be sought in terms of the digital labour necessary to 'mine' a bitcoin. Departing from the existing literature on the ontology of cryptocurrencies, I view the value of bitcoin through a Marxist lens, by stating that the labour theory of value is the most appropriate tool to assess both the value of the informational commodity that is a bitcoin, as well as the sharp increase of this value in recent times. An analysis of the digital labour inherent to a bitcoin, recognised in its mining process, shows how bitcoins are more valuable than commonly used money. Moreover, the fact that bitcoin is a privately produced currency in concordance with the increase of bitcoin's value in the recent crisis signifies that the surge of bitcoin's value is resultant from a perceived trust in the continuity of the value of information or digital labour in the near future. The research concludes by stating that the value of bitcoin is analogous to the early conception of the value of gold: rigid, as a trustworthy 'vessel' for the abstract concept of value, consented to fulfil this role by the majority of society.

There are few developments that show the increasing influence of the internet on society as explicitly as bitcoin does. Its skyrocketing value has made millionaires of thousands of people, more or less overnight. Naturally, these news headlines have caused a great deal of confusion. An explanation of the bitcoin system, stating that it is a transaction system that requires people to ‘mine bitcoins with their computer’, raises way more questions than it answers. The nature of these questions is, however, quite revealing. During the initial days of formulating a research question, I asked people why they thought that bitcoins were so valuable. They knew as little as I did, but after some deliberation arrived at the conclusion that it had to be an economic bubble, or a cover for some shady financial practices. If one takes a more optimistic (or perhaps naïve) stance on the matter, however, the only possible explanation is that bitcoin is valuable because we think it is, despite the fact that every cryptocurrency is nothing but a line of code on a computer screen.

How is it possible that bitcoin, the first cryptocurrency, is so valuable compared to everyday types of money like the US dollar or the euro? This is the foremost question this research aims to answer. To approach the answer, it is necessary to unpack a number of hidden assumptions implicit in the question. Naturally, a more than superficial understanding of the functioning of bitcoin and its platform (the blockchain) is required. Moreover, it is impossible to speak of the value of bitcoin if one is not familiar with the value of money in general. To this end, I will use the most recent standard literature on money’s value if clarification is required, which is a handbook produced by Geoffrey Ingham (2004). In addition a case could be made for the need to be aware of the (even more general) notion of value, and how this subjective principle is expressed in tangible and manageable ways. For this reason this research can be considered as an investigation into the ontology of bitcoin: it puts into question how bitcoins, as an object, partake in the (subjective) class of things that are considered valuable. To assess the ontology of bitcoin I will make use of the work of Ole Bjerg (2016), who maintains that bitcoins have value because they adopt aspects of the ontology of previous types of money. I adopt and expand upon the methodology Bjerg utilises, not just by discussing the three value theories he proposes more thoroughly and using additional literature to support the link of these theories to bitcoin, but also by adding a fourth theory of the value of money Bjerg leaves untouched. The second half of this research will add a Marxist view to the ontology of bitcoin, stating that bitcoins have value because they harbour valuable digital labour. Approaching the ontology of bitcoin through a (neo-)Marxist lens puts this research in a unique position. It fills a research gap by adopting the renewed attention towards Marxist writing and applying it to the case of cryptocurrencies, making this research novel in the sense that it is the first instance of a neo-Marxist approach to the ontology of bitcoin. Additionally it supplements the sparse entries in the research towards bitcoin mining as a type of digital labour.

Since this is a philosophical investigation towards the concept of value in bitcoin, economic theory on the value of money will be kept to a bare minimum. As a starting point into the discussion on money’s value, I will discuss the Aristotelean account of the origin of money. This not only serves

to show how economic theory relies heavily on Aristotle, it also provides an introduction to the commodity theory of money. This theory answers the question ‘why does money have value?’ by stating that value is inherent to the material money is made up of. In practice, this meant ascribing value to a particular thing, like gold, and using this thing for the creation of the objects that constituted money, like coins. To show the close ties bitcoin maintains towards this material notion of value, the work of Maurer et al. (2013) will be used to highlight the influence of the commodity theory of value in the semiotics of bitcoin.

When asking people what they think about when they think about coins, gold or silver might not be their primary association. Another association could be with authority, as reflected by the head of the statesman (or national monument) on the face of the coin, which brings me to the second way in which value is expressed through money: the fiat theory. A money is a fiat money when its value is derived solely from the power of the sovereign entity that minted the money. This allows for the creation of more money in times of need, and thus fiat eliminates the need for valuable matter to mint money. This of course brings with it not just the risk of inflation, but also a reduced sense of trust in the value of money. The economic value of gold is considered robust, insensitive to political developments – a corrupt government could devalue a currency, which makes fiat money anything but an improvement over commodity money. It merely moves the perceived object of value from matter to sovereignty, resulting in a similar type of ontology. Once again the link of bitcoin towards this fiat theory of value will be made explicit, through a discussion of the political structuring character of bitcoin’s platform, the blockchain, using the work of Velasco (2017).

In a more contemporary setting, it is necessary to discuss the credit money of commercial banks. This theory is best understood as providing value through a belief in the system of transactions: as long as the system is up and running, the additions to and deductions from balances form the network that guarantees the value of money. This makes the concept of value reliant solely on social convention: money has value because we treat it as such. In this way, the ontology of money is a matter of mere social convention, and value appears as a result of consensus and general use. Using the work of Smit et al. (2016) I maintain that the credit system poses the most radical removal of money from the concept of value up to this point. Since the credit system requires neither materiality nor sovereignty for its way of expressing value through money, it presents the holders of this credit money with numerous unprecedented measures to speculate with their money. I will at this point briefly discuss the 2008 housing market economic crisis as a result of this type of speculation, i.e. ‘spending money you do not have’. Chronologically, bitcoin enters the stage here, as an explicit revolt against the consequences of the speculative and increasingly accumulative character of late stage capitalism. I will show how bitcoin is new, or even revolutionary, by stating that it encapsulates aspects of all the aforementioned value systems, albeit slightly differently in every regard. What remains then is to answer the question towards bitcoin’s excessive value, which will be answered through the discussion of a fourth value theory: the labour theory of value.

Evidently, the labour theory of value states that value takes the shape of the labour necessary for the production of a commodity. A thing that requires a lot of work to produce is more valuable than a thing that takes five minutes to make, corrected of course for variables like worker level of expertise and such. Money is, in this sense, a way to compare amounts of labour with one another. To understand this theoretical framework, I will briefly discuss Marx' value analysis from the first chapters of *Capital* (2011), which allows me to posit bitcoin as a type of societal protest in the sphere of Marxist class struggles. This point will be clarified through a comparison with the Occupy movement, as it was situated in the same context (2008-2009 societal outrage) as the founding of bitcoin. The influence of societal protests on the notion of value will be explicated using the work of Collins (2016) on the expansion of the labour theory of value to fit the modern age. She states that the neo-Marxist approach taken increasingly often in recent decades is necessary to address problems caused by late stage capitalism, and lays bare how crises lead to redistributions of labour (and, consequently, value) that make obscured aspects of the economy visible. This narrative is necessary for the conclusion of this research in which the question towards the value of bitcoin is answered, namely by pointing to the different nature of the labour inherent to the bitcoin commodity, and how it has been made visible after the 2008 crisis.

Bitcoin is so valuable because it expresses a revaluation of digital labour. After setting out the nature of this digital labour using the handbook by Fuchs (2013), and how it functions as a foundation (or 'substance of value') of informational commodities, I can show how bitcoin repurposes aspects from commodity, fiat and credit systems of value to shape a type of money befitting what some have called the 'information age'. The notion of bitcoin as an informational commodity, made explicit using the work of Bergstra & Weijland (2014), ties its production to Marxist theory in order to substantiate the use of the labour theory of value to assess the ontology of bitcoin. Here the role of technology in the production of bitcoins will be highlighted as well, in order to show that bitcoin puts forward a discontinuity regarding Marxist theory, as opposed to other instances of digital labour, the exploitative character of which lets them be analysed as logical consequences of late stage capitalism continuous with Marxist theory. The surge of bitcoin's value, then, can be conceived of as a response to the recently 'made visible' digital labour, as it transformed from a hidden aspect of digital infrastructures to the occupation of a more prominent position.

2

Bitcoin and the blockchain

The enthusiasm around bitcoin has been expressed as being about “a technological advancement so powerful that it transforms the very basic pillars of our society; a technology which fundamentally influences the way that our economy, governance systems and businesses function, and could change our conceptual understanding of trade, ownership and trust” (Odyssey 2014). It seems confusing that a network of computers exchanging transactions could function as the replacement of the payment systems we have used our entire lives, as our parents and grandparents did before us. To understand how bitcoin is capable of revolutionizing our economy, and as a result our society as well, I will briefly set out the example provided by Smit et al. (2016, 340-41) which shows that an economy can function once some very basic principles are adhered to.

In this example, an island is proposed on which five people live, in dire need of a monetary system to exchange goods. Each of these five people are special in the sense that they all possess perfect memories, are very capable in arithmetic and are perfectly honest as well. Suppose that these five people meet once every day to conduct transactions. They would start off with a given number of ‘currency’, say 2, and subtract an agreed upon amount from this number after purchasing some good from someone else. So after purchasing 3 coconuts, the balance of the buyer would become 1.85, while the balance of the seller would become 2.15. All of the five people present in the gathering would take note, and update their mental ledger of the balance of everyone’s account. This system, which Smit et al. (2016) call the ‘money protocol’ (340), is an abstract economy adhering solely to the most essential aspects needed for the economy to function. Our own economy works this way, as does the bitcoin system; bitcoin is a more basic money transfer system, not having gone through the centuries of development our everyday economy has.

The point of this example is, firstly, to show how a simple network of transactions, in which trust and shared information about the ledger are guaranteed, serves as a sufficient condition for creating an economy. Secondly, it offers a starting point into the explanation of the functioning of bitcoin, which starts with the creation of a shared ledger among, originally, dark web users (a point upon which I will deliberate further in chapter 4.2). They felt that the common money transfer system was unfair considering the policy of transaction fees used by companies like PayPal (Nakamoto 2009, 1). In dealing with the problems they were faced with, bitcoin creators designed a system that in many respects improved upon the existing systems of money transfer. In the following chapter, I will show how bitcoin was created by discussing some of the aspects that make trust unnecessary through an elegant use of cryptography. To this end, I will utilise a blogpost by Michael Nielsen (2013), whose detailed and technical description has been recommended by many bitcoin commentators (e.g. Lo & Wang 2014, note 2).

2.1. *Trust the algorithm*

The island example showed that a money transfer system requires only a shared ledger and a guarantee of trust. If person A were to transfer a number of bitcoins to person B, what happens is that they would update their shared ledger after the transaction is agreed upon by both parties. This shared ledger is called the blockchain, a ledger technology which according to many commentators might prove more revolutionary, and might outlive, bitcoin itself (e.g. Swan & De Filippi 2017, 604). The functioning of the blockchain will be discussed momentarily, since for now, the first problem we run into is that of trust. In the bitcoin system fraud is impossible for a number of reasons. Firstly, to ensure that no one can conduct a transaction that the receiving party does not agree with, or that no one can alter the amount of a transaction between the moment of agreement and sending, the bitcoin system utilizes digital signatures. These signatures illustrate the agreement of both parties with a transaction. The signatures are comprised of two keys, a public key used for verification and a private key, which is personal and kept secret. These keys are codes, strings of 256 ones and zeroes which make up lines of 32 alphanumeric characters, which means that they are very hard to copy (there are 2^{256} possible combinations of characters). In order for a transaction to be deemed valid, the public and private key need to generate a previously determined ‘true’ statement. To arrive at this point, both keys need to ‘match up’, which entails that the public key generates a ‘true’ statement on the basis of the code generated by the private key, which, in turn, is dynamic and changes according to the message and amount of bitcoins transferred.

In order to make sure copying a transaction (i.e. double spending) is impossible, every transaction is equipped with a particular identification number as well. All of these codes (keys, ID’s and signatures) are generated using SHA-256-512, which stands for Secure Hash Algorithm. What this algorithm does is translate any input into a 256 digit line of bits (ones and zeroes), or 32 alphanumeric characters (bytes), called a hash.¹ SHA-256-512, like many other algorithms utilised in information technologies, is opaque. Put shortly: the algorithm is called opaque since it is infeasible for people to execute the mathematical calculations that take place in the hidden layers between input and output.² It is possible to calculate an outcome from a given input using pen and paper (Shirriff 2014), but this method takes a skilled mathematician about fifteen minutes, while it takes an average computer mere milliseconds. Another aspect of the SHA algorithm is that it is a one-way algorithm: it is (as of yet) impossible to derive an input from the outputted hash code. Because of this particular property³, it is

¹ Here the only possible lapse in SHA-256’s security becomes apparent. Since the number of possible inputs is infinite and the number of outputs finite, there exist inputs that share an output. The number of finite outputs is so inconceivably large, however, that this is a mere theoretical challenge that does not pose a practical issue.

² For a more thorough explanation of the types of opacity in algorithms, and a telling example using the visual recognition learning process of a neural network, see Burrell (2016).

³ This property has made SHA-256 an indispensable part of the programming of many large websites as well, like Google; “a huge amount of modern [digital] security depends on cryptographic hash functions” (3Blue1Brown 2017).

impossible to re-engineer the algorithm in order to find loopholes or commit fraud in the bitcoin transaction system. Moreover, it means that a match between a public and private key resulting in a digital signature is so incredibly rare that it is infeasible that this code would have been guessed. In this way, bitcoin deals the first blow to the need for interpersonal trust in its transaction system.

2.2. *Mining blocks, obtaining bitcoins*

What remains is for these transactions and their accompanying digital signatures to be verified by the community of bitcoin users. As was the case in the island example, everyone included in the ledger needs to be appraised of the transaction. In the case of bitcoin, this ledger takes the shape of the blockchain. Aptly named, this ledger is a chain of consecutive ‘blocks’: about 2400 unique transactions broadcasted into the bitcoin network, retrieved and gathered into a list (or block), waiting to be verified. The fact that these transactions are broadcasted into the network of users is another elegant way of circumventing the need for trust in the system: the ledger is decentralized. However, this brings us to another problem: how do you make sure that everyone who receives a broadcasted transaction from the network is both sure that everyone else received it as well, and that everyone believes that that transaction is valid? This problem is called the ‘Byzantine general problem’ in computing science, referring to the historical issue of being faced with the need to get every participant in a system to follow the same strategy, despite the fact that some parts of the system are malevolent or corrupt (Velasco 2017, 721). This is the issue Nakamoto (2009) solved in his White Paper, which resulted in the start of the blockchain through the verification of the first block.

To make sure that blocks are verified, and that everyone maintains the same ledger, the system incentivizes people to use their private computational power to crack a code. This is what is called bitcoin mining. Miners are people who gather broadcasted transactions into blocks. They then apply the algorithm, SHA-256, to the list of transactions with an added random input at the end of the list. The result is a 256-bit sequence of code, a hash. The goal of this guessing game is to have the resulting hash start with a particular number of zeroes, say 30, or 60 depending on the degree of difficulty to solve the puzzle. The miner who finds the right outcome, and therefore has guessed the right input, broadcasts this verified (or ‘mined’) block into the network. They are then rewarded for solving the cryptographic puzzle with newly generated bitcoins: 50 at the start of the blockchain in 2009, but after three halvings, which are predetermined occasions cutting the bitcoin reward for mining a block in half to guarantee a final fixed number of bitcoins in circulation (see figure 2/chapter 3.2), the reward currently stands at 6.25 bitcoins. In addition, miners gather possible fees that bitcoin users can add to a transaction, in order not just to tip the miner that verified their transaction, but also to make sure their transaction is picked up from the network quickly. Since bitcoin was intended as a protest against these transaction fees, these ‘tips’ are of course completely voluntary, and do not affect the eventual verification of the broadcasted transaction.

Once the block has been broadcasted, it is linked to the chain of previous blocks. These links are facilitated through the inclusion of the previous block's hash code at the header of each block. As a result, the blockchain is a coherent whole: altering a part of it means the entire series of interlinked codes is invalid, which is another measure to prevent fraud. The solution to the cryptographic puzzle is added at the bottom of each block, and is called a 'proof of work'. The proof serves to show the amount of computational power that went into mining the block. This function is what the system utilizes to ensure trust in the verification: a block with a large amount of computational work put into its verification is deemed trustworthy. Suppose a user of the bitcoin network finds themselves faced with two separate chains: a fraudulent chain and a legitimate chain. To ensure that they update their version of the blockchain with the right set of blocks, containing legitimate transactions, they defer to the longest chain, i.e. the one with the most computational power put into it. In this way, trust does not need to be put in a centralized authority, as is necessary in contemporary monetary systems, but rather the need for trust is eliminated. The system works on the basis of decentralized trust – every participant can rely on the system functioning as intended, since every participant feels that it is safe to trust the algorithm.

To illustrate why this works, let's take a counterexample. If I were inclined to commit fraud in the bitcoin system, I could for instance choose not to broadcast a transaction between me and a consenting second user to the network. That way, the payment never happened for the rest of the network, despite the fact that my debt has been settled for the receiver. To make sure I can pay with money I don't have, I will have to verify the block which contains the fraudulent transaction, to make sure it gets added to the chain of the receiver, the rest of the network being none the wiser. In effect, this means I would have to solve the cryptographic puzzle, which requires billions of calculations (attempts) per second, before any of the other miners are capable of doing so. In fact, the number of attempts at guessing the correct hash function per second was estimated to stand at about 5×10^{18} calculations per second in the summer of 2017 (3Blue1Brown 2017). And even if I am so lucky, or simply have that much computational power under my command; the receiver will soon be faced with conflicting chains. One of them containing my fraudulent payment, the other containing the blocks approved by the network. So in order for the receiver to choose my chain, it will have to be longer than the other, legitimate chain. Since this is an uphill battle from the very start, blockchain technology makes fraud an infeasible endeavour.

In addition, the code of the blockchain is open sourced in order to allow for competition between several blockchain currencies. The point of this measure, which allows everyone with access to the internet to create their very own cryptocurrency using the blockchain code, is to assure that even in the case of a coup of the bitcoin network by a kind of computational aristocracy the corrupted system can be replaced by a more democratically structured alternative. This coup is after all never fully preventable, despite becoming ever more unlikely: all that is required is the organization of a group of miners so large, that together they account for 51 percent of the total computational power of

the network. This is not just unlikely, given the immense power of the network as it currently operates, but also implausible, since it is not rewarding to defraud the system in this way. The bitcoin reward of using this incredible computational power to mine blocks is greater than the reward of the upkeep of a fraudulent chain would be.⁴ These measures (the open sourced code, the unlikelihood of mining groups having a majority share of computational strength and the implausibility of fraud) are conscious programming choices which, together with the aforementioned design of the blockchain, make bitcoin an astoundingly secure system of monetary transaction.

It should now be clear where exactly bitcoins come from. What remains is to mention the fact that everyone who owns bitcoins ‘stores’ them in a digital wallet, which is nothing but a ledger entry, a balance. The preceding chapter should function as a theoretical background, upon which a more philosophical (ontological) investigation is conducted towards the concept of value. After all, knowing how the bitcoin system works does not bring us any closer to an answer to the question why bitcoin is so valuable, let alone why it is considered valuable at all. The answer to this question will be sought in the substance of bitcoin. That is to say: I expect to find the cause of the value of bitcoin in the substance of bitcoin. The following chapter will be dedicated to an analysis of the substance of the class of things bitcoin belongs to, which is money. Once we know why money in general has value, we might find out why this new ‘informational money’ has value.

⁴ There are a number of reasons for this, most prominent of which is the measure that users cannot spend more bitcoin in a transaction than their wallet contains.

3

Commodity theory of value

The common sense approach to answering the question ‘why is money worth something’ is to find a definition of money in economic theory. This is exactly how many banks and other financial institutions, private or public, acted in response to the growing value and use of bitcoin (e.g. Ali et al. 2014): compare it to conventional types of money to see if bitcoin ‘fits the bill’. An account of the ontology of any type of money, however, cannot be approached from any given theory: measuring the ‘moneyness’ of bitcoin by comparing it to the money we commonly use does not bring us closer to the principle of the value of bitcoin at all. Money is a very dynamic concept⁵, which would explain why the act of assessing the validity of bitcoin as a currency has been approached differently by different national banks (Bjerg 2016, 54).

The commonly used measure for ‘moneyness’, or what an object requires to be worthy of the predicate ‘money’, is threefold. As stated in traditional economic theory⁶, the object should act as 1) a store of value, 2) a medium of exchange and 3) a standard of account. This entails that something is a money if and only if: 1) it can be reliably stored and retrieved at will; 2) it is used as a way to compare the value of dissimilar commodities and trade them as expressions of this value denotation; and 3) it is the only numerical denomination of the value of tradeable commodities, i.e. the reference point of value (Ingham 2004, 69-71). Though this formulation tells you exactly if a commodity is to be seen as money, it does not tell you why, neither can it afford an answer as to why metals and banknotes are used as money rather than bottle caps. To answer these questions, many different theories have been proposed. The most commonly used and agreed upon theories on the nature of money are 1) the commodity theory, 2) the fiat theory and 3) the credit theory of money (Bjerg 2016, 53; Maurer et al. 2013, 268-70; Ingham 2004, 15-58; Barber 2015). The following chapter will describe the usage of commodities as money, based on an agreement regarding the inherent value of the valuable commodity of choice, to serve as the general equivalent (see chapter 6.1) for the trade of other commodities. It will be shown that this ‘commodity money’ maintains a circular concept of value. Nevertheless, it is an obvious and thoroughly researched first step in formulating a theory of value.

3.1. The origins of commodities as value-objects

The origins of the (nowadays largely abandoned) commodity theory of money are most commonly traced back to Adam Smith’s parable of the butcher, the brewer and the baker (Bjerg 2016, 57), though

⁵ Anything can be used as money as long as the society that utilises that thing agrees on the usage. The title of an essay on the ontology of money by Smit et al. (2016), *Cigarettes, dollars and bitcoins*, is telling in this regard.

⁶ The original necessary functions of money were first theorised by the English economist William Stanley Jevons in 1875, but were later adopted by writers of macroeconomic textbooks. For the purposes of this research, it is however not necessary to uncover this economic history.

some believe that Marx ought to be credited with at the very least the most thorough commodity value analysis (Foley 2004, 2). Smith, being a ‘defunct economist’ according to J.M. Keynes⁷, illustrates how the need for a portable unit of value arose among the guildsmen of antiquity to replace the bartering system of trading goods. The practicality of this redefinition of value was, however, soon presented with limitations, as becomes apparent from an English 18th century debate on the value of commodity money. Originating as a legal debate on “the practice of clipping snippets of metal from coins” (Maurer et al. 2013, 269), which would be molten together into new coins in order to turn a profit, it became a debate on the origin of value in general. Since the clipping practice exposed the unsustainability of the coin-system of value, none less than the philosopher John Locke defended the theory that value, rather than being a political structure, originated from “the universal, imaginary value human beings “consented” to bestow upon the precious metals” (Maurer et al. 2013, 269).

The stance Locke took in this debate has been taken to be exemplary of his political orientation, which was strictly liberalist. In the preceding century, Locke formulated a theory of value that has since been denoted as the first labour theory of value: “Let any consider, what the difference is between an Acre of Land planted with Tobacco, or Sugar [...] and an Acre of the same Land lying in common, without any Husbandry upon it, and he will find, that the improvement of labour makes the far greater part of the value” (Collins 2016, 105). It is clear then that, from Locke’s stance, two ideas about the origin of value can be recognized: value as bestowed upon precious metals, i.e. the commodity theory of value, and value as stemming from the improvement of labour, which is the labour theory of value. Both theories have been developed extensively, but in economic discourse the commodity theory received far more attention. A possible cause for this preference can be sought in the indebtedness of modern economics to Aristotle’s theory on trade. Therefore I will now briefly reflect on what this ancient theory entails, and how it suffers when taken out of its context.

The commodity theory of value can be traced back all the way to ancient Greece (Ingham 2004, 7). In *Politics*, Aristotle already distinguished the three functions of money, as maintained by economic institutions to this day. Bjerg (2016, 54) initiates his analysis of the ontology of bitcoin by pointing to a recent report on bitcoin by the Bank of England, which maintains the three criteria from economic theory Aristotle coined in *Politics*. For this reason it is necessary to briefly show Aristotle’s money theory (see figure 1), since many of the incongruences pertaining to money discussed later in this paper can be called anachronisms. Aristotle’s theory of money is framed by his concept of teleology (all things develop towards their *telos*, their goal or end), which leads to this economic treatise being best interpreted as more of an ethical discussion (Meikle 1994, 27). The ends to which money is used as a means can be ethically sound or unjust. The natural exchange of goods, or barter, is just in the sense that it is necessary for people to have sufficient goods to sustain themselves and their families. Using money as a practical intermediary of this practice shares the same end, and is therefore

⁷ John Maynard Keynes (1883-1946) is considered as one of the most influential figures in the development of macroeconomics.

acceptable as well. The practice of accumulating money, says Aristotle, is unnatural in the sense that it does not lead to an end. Commodities have use value and are capable of sustaining human life – money does not, as it is merely a medium of exchange. Trade (buying and selling goods to turn a profit) and lending money against an interest are forms that should be discouraged in the Aristotelian system (Meikle 1994, 28).

C-C

C-M-C

M-C-M

M-M

(Figure 1: The development of the usage of commodities (C) traded (-) for money (M), from barter (C-C) to usury (M-M.)

Through this distinction, Aristotle argues for the pursuit of use value rather than exchange-value. If one seeks value as an end, money is therefore not the object one should accumulate: money ought to be exchanged, to acquire commodities which actually possess use value. This reasoning has shaped economic theory, since “late nineteenth-century economists simply incorporated the well-established theory of precious metal coinage into their theories of marginal utility and supply and demand” (Ingham 2004, 16). This contribution to economic theory has been polished in the 18th century by Adam Smith, who resolves Aristotle’s difficulties with money being treated as an end in itself. Smith states that while a market economy entails business being conducted in an M-C-M form, in which money is the end to which business is conducted, “the totality of those operations produces an outcome for the society that is C-M-C in character” (Meikle 1994, 39); the ethically sound usage of money as a means Aristotle had in mind. In other words: despite the intricacies, any economy merely upholds the circulation of use value commodities.

3.2. The gold standard

The previous chapter served to show that modern economic theory about the value of money stems from Aristotelian theory on the development of money’s usage, which leads to anachronisms and other falsehoods. Note, for example, that Aristotle sought to conduct an ethical inquiry, not an economic one, let alone a study of ontology. It does offer an entry into the discussion on the value of money, since it is now clear that economic theory rests on the commodity theory of money. The problem we are then faced with, is determining what things should be used as money, in order to facilitate the practical solution to barter mentioned earlier. What is this theory of ‘precious metal coinage’, and does this approach offer an answer to the question towards the ontology of money? The answer, we will see, is both a resounding ‘no’ and a careful ‘yes’.

In *Capital*, Karl Marx (2011) conducts a thorough research into the origins of the market economy, defining value, labour power and the root of capitalism. In chapter 6 Marx' value theory will be discussed at length - for now it suffices to show how he opened *Capital*. He starts his seminal work analysing the same process that concerned Aristotle (the relationship between commodities and money) by stating that the exchange of two commodities in different proportions puts forward a 'third thing' (Marx 2011, 18-19). This third thing, the concept of value, is what gets expressed by money, which itself is made up of a precious metal. The question then arises: which precious metal is used as money, and why? Intuitively, gold is seen as this precious material, the standard of value.⁸ There are many factors, political, historical and geographical, which lead to the choice of gold as the standard of value, which until very recently functioned as the material against which many of the world's monetary units are measured (Marx 2011, 93-96; Ingham 2014, 97-101); a point upon which I will deliberate further in part 3.3. For our purposes it is important to note, at this point, that the value expressed by a gold coin and the value of the amount of gold needed to mint that coin are 1:1, symmetrical.

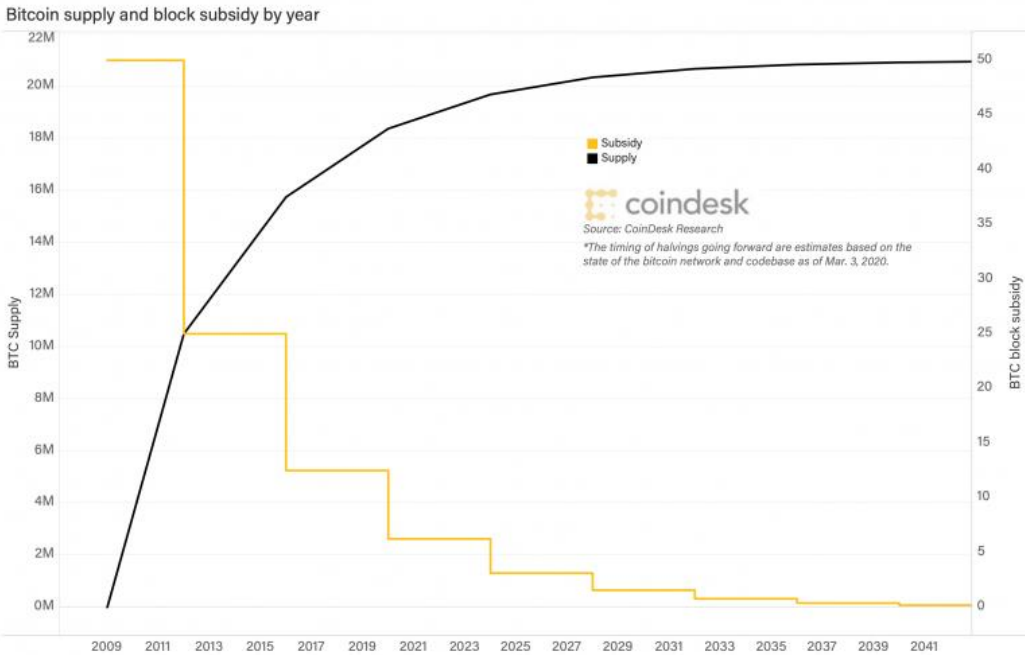
The usage of banknotes as units of monetary value had as a consequence that gold was no longer required for its production. As a consequence, the current alloy of materials used for the production of e.g. a 1 euro coin amount to about 4 eurocents worth (Worstell 2011). This is possible because the people who use modern money don't need a tangible proof of the value of that money: the trust needed to reinforce the claim upon value made by a sovereign is in the monetary system itself (more about this in chapter 4). Extreme cases show how a loss of trust in the economy of a state leads to new usages for money, like the common phenomenon of heaps of banknotes in public bathrooms in Venezuela, where hyperinflation led to the value of a banknote plummeting to less than that of toilet paper.

What this case shows as well is that the material needed for the production of money needs to be finite. In the case of bitcoin, this finite amount is guaranteed through the code, in which it is stipulated that only 21 million units of bitcoin can exist at the moment of depletion (Maurer et al. 2013, 270-1). This development is shown in figure 2, depicting the asymptotic increase of the amount of available bitcoins in circulation. Hyperinflation is caused by states printing more money and entering it into circulation, which drastically reduces the value of the circulating money. In a system of commodity money, in which a finite resource is used as the material for the money circulated, inflation is less of an issue, and hyperinflation practically a negligible risk.⁹ The stability of the value of certain

⁸ There is a lot to say about the trajectories of gold trade in history, from sub-Saharan Africa to Europe and the Middle-East, as well as other pragmatic decisions on the reference material for value tokens, like copper, *Hacksilber* or even beads or shells. It does not however contribute to the argument of this research. For more information, see Ingham (2004), chapter 5 (89-106).

⁹ Despite the rigidity of gold's value, it is of course still susceptible to (hyper-)inflation if large quantities are somehow found and added to gold reserves. An exciting possibility through which this could occur is through the development of asteroid mining technology in the near future, for example.

materials has reinforced their position as the general equivalent of value: gold, most notably, is an object the value of which is robust against most factors that influence value, like wars or other crises. This ‘soundness’ aspect of commodity money has been appropriated by the developers of bitcoin, in order to craft a digital coin which mimicked the validity of a traditional commodity money. I will elaborate on this type of semiotics, called practical materialism, momentarily (chapter 3.4).

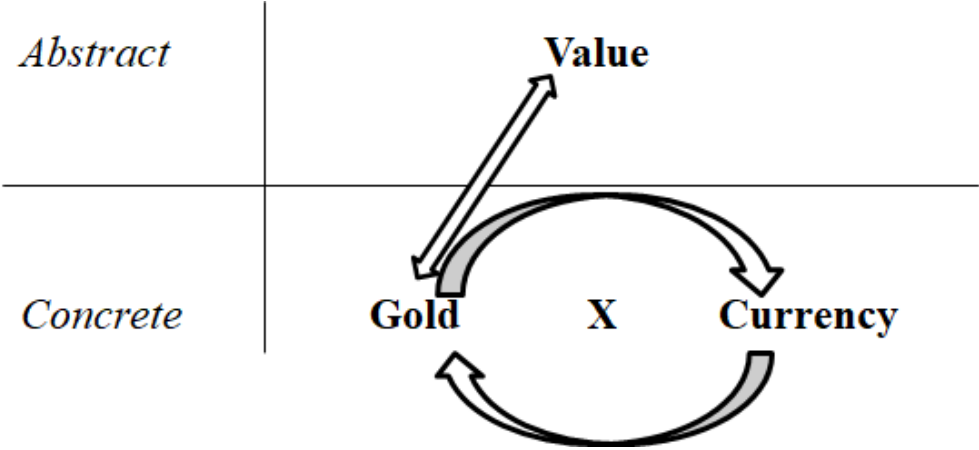


(Figure 2: Bitcoin halving; how bitcoin reinforces its claim on value by periodically reducing the amount of new bitcoins introduced into circulation through mining rewards (‘subsidies’), resulting in a finite amount of possible bitcoins (21 million).

Source: <https://www.coindesk.com/bitcoin-halving-explainer>.)

From this description of commodity money, it appears that this type of valuation is a strong candidate for the ontology we are looking for. Bjerg (2016) contests this, however, by pointing to a void in gold’s value, which leads to a negative ontology in the sense Slavoj Zizek proposed. To illustrate how the choice for a negative ontology applies to money, it is argued that money has no transhistorical essence: “Paraphrasing Lacan’s infamous slogan that ‘The woman does not exist’, our analytical approach to Bitcoin is underpinned by the following assumption: ‘Money does not exist’” (Bjerg 2016, 58). To strengthen this case, Bjerg shows how the value of money, captured from the abstract into the real by connecting it to the value of gold, leads to a paradox. That is: gold itself has no inherent value, save for value with reference to money (Bjerg 2016, 60). Here the circular aspect of value becomes clear, which shows that, in Zizek’s terminology, the value of money is structured around a ‘pure lack’ (see figure 3). In this sense, assuming the commodity theory of money to be a

candidate for the ontology of money in general leads to a careful ‘yes’. It hardwires trust in the usage of money by tying abstract value to real, tangible value; which in turn has been shown to be void. The commodity theory of money is an ontology of money, albeit a negative ontology.



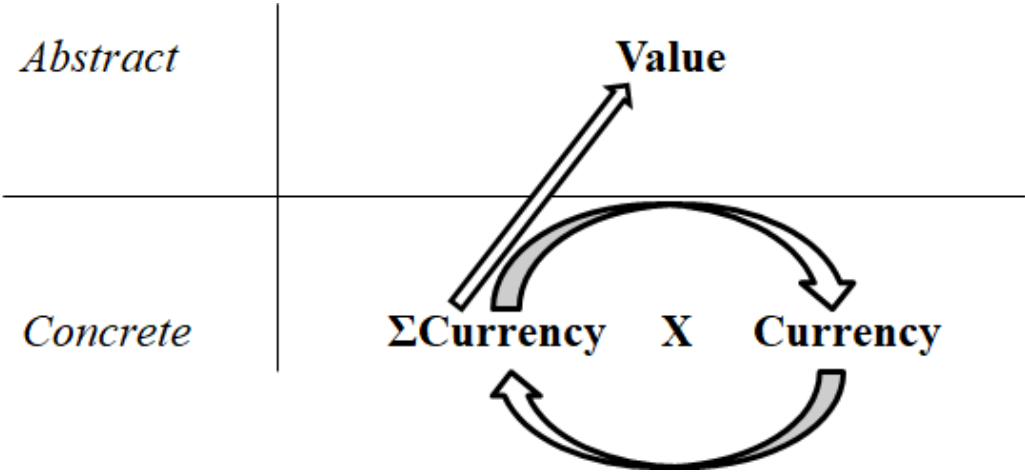
(Figure 3: The negative ontology of gold as the standard of value. Note that the X symbolizes the lack around which the commodity value system is structured, and how it is positioned with respect to the concept of value. Value is abstract, so “money does not exist”.

3.3. Abolishment of the gold standard of value – towards fiat money

Historians, anthropologists and economists typically answer the question towards the material ontology of money with a resounding ‘no’. The reason for this, they argue, is that the commodity theory of money lacks a crucial social aspect (Bjerg 2016, 57-58). This social aspect entails usages of money like the establishment of a standard of account, the phenomenon of debt and the role of banks in an economy (Ingham 2004, 89). In the following chapters I will discuss these notions and their significance for the concept of value. For now, I will deliberate on the aforementioned commodity system of value by discussing what happens when the link between value and gold is no longer deemed necessary for the creation of money.

An accurate way to think about the disconnection of money from gold is by considering banknotes. Since they are money tokens that are not made up of valuable material, the question arises how mere pieces of paper or cloth are capable of expressing value. In other words, the imaginary value people consented to bestow upon precious metals no longer suffices as a theory of value. What remains, then, is the need for people to trust the claim on value money puts forward: the value of money has become dependent on political structures. As the concept of the nation state reached its peak during the course of the 20th century, national governments sought to express the value of their

money not with reference to the gold standard, i.e. the nation’s gold stockpile (or gold bullion in economic terms). Rather, the concept of value is detached from the realm of the physical, by cutting out material value nearly completely. What determines the value of money in this fiat system of money is the supply of money existing in the world (see figure 4). The value of the dollar increases or decreases according to the amount of dollars circulating in the economy, which in turn competes with other national economies to strengthen its position. In other words: the circle of material value has collapsed into itself. Value has become a true void, resting solely on general consensus.



(Figure 4: The fiat system of value. The value of currency is determined by the sum of all existent currency of that type, which in turn also is used to denote value in general, but makes no claim on having an inherent value characteristic in the way gold had.)

As a consequence, the principle of money’s value that it needs to be based on a limited supply of (valuable) commodities, as is the case with gold or bitcoins, disappears completely. In its stead, people’s trust in the money they use and work for becomes synonymous with trust in the integrity of their government, or in the functioning of their national economy with respect to other economies. In the worst case scenario, a corrupt or incompetent government can decide to mint more money as a short-term solution to economic crises, like the plummeted demand of a nation’s prime export commodity (as is the case with the Venezuelan government), or excessive national debt (as was the case with post-WWI Germany). Currently, and over the past decade, United States economists debated the viability of this practice in response to the excessive growth of their national debt. I will not set out the multitude of perspectives to this ongoing debate, save for one notion that is relevant to the concept of value under scrutiny in this research. The notion of the ‘petrodollar’, which conceives of the dollar’s value as being dependent on the United States’ share in the global oil trade, sheds a new light on the development mentioned before. That is, when considering the abandonment of material value through fiat money, the question could be posed whether fiat was either a very short-lived experiment, or a purposeful manoeuvre to create a new general equivalent. The practice of changing the general

equivalent material as an opportunistic political measure is, after all, not unprecedented at all (Ingham 2004, 17-18).

The following chapter will discuss the semiotics of bitcoin. It has been argued that the creators of bitcoin, in an effort to foster trust in the claim on value they put forward through the concept of cryptocurrency, utilised a particular materialist narrative. This shows the influence of physicality on our idea of value and trust, as well as legitimizing the research question we set out with. Why is a string of code valuable? As we will see, the creators of bitcoin conceived of their currency as constituting ‘digital gold’, in an attempt to persuade prospective users not to ask this question – and thereby in a roundabout way reinstating the ancient gold standard.

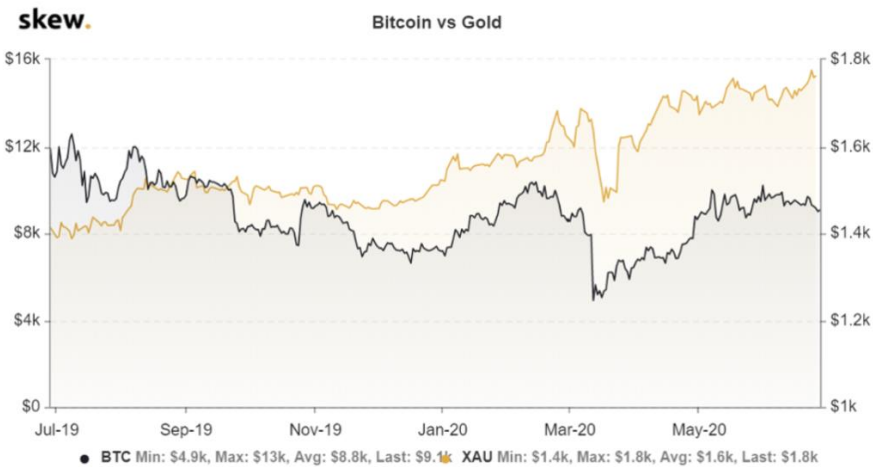
3.4. *Digital metallism and the revitalisation of the gold standard*

In their essay on the practical materiality of bitcoin, Maurer et al. (2013) utilise a poem posted by a user of a bitcoin forum, which details how bitcoin arose as a response to the unsustainability of the fiat system. They purposefully picked the poem to show how users of the blockchain express a certain narrative. This shows the semiotics of bitcoin: the meaning maintained by its user base, which Maurer et al. (2013) deem to be practical-materialistic in nature (261). The values that have been pushed to the background in global market capitalism, like privacy, labour and (as shown above) value, have been built into the code of the blockchain.

The irony at play here is that the move to data being the prime source of value for money in fact rematerializes money. Bitcoin’s practical materialism, which has been characterized as the “embracement of a monetary pragmatics” (Maurer et al. 2013, 262), clearly shows a kind of digital metallism. This term, constructed together with digital materialism from Ingham’s (2004) term ‘practical metallism’, is supposed to denote the narrative of bitcoin enthusiasts in terms that evoke commodity theories of value. Examples of this are ‘mining bitcoins’, rather than minting, an artificial limit to the possible total amount of bitcoin, as is the case with valuable metals like gold that serve to ‘ground value’ in commodity systems, and even the trust in the code, which parallels the old-fashioned trust in the eternal value of gold as a commodity (Maurer et al. 2013, 268-71). Trusting the value of bitcoin means trusting the unchangeable nature of mathematics.

Whether or not Nakamoto (2008) sought to revolutionize our concepts of value remains an unanswered question; Satoshi Nakamoto is a pseudonym after all, which is another measure taken to foster legitimacy – through a foundation myth. It cannot be denied that bitcoin posed a challenge to the dollar and, by extension, most of the world’s currencies, by reinstating the gold standard. It is important here to note the severity of this challenge: a threat to the dollar is a threat to the ‘world reserve currency’, so broadly speaking to money in general. By making users familiar with a

materialist narrative, in a sense deluding them into thinking their ‘coins’ are made up of valuable matter rather than lines of code, bitcoin fosters a sense of trust in the value of money that had been lost in recent times. The corona crisis showed the success of this approach, as it forced stock traders to invest their money in shares that are robust against value crashes due to the crisis. Traditionally this safe haven was gold, and the price of gold skyrocketed accordingly during the past months (De Waard 2020). Bitcoin, however, saw a similar movement, illustrating the trust people have in the soundness of its value (see figure 5). Reverting back to a time when money was valuable regardless of the entities that guaranteed that value, and their standing in (inter)national hierarchy, meant scrapping politics from the equation.



(Figure 5: The values of bitcoin and gold, measured against the US dollar, from 07-2019 to 07-2020.

Note how similar the fluctuations of gold and bitcoin appear after the start of crisis in march.

Source: [https://nieuws.btcdirect.eu/recordhoogte-btc-gold/.](https://nieuws.btcdirect.eu/recordhoogte-btc-gold/))

The foregoing chapter aimed to make clear how bitcoin can be understood as a type of commodity money, through its materialist narrative and the its use as a trusted investment. However, bitcoin is simultaneously not conceivable in terms of a material store of value: bitcoins exist as unique lines of code in digital wallets, and there is no material standard of value used to determine the value of bitcoin. Ironically, this lack of a material reference makes bitcoin’s stock value similar to that of gold, which relies on this material reference as a concrete connection of value to matter. What connects them is their reliance on a finite quantity of diverse valuable elements, which for similarly diverse reasons is expected to be robust against diminution of volume – the gold supply is equally asymptotic as is the supply of computational power. The most important conclusion to be drawn from the foregoing is that a commodity theory of value does not suffice for an ontology of bitcoin. Something more is needed, to which aim I will now focus on the fiat theory of value, which states that in lieu of a material value referent money should be understood as “a creature of law” (Bjerg 2016, 61), i.e. a creature of (blockchain) code.

4

The fiat theory of value

The tendency to utilise a promise to pay at a later moment as a payment in itself, also known as debt or credit, is anything but recent. A telling example is the etymology of the English ‘guilt’, which resembles that of the Dutch or German ‘geld’; they both stem from the old-German ‘geldan’, meaning to be in debt (Etyman 2011). This line of reasoning gives credence to the claim made by Alfred Mitchel Innes (1913) that ‘all money is debt’ (Bjerg 2016, 64). In the next chapter, the credit theory of money, which sees debt as the substance or essence of money, will be discussed in depth. The English debate on the value of money, mentioned in the previous chapter, also saw participating parties which “worried over the increasingly common practice of circulating bills of exchange as a form of currency” (Maurer et al. 2013, 269; Ingham 2004, 41-43). These bills of exchange entailed a mere promise, used as a pragmatic solution to conduct trade during times of shortage. The issue was that the principle of value of these bills of exchange was immaterial: their worth hinged on the value of the autograph the bill was signed with, i.e. the trustworthiness of people. Moreover, exchanging these bills for other bills, actual money or commodities, ‘watered down’ the promises, “to the point where value seemingly inhered only in the social commitments of each to all” (Maurer et al. 2013, 269).

From this 18th century debate it becomes clear that trust (in a currency’s value) and honesty (of payments being followed through) are crucial to the proper functioning of money. It is no surprise, then, that modern economics sought to deal with the issue of trust firstly. The way in which this was established was to nationalize currency, meaning that the state was to be the sole distributor of money tokens. Bills of exchange were adopted, in this sense, by the state, with the addition of a guarantee of its value in the shape of a portrait of an important statesman. The consequence of this measure was that it raised more problems in the long term than it solved in the short term.

This meant, namely, that outstanding debt became a legitimate way of conducting business. Ledgers were no longer under control of traders of questionable integrity, but under control of the government, which might not necessarily have the people’s but certainly the economy’s best interests at heart. Money became valuable because it was recorded, rather than made up out of valuable material. What this means for our purposes, is that the common sense approach of looking for the ontology of value in matter is no longer feasible, since the commodities used to represent value are materially worthless. Rather, the introduction of debt and credit poses the need to formulate a social ontology: a type of agreement in which the essence of value resides. The difficulty this agreement brings with it becomes apparent from the island example mentioned in chapter 2: an agreement among three peers is easy enough, especially given their complete honesty and good intentions. An agreement among an entire nationality requires something more, to account for the fact that not every participant in the system necessarily abides by its rules.

4.1. *The blockchain as a political structure*

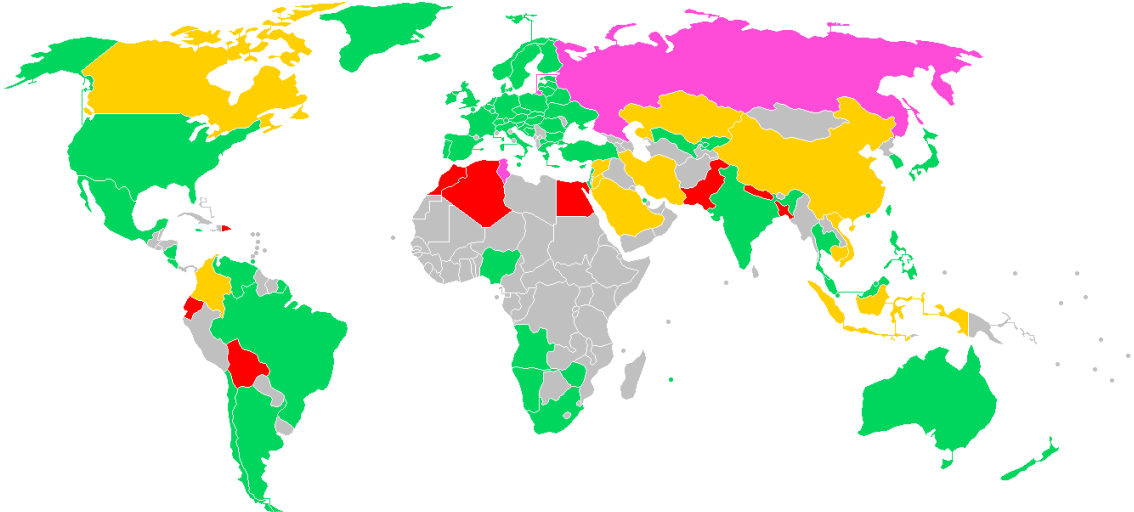
Discussing bitcoin with reference to fiat theory is not as straightforward as its conception as a commodity money, which merely meant following its semiotics. A fiat currency requires a central authority that produces it, thereby giving it its mark or guarantee of value, and a community of people who accept this currency and its claim on value, linking it to a claim on authority. Bitcoin is an explicitly anti-institutional currency, its production decentralized, its community adhering to the authority of cryptography. As mentioned, Nakamoto (2008) stressed that bitcoin was to be seen as a response to the corruption of financial ‘third parties’, as an aspect of late-stage capitalism that was seen as the cause of the great global economic crisis of 2008. It is however possible to denote an institution in bitcoin’s production, in the shape of the blockchain. It seems, then, that while bitcoin puts forward a revolutionary narrative protesting centralized financial agencies, it employs a kind of social technology that structures its user base in the very same way centralized agencies do. Velasco (2017) describes this structuring as a political quality inherent to the technology of ledgers. Invoking Langdon Winner’s seminal *Do Artifacts Have Politics?* (1980), he states that certain artefacts are political in the sense that they “embod[y] a specific form of authority” (Velasco 2017, 714). The ledger is a ‘techno-social assemblage’ which co-evolved alongside central and commercial banks, as a way of dealing with the issue of trust: “Trust can’t be democratized, as it is provided not by the system itself but by the managers” (Velasco 2017, 716).

Here it becomes clear how bitcoin acts as a decentralized currency: it replaces the aforementioned managers with open-source software. Because of this, trust is in fact democratized. Having said that, the blockchain remains a ledger technology, and therefore exerts some kind of structuring power (i.e. politics) over its user base. The usage of ledger technology does place bitcoin in a particular position with regards to governing agencies. Since bitcoin merely exchanges the authoritative figures with an algorithm, the normative framework that allows for power to be exercised by one entity over another stands (Velasco 2017, 716). As a result, bitcoin is tolerated by governing agencies as part of an ‘extensive politics’-design. It is not seen as a new type of counterfeiting, which would mean that the state could simply block bitcoin exchanges from occurring: rather, it is tolerated as a functioning currency outside of state affairs. As examples of this type of currency, Velasco (2017, 716) mentions the usage of the tumin in parts of Mexico and the Bristol pound, which are used as money merely by the grace of the government’s tolerance.¹⁰

This tolerance, and the extensive politics governing agencies maintain with respect to alternative currencies, is motivated by the fact that these currencies aid in the circulation of national currency. Since “the vast majority of bitcoin is traded as a speculative investment” (Smit et al. 2015, 333), most bitcoin transactions are used to generate fiat money, i.e. traded as stocks. This circulation

¹⁰ A more fitting denomination would be the Dutch ‘gedoogbeleid’, which is unfortunately untranslatable.

of fiat money is an important characteristic of national economies¹¹, so any factor that contributes to the economy will necessarily be tolerated by the governing agency capable of blocking threatening exchanges. This is, however, anything but a common approach to bitcoin by governance, as many nations have opted to forbid bitcoin transactions within their borders (see figure 6).



(Figure 6: The legality of bitcoin: accepted in green countries, prohibited in red countries, contested to some degree in yellow and pink countries. Source: https://en.wikipedia.org/wiki/Legality_of_bitcoin_by_country_or_territory#/media/File:Legal_status_of_bitcoin.png.)

4.2. Bitcoin as post-fiat or extra-fiat money

The foregoing chapter was intended to show the consequence of discussing bitcoin in terms of fiat money, a ‘creature of law’: it is possible to consider bitcoin as a political system, since the blockchain exerts a structuring influence over its user base, but it is still prohibited in some countries. In this sense, it is dependent on the political-economic context of a given nation to be deemed either a threat or an addition to fiat currency systems. Considering ontology, bitcoin’s value can therefore be said to be derived from a structuring agency, in the shape of the blockchain and, more importantly, the acceptance of its user base. On the other hand, bitcoin is decentralized; if we were to point to a particular structure or institution as the cause of bitcoin’s value, we would have to account for this crucial characteristic. The following chapter will point to some other aspects of bitcoin which problematize its conception as a fiat currency, making clear that it should be understood more accurately as extra- or post-fiat.

¹¹ The circulation of fiat and its cause, state debt, have been omitted from this segment. For more information on this topic, see Foley (2004).

An aspect of bitcoin that up until this point has not been mentioned is the influence of criminal activity on the growing rate of acceptance of bitcoin. The early years of bitcoin production and trade occurred on a non-categorized part of the internet, called the dark web. A website on this dark web, called Silk Road, traded in illegal substances and services, and to avoid financial third parties tracing transactions bitcoin was the only accepted means of payment. As the site grew in popularity before it was seized by the FBI, the production of bitcoin grew accordingly, as did the amount of bitcoin circulating in this ‘shadow economy’ which has been estimated to equal nearly 10 million bitcoins of revenue (Bjerg 2016, 63). To give an idea of what this number represents: measured against the current rate of exchange for bitcoin to the dollar (nearing 1:10.000 at the moment of writing), Silk Road’s revenue would nowadays have been similar to the GDP of Africa’s more prosperous economies, like Kenya and Ethiopia, making it about the 60th largest economy in the world were it to be considered a sovereign entity.

Bitcoin profited from its characterization as a currency devoid of state interference, in the sense that illegal platforms like Silk Road ‘kick-started’ the currency. Nowadays more and more private enterprises accept bitcoins as a means of payment, though the currency is never demanded as such in the way states demand their national currencies as payment – it is always a mere optional means of transaction. The only notable exception illustrates the complicated relationship between bitcoin and illegal activity. It originated as the currency of the state of exception, but suffers from that narrative with respect to its acceptance. The community of (malicious) hackers demands cryptocurrencies as a ransom for unlocking hacked systems, encrypted with the hackers’ ransomware. This is the only instance where cryptocurrencies are strictly demanded as a payment, which means that the only usage of bitcoin as a fiat currency, by enforcing circulation of the currency, is through illegal activity (Deppen 2018). Any speculation on the possible functioning of bitcoin as a full-fledged currency needs to account, first and foremost, for this practical challenge. Despite being born out of its community, illegality hangs over bitcoin like a sword of Damocles, being ever capable of ending the fostered trust of the general community.

This leads to an extra-fiat definition of bitcoin: a value unit or token that functions outside the reach of public governance. What illustrates the post-fiat definition best is a scenario proposed by the financial commentator Max Keiser (2013), which puts into question the relation between money and nation states. In the case of fiat money, nation states create money and demand it in return through taxes, enforcing in this way a claim upon their national society. In Keiser’s example, this creating property of nation states would be flipped around: bitcoin could be capable of creating sovereignty instead of the other way around. Being very far from being implementable, Keiser proposes that the nation of Palestine, which uses the Israeli shekel, could adopt bitcoin as its national currency (Bjerg 2016, 64). This would result in a great increase in Palestinian purchasing power, but more importantly, it would mean that the Palestine economy would no longer be dependent on Israeli monetary policy. Moreover, the Palestine economy would benefit from the robust character of bitcoin, being immune to

debasement, which would make it one of the strongest currencies in the world. From this example, it should be clear how bitcoin is post-fiat: it transcends the established system of national economies, to the point where it is capable of creating new sovereignty in this system, possibly ending it entirely through a likely snowball-effect of economies adopting cryptocurrencies.

From Keiser's (2013) proposal it should also become clear how bitcoin could obscure the tight connection between government agencies and monetary policy. Bitcoin's past shows how it could be seen as an extra-fiat currency, facilitating exchange in illegal commodities, bypassing the state's capacity to block certain unwanted exchanges from happening. It could evolve into a post-fiat currency, were it able to increase its rate of acceptance so thoroughly, that it no longer requires the authority of a government to guarantee its value. The drawee's name on the bill of exchange would no longer be that of a president, king or chancellor - in the case of post-fiat money, a mathematical equation would suffice.

Up to this point, two theories of value related to money have been discussed, and compared to bitcoin. In both cases, it was made clear that bitcoin borrows aspects from these systems for its own legitimacy. Similarly, it was possible to point to differences in both commodity and fiat comparisons, resulting in the fact that neither theory is sufficient for an explanation of the value of bitcoin. A final theory that has until now been left untouched is that of credit; the system of balances most closely related to the island example of chapter 2. This system, after all, requires neither a material reference of value, since the balance numbers were imaginary, nor a central agency that guaranteed the value of the numbers. The value of the numbers was absent; all that was required for the system to work was its continuous operation. In the following chapter, I will discuss the role of banks in our society, which will bring us to the conception of bitcoin not just chronologically but also theoretically, as we come close to the exhaustion of available value theories of money.

5

The credit theory of value

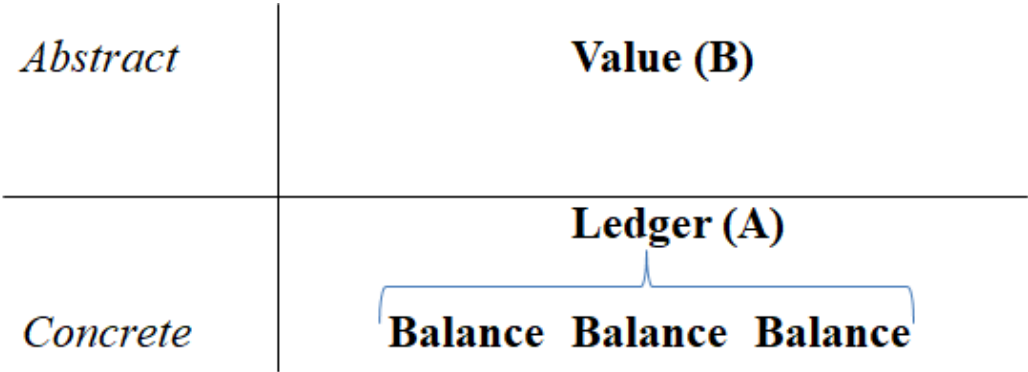
In chapter 4.1 it was mentioned that bitcoin originated as a protest against the corruption of financial third parties. The housing market crisis of 2008, less than a year before bitcoin was launched on the darkweb, is generally seen as the event that triggered this response. Given this typology, bitcoin is accompanied by several other protests that focused on late-stage capitalism, direct or implied, as the root of injustice and inequality in society. Together with these social movements, the crisis “resuscitated debates on the labour theory of value that had gone silent after the 80’s” (Collins 2016, 103-4). Academics directed their attention towards Marx for answers to contemporary crises of value, in which they saw the augured fall of capitalism, which Marx denoted as an unsustainable system. They were strengthened in this belief by the social movements which directly blamed capitalism, and did not need theorizing to be categorized as an attempt to redistribute labour, or to make it visible.

The most obvious example is the Occupy movement of 2011, the occupation of Wall Street reminiscent of the sit-ins from the 70’s. This worldwide movement against the ‘corporatization of people’, by viewing them as tools to turn a profit from, has been called a modern class struggle (Fuchs 2014, 318). The movement conceives of itself as ‘the 99%’, protesting against the disproportionate wealth of the richest 1% of society, which shows how this protest is a clear attempt to redistribute value. The way to do this, according to Marxist theory, is by “allocating social labor to activities materially necessary for the reproduction of the historically specific political economy” (Collins 2016, 109). In chapter 7.3 it will be shown how this means valuating labour by making it visible through rewarding it accordingly. Before that, in chapter 5.3, the cause of the 2008 crisis will be discussed – as originating from the reduced value of fiat currencies. The following chapter is intended to discuss the credit theory of value as the root cause of this reduced value of fiat currencies, and to set the stage for the discourse of social movements that is required for an answer to the question towards the excessive value of bitcoin.

5.1. Banks: ledger technology and fractional reserve banking

The third ontological formulation of monetary value is that of debt and credit. In a nutshell, the credit theory of money states that all money is debt (Bjerg 2016, 64). From this usage of money as outstanding payments comes the liberation from reliance on any value-commodity – all that remains is trust in the system. This system will have to guarantee that transactions follow through at a later date for the system to work, after all. Not all debt is similar: once more we have retreated to the system in which a bill of exchange is worth just as much as the name of the drawee, and the trust we put in that

name to follow through on their promise. Value therefore inheres solely to the social commitments of each to all, just like it did in 18th century England (see chapter 3.1). From this reasoning it becomes clear how credit theory follows from fiat theory: it removes the reliance on matter as the physical expression even further by also striking the governmental claim on value from the equation. All that is required for money to have value is its usage in a particular context, or by using the correct (bank-issued) technology. The claim on value comes from convention, which makes this system very similar both to the island example as well as to bitcoin: their value stems from their usage of a shared ledger (see figure 7).



(Figure 7: The credit theory of value. If A, the ledger comprised of balances and movements (transactions) between these balances, accurately records the balances, then the things that move around between balances are said to have B, value.)

In our current system of money usage, at which point we have now arrived, we utilize both credit and fiat systems. That is to say: we can pay with cash (state issued fiat money), or with a credit- or debit card (any commercial bank’s credit money). To understand how these two usages of money are different, a preliminary distinction should be addressed: commercial banks circulate credit money, which exists only as a number on a ledger, whereas central banks maintain (and produce) the state’s fiat money reserves.¹² In the latter building, then, you will find guards and safes, since fiat money relies on physicality for its value still. In a commercial bank, however, this is not the case: commercial banks do not need physical reserves of value commodities. They rely solely on their ledger, consisting of the balances of private customers. It is exactly this phenomenon that problematizes our current economic system. It is vulnerable, since all it relies on is this ledger: hack the digital ledger and

¹² During the autumn of the year 2020 a number of central banks, including those of the Netherlands, Sweden but also the European Union, have expressed an intention to launch a digital version of their national fiat currency. Through this measure, they intend to reaffirm their grip on money circulation in their respective economies. This is a response not just to the credit money of commercial banks, but more directly to privately owned instances of digital currencies, like the Libra coin. In October of 2020, many news outlets (see Beunderman 2020) reported the plans of the European Central Bank to design its own ‘digital euro’, which shows the potential consequences for European societies instigated by the invention of bitcoin in 2009.

destroy physical copies and you essentially erase digital money from existence. Furthermore, this practice leads to the possibility to speculate with large sums of money, the creation of which is possible literally by adding zeros to the holdings of a commercial bank. In other words: commercial banks are capable of producing money out of nothing (though in practice, this only occurs within reason). This is called fractional reserve banking, the creation of credit money up to the point where it no longer stands in any reasonable comparison to the fiat reserves a commercial bank holds. Speculation with this type of money, in the shape of (second and third) mortgages, is what led to the 2008 crisis of value in the United States, which in turn gave rise to the ‘protest currency’ of bitcoin (as will be discussed in chapter 5.3).

From this definition of the way in which we currently use money, Smit et al. (2016) define money as a mere position on what they call a ‘relative ratio scale’. They arrive at this point in search for a brute object to function as money using Searle’s theory on institutional reality¹³. In the case of fiat money, one is perfectly capable of pointing at the object functioning as money. In the case of credit money, however, finding a brute object is anything but straightforward. To explain why credit money still functions as money, it is necessary to figure out what the brute object is that counts as money in this context. Smit et al. (2016) arrive at the conclusion that “Searle’s X-term can be taken to refer to a brute object, namely a position on a ratio scale” (339). Searle’s brute object is a number, which functions as a position on the grand scale of personal wealth of every respective inhabitant of a nation. Any transaction, then, is a movement up or down this scale. This is how our current system is best understood, and how it is possible to approach money under the assumption that it is nothing but debt. The concept of value resides in a type of convention, the practice of exchange.

Here it is possible to, once more, discuss the way in which bitcoin adopts crucial aspects of another monetary system. It should at this point be obvious that what bitcoin takes away from the credit system is its ledger technology. The blockchain is a concrete manifestation of the ratio scale which functions as the abstract entity that makes money valuable. That is to say: bitcoins have value because their production or transaction is traceable in this enormous shared ledger. Another aspect of money Smit et al. (2016) mention, and that bitcoin borrows on a macro-scale, is the fact that money can be viewed as a protocol to be implemented, or a type of software. As is the case with credit money, it does not matter which object is used to circulate value. It is even possible to leave this part of Searle’s equation (the brute object) vacant, since a position on a ratio scale in the form of a number counts as a brute object as well. It is tempting to discern a pattern, at this point, of a movement away from value over time. Whereas the previously discussed commodity and fiat theories still maintained a

¹³ A discussion of Searle’s theory of institutional reality does not contribute much to the argument put forward in this research. For the sake of clarity I will briefly summarize it here: in order to explain why any given object exercises a function that does not necessarily stem from its material structure, Searle proposes an ontology of institutional objects, that is objects that exercise a particular function within a particular context. In the case of money, this serves to explain the discrepancy between the value of a banknote and the value of the paper that it was printed on. For an elaborated discussion see Smit et al. (2016, 328-29).

connection to value (see figures 3 and 4), in the sense of a concrete manifestation of this abstract notion, the credit system separates money from value completely, in that it makes no claim on value. It should be noted, however, that ontologically speaking none of the systems discussed have approached value accurately. It is, after all, an abstract notion, a Platonic Idea or a Kantian *Ding an sich*. The only means we have of approaching such a concept is by expressing it in more tangible, concrete ways.

An illustrative analogy used by Smit et al. (2016, 334-35) to describe credit money is that of chess notation. The physical game of chess can be conceived of as the interchange of positions on a ratio scale, through the practice of move notation. Moving one of the pawns at the start of the game could be noted as 'e2-4', or simply 'e4', which is analogous to moving the pawn in real life as far as the game of chess is concerned. This practice enables chess players to play a game of chess without even touching any pieces, but by simply responding to one another with commands of the aforementioned type. In the same way, computers have been programmed to play chess using this notation system, famously surpassing human performance decades ago (Ensmenger 2011). The point of this story is to show how electronic money, commercial bank's credit money that is, can be used as legitimate money: in the same way 'e4' is used as a move on a chess board.

5.2. *Bitcoin as post-credit money*

At this point we are able to provide an answer to one of the questions that urged this research: why are bitcoins so valuable when they're basically nothing but code? As we've seen, the money on one's bank account has value for similar reasons – "Bitcoin is no more fake than more conventional forms of money" (Bjerg 2016, 68). It is nothing but a number, a position on a ratio scale. Moreover, both bitcoin and credit money have the capacity to be seemingly 'created out of thin air'. Once again it is however also possible to discern differences between bitcoin and credit money, some of which could lead us towards an answer on the second initial question towards the surge of the value of bitcoin. These differences are that they're sanctioned¹⁴ by fiat money (Bjerg 2016, 66) and the blockchain respectively, as well as that bitcoin is not actually produced out of thin air. Of course, neither is credit money, since an insignificant action is required by a human (drawing a zero behind a balance, for instance). But in the case of bitcoin, every single token represents an ever increasing amount of computational power, made possible by digital labour. This is a crucial concept for understanding the value of bitcoin, and thus I will build towards it in the following chapters.

Another striking difference between bitcoin and credit money is the fact that the latter can have a devastating effect on the nation in which it operates. The fact that fractional reserve banking allows commercial banks to have a disproportionate amount of credit money to their fiat reserves, gives them a direct power over their nation. This nation, in turn, depends on the capacity of commercial banks to create new money for several reasons, the most pressing of which is that if a

¹⁴ Meaning that credit money is not just expressed in terms of fiat money (you have x amount of euros in your bank account), it also functions as the medium through which the state circulates currency.

commercial bank collapses, “they tend to take with them their host organism”¹⁵ (Bjerg 2016, 67). Curiously, despite this power of commercial banks, they have to indulge in the fact that not only their credit money circulates the economy of their ‘host nation’. Fiat cash still exists, and these banks only possess a fraction of it when compared to the sum of the credits they issue. As a result, any bank will fall when people decide their money is safer at home than at their bank. When they retrieve their money from their balances *en masse*, they will find that their bank does not have their money; it doesn’t exist in a tangible form.

To avoid this scenario, appropriate measures have been taken in recent decades by banks and nations alike, in order to avoid this impending doom scenario. These measures are firstly the promise to their customers that they can retrieve their money whenever they wish to do so, at a bank facility or an ATM. This is of course a downright lie: the banks make sure that there is enough fiat money in their reserves to facilitate minor withdrawals, but if the majority of their customers were to withdraw their money, they would still get into trouble. The fact that they don’t, is because if people believe this fantasy of their money resting safely in a vault somewhere, within reach at the push of a button, the majority won’t feel the need to retrieve it (Bjerg 2016, 66).

A second measure used to avoid massive withdrawals of fiat is less subtle. For reasons of convenience and safety, people in the Netherlands have been urged by state-financed advertisement campaigns (see figure 8) to use their debit cards to pay for purchases, rather than to pay with cash. Not only is this faster and more convenient (or even mandated in times of corona), it is safer for any merchant to have a cache of electronic money, a balance untouchable by robbers, as well as convenient since they no longer have to undertake a perilous journey to the bank with their accumulated profits. Here it shows how a nation’s culture and politics reinforce certain behaviour in their society. The Netherlands’ economic dependence on its commercial banks led to these advertisement campaigns, which in turn led to a culture of quick, convenient transactions (*tikkies*). This development has continued up to a point where large payments are generally not just refused in cash; they serve as a signal of criminal activity.

¹⁵ Bjerg (2016) utilises a narrative of a parasitic relation of commercial banks to the nation(s) in which they operate.



(Figure 8: Advertisement campaign in the Netherlands promoting electronic payment. Many varieties of these slogans exist nowadays, all discouraging traditional payment in cash. Source: [https://www.pin.nl/webshop/pinnen-ja-graag/.](https://www.pin.nl/webshop/pinnen-ja-graag/))

A collapse of bitcoin would have less drastic consequences: it would lead to investors losing a lot of money and many people losing their livelihood, but the state would be unaffected. Moreover, whereas bitcoin may be sensitive to demise through e.g. hyperinflation, some authors (Velasco 2017, 717) have argued that blockchain technology plays a more important role in that it could be applied to many future technologies. Interestingly, because bitcoin cannot be produced in a ‘fractional reserve’ way, the two systems of money are incommensurable. A bank cannot issue credit using bitcoins, since in that case, it could not demand interest in bitcoins: they do not share this dynamic property (Aristotle’s M-M, figure 1) with traditional types of money. Through this practical incongruence, we can lift the veil over the ongoing debate on bitcoin’s future. The fact that a bitcoin bank is a financial structure which is at this point largely hypothetical, means that an actual implementation of bitcoin in society, as a valid means of exchange, requires a revolutionized global economy. The pandemic is oil on the fire under this debate, since no one is sure about the shape of the economy once normalcy is attempted at some point in the future.

5.3. Occupy

A consequence of the dominance of credit money was, as mentioned before, that it allows for speculation with money to an unprecedented extent. More than ever before the phrase ‘money does not exist’ finds its expression in the behaviour of e.g. stock brokers. Naturally, this practice is anything but sustainable, and has resulted in a number of crises: most recently in 2008. The global economic crisis of 2008, and the consecutive revolts around the world, proved to be a key event for capitalist societies in general. Without going into technicalities of financial jargon, the culprit of this crisis could be

reduced to the practice of ‘democratizing credit’¹⁶, which expressed itself mainly in advertising second mortgages to people who could not afford to pay off these excessive amounts of money. Once debt accumulated and people found themselves unable to pay off their debts, the financial institutions which marketed the mortgages got into big trouble, as they missed out on calculated revenue. Not only did people lose all their possessions as a result of their inability to pay off their debt (as famously portrayed by Michael Moore in the documentary *Capitalism: A Love Story*), dissent with the economy was exacerbated by the federal decision to bail out financiers rather than the people. This is another crucial aspect of the 2008 crisis, as it showed the dependence of national governments on financial institutions. Since the economic crisis resulting from this United States affair was felt in every economy worldwide, a multitude of protests rose up as a response. Most aimed at the economy, some at the government like in Arabic nations, and most notably one aimed at monetary practices – bitcoin in 2009. At the epicentre of the crisis, Wall Street, New York, a group of people structured by social media initiatives sought to set up camp, declaring themselves to be ‘the 99%’ rebelling against the immoral practices of the rich ‘1%’.

Not just the explicit revolt of a group of people against capitalism in general is of key importance to the topic of this thesis. The fact that Occupy gained traction in virtue of the usage of social media as an organizing principle, or a technological instrument facilitating structured protest in a decentralized shape, is a key point of interest here. It signals the context of modern protests, as situated in digitally connected groups of likeminded partisans. The ability to connect with the likeminded offers an explanation for the great increase in revolts around the world, now more connected than ever, which in turn shows why Marxist theory has become a revitalised theoretical framework in academics. In this sense, the revolt against capitalism is not the only parallel between Occupy and bitcoin. Both are organised around a digital medium that allows for the structure and according traction among a significant part of society. In this sense, Occupy is an expression of the sentiment of the 99% as a response to the economy, as much as bitcoin is an expression of the wish to start a currency from scratch for the deep web community, eliminating immoral aspects of existent transaction systems.

This narrative is intended to situate bitcoin in a context of revolt against the order of things. Since a revolution entails not just a radical change, but also a continuation of elements from the previous system, it is fitting to speak of bitcoin as a revolutionary currency. It borrows aspects from conventional currency systems, while also revolutionizing the way we think about value. To support this latter point, I will discuss a theory of value left mostly untouched in the foregoing chapters. As becomes evident from the fact that, contrary to conventional currencies, bitcoin is produced by the people themselves, it is necessary to look for the cause of bitcoin’s value in this new aspect. I maintain that bitcoin is more valuable than traditional currencies because it departs from the traditional aspect

¹⁶ Best understood as ‘turning people into corporations’. This meant that the speculative behaviour made possible by credit systems of value was applied to citizens, who could not deal with the consequences.

of currency being created by a state or a bank, and democratizing this creative capacity. Bitcoin is valuable because it is the first of its kind to be created by anyone with the tools to do so.

To this end, I will discuss the labour theory of value in the following chapter. I will use Karl Marx' *Capital* to be able to show how value originates from labour, in order to be able to formulate a fitting value ontology for bitcoin. The labour used to create bitcoins is, however, different from our traditional conception of labour, in the sense that we speak of digital labour required to mine bitcoins. Using the theoretical frame offered by Marx, I will elaborate on digital labour in chapter 7, which will allow me to answer the question towards the excessive value of bitcoin. In addition, I will discuss the nature of bitcoin as a type of informational commodity, and how it differs in this regard from previous types of money. At that point, it will also become clear how the protest character of bitcoin contributes to its excessive value.

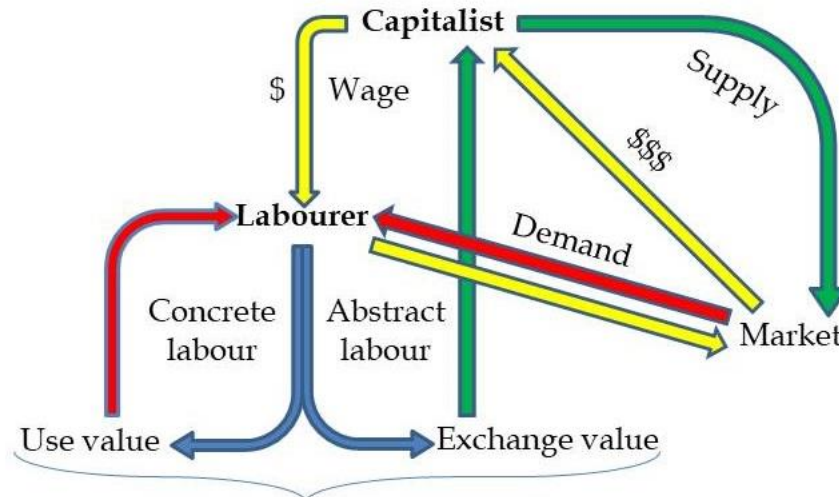
6

The labour theory of value

In the contribution of John Locke to the English debate of chapter 3.1 two theories of value were recognized. The commodity theory of value, stating that value resides in objects in virtue of the people's consent in bestowing the object with this value, has shaped the way we have thought about value throughout the development sketched in the preceding chapters. The labour theory of value, however, has received less attention. Karl Marx responded to the capitalist mode of production that became prevalent in Europe after its industrialisation with an analysis through the lens of the labourer. In doing so, he laid bare a process of systematic exploitation on the basis of a revived labour theory of value. Society, he maintained, had taken the shape of a class struggle between Labour and Capital (henceforward the two respective classes are capitalized, in order not to confuse them with e.g. the activity of labour), as a result of the rise of factories that disconnected the worker from their product. Technology plays a key role in this development as facilitating factor of the shape of society. I will start by showing what Marx' value theory entails, and how labour becomes part of a commodity as its inherent value, which we approach by giving it a 'value-name', a price.

6.1. Use value and exchange value

Capital is a collection of three books, describing the historical origins of the Western class society. In a nutshell: the need to produce commodities for the sustenance of the general population (food, cloth, etc.), together with historical developments like the industrial revolution, divides this population in a producing class, called 'Labour', and a class commanding this producing class, called 'Capital'. Marx shows the unsustainability of the capitalist socio-economic system, and conceives of history as a dialectics of the struggle of the oppressed labourers against capitalists, the latter of which tend to disregard Labour's human values in order to increase profits. For our purposes, we need only be concerned with the first chapter on value theory, since it contains a formulation of the way in which labour functions as the principle that gives commodities their value, as 'abstract social labour'.



Primitive (feudal) - **Commodity** - Market economy

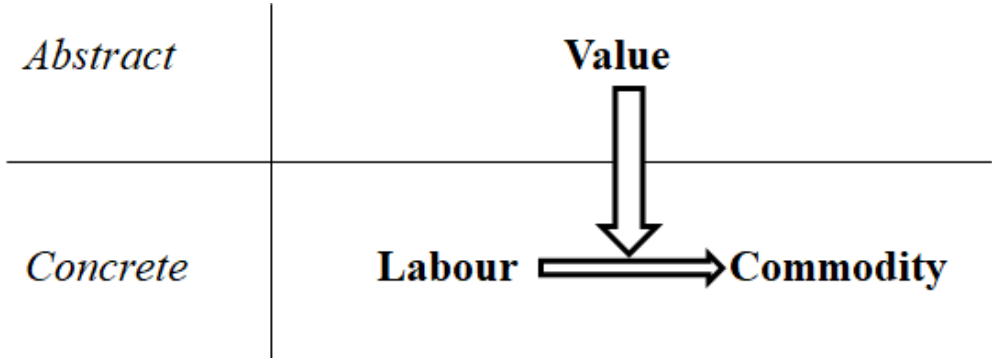
(Figure 9: Visual representation of Marx' argument in chapter 1 of Capital. Blue arrows represent production; red arrows represent consumption; green arrows represent movement of commodities; yellow arrows represent movement of money.)

The starting point of Marx' analysis is the commodity, "the elementary form of capitalism" (Marx 2011, 17). This commodity has two possible functions, if taken in isolation: it can be consumed or used, in which case it possesses a certain use value, or it can be exchanged for other commodities, in which case it possesses a certain exchange value (Marx 2011, 17-18). In order to produce the commodities necessary for one's subsistence, like food and shelter, labour is required. This process, then, can be characterized as "a process by which man, through his own actions, mediates, regulates and controls the metabolism between himself and nature" (Fuchs 2013, 29). Marx, as did Locke, noted that this process of creating use values from nature requires technological instruments, as a sort of mediator that facilitates the expenditure of labour power into something else, a product. A product is a use value if it is a commodity comprised of natural materials altered to fit human needs through the use of labour-power (the time and capacity of labour) and labour-instruments (the required technologies). It is important to note, at this point, that Marx, along with preceding labour theory of value theorists, stated that technology or tools are a necessary element in the labour process.

In a feudal society, everyone would dedicate their time and labour to the production of the commodities which they needed for their own and their family's sustenance, unless one ought to dedicate their labour to a noble. For Marx, the technology that determined the mode of production of a certain age in turn determined the shape of its society: "The handmill gives you society with the feudal lord; the steam mill, society with the industrial capitalist" (Singer 2000, 49). In the next chapter, this claim will be followed through using bitcoin, which will allow me to show how the notions of production and technology can be used to make claims about or current society. Labour that aims to

sustain the life of oneself, or one’s family, is called concrete labour. In figure 9, this is the production/consumption cycle represented on the left. At this point it is appropriate to point at the distinction between labour and work (Fuchs 2014, 25-26); the latter being more general, as describing the fundamental human productive activity describing the interplay between nature and man, resulting in use values that satisfy human needs. The former, however, produces exchange values, which entails that the worker produces not for himself, but for a capitalist that exploits his labour, and alienates him from the product of this labour.¹⁷

The focus of the value analysis lies with exchange value: the type of commodity facilitated by an industrial mode of production. Since machinery¹⁸ allows for the production of an amount of commodities far greater than the amount necessary for subsistence, the value of certain quanta of commodities, with respect to other commodities, becomes an issue. To determine what amount of commodity A constitutes a given amount of commodity B, it is necessary to introduce an abstract concept of value in order to compare them. To arrive at this abstraction and formulate a system of exchange values, trade and economy, physical entities will have to be connected to abstract entities (hence we speak of ontology). Marx proposes that a ‘general equivalent’ is required: an agreed upon commodity that functions as a physical expression of the concept of value, or “the necessary mode of expression, or mode of appearance, of value” (Marx 2011, 48). In a capitalist society, the general equivalent serves as the thing that allows for exchange by reducing several distinct qualities (commodities’ use values) to a singular aspect, a unity. It is at this point where the money ontology of the previous chapters becomes relevant, as this connection of the physical to the abstract required the selection of a general equivalent commodity, like gold. The novel aspect of Marx’ analysis, however, is that he points to another physical aspect of use values. That is: the amount of labour expended in order to create the commodity.



¹⁷ This distinction has been widely criticised after the publication of *Capital*, most notably by Hannah Arendt in *The Human Condition* (1998).

¹⁸ Marx, like his contemporaries, speaks about machinery rather than technology, which is a term coined later as a newly found term better describing the machines used in society. See Marx (2010, 562) for a discussion on the historic context of the appearance of the word ‘technology’.

(Figure 10: The labour theory of value. Value resides in the process of producing a commodity. Labour in isolation is not valuable: value can only be approached, as mediated by money, through an assessment of the labour inherent to a commodity.)

6.2. *The class struggle and surplus value*

Labour occupies a particular ontological position, in that it is considered as both a non-physical activity as well as a physical commodity to be sold. Hence we speak of goods and services in trade, rather than just about commodities. Moreover, labour becomes the constituent of value through its exertion in a production-setting: “value first appears as undifferentiated human labour” (Marx 2011, 44). This discourse shows the complicated nature of labour, especially with the added political qualities Marx associates with it through the class struggle. As proposed by Coeckelbergh (2015) in a consideration about bitcoin’s ontology, labour’s complex ontological dimensions are also best captured by the notion of mixed ontology; the mixed categories labour belongs to are constitutive of its ontology, which allows it to perform several distinct performative roles (Velasco 2017, 720). For Marx however, the focus lies with the discrepant views of the two classes, Capital and Labour, towards labour as activity and commodity. For Labour (defined as poverty), labour is a personal commodity which necessarily needs to be sold to capitalist employers, to be rewarded with a general equivalent that allows the worker to acquire their means of subsistence. For Capital (defined as wealth) on the other hand, labour is a use value in the sense that it is exerted under the command of the capitalist. That is: in order to sustain itself, and accumulate wealth, Capital requires labourers (subjects) to produce values by objectifying their labour power. Another consequence of this practice is that labour can never be the labourer’s property: they are separated from each other since the labourer only exerts their labour under the command of a capitalist. Because of this, labour is seen as a non-value, or absolute poverty. This is the paradoxical nature of labour, “absolute poverty as object, and the ‘general possibility’ of wealth as subject and activity” (Fuchs 2014, 48). In chapter 7, it will be made clear why this definition of labour as absolute poverty matters in the context of bitcoin and its value. It should be noted however that the labour theory of value mimics the commodity theory of value, in the sense that both utilise a negative ontology in their conceptions of value: they revolve around a lack and absolute poverty respectively.

Up until this point, Marx’ analysis of the Western market economy could be called an analysis through the lens of labour, laying bare a historical development that shows the disconnection of the labourer with his product, i.e. the alienation of labour. The controversial novel aspect, or as Friedrich Engels stated during his oration at Marx’ funeral, “the great discovery” (Singer 2000, 66), is that of surplus value. In figure 9, I have tried to show that the payment for the commodities sold on the market to the capitalist outnumber the payment of the capitalist for the labourer’s labour time in the shape of wages. It has been stated that Capital seeks to increase itself as its primary, defining function.

It does so by generating surplus value: production that accumulates on top of the production that was strictly necessary for the labourer in order to sustain themselves. Through the payment of wages, a capitalist ‘buys’ the labourers labour time, say eight hours a day. The dynamic character of labour power, i.e. the increase of the output a worker generates through increased skill or improvements to the technology he or she utilises during their work, means that that their output requires less labour time. However, despite only needing to work, say, six hours a day to meet the demands of their employer, the bought labour time is fixed. The remaining two hours, in which the worker exerts unnecessary labour under coercion of the capitalist, generate surplus value for this capitalist: profits. These profits in turn serve not only to increase capital, but also to keep wages at the right level – high enough to assure the ‘reproduction of labour’¹⁹ but low enough to keep profits at the highest level possible. The labourer only receives a fraction of the value they create, and actively contributes to the increase of their employer’s wealth. For Marx, this is the foundation of the class struggle and the cause of capitalism’s unsustainability.

The shape of the dialectic of the class struggle appears in the form of protest, expressed in the form of worker strikes or union protests. These protests are caused by a disapproval on the level of prices: prices for the worker’s labour, or on the market as overly high priced commodities. In this instance, consumer protests take many shapes, like producing one’s own commodities rather than buying them on the market, or seeking out ways to acquire cheaper commodities elsewhere. Competition among capitalists assures a balance between the need to raise prices and keep customer numbers at an acceptable level. Nevertheless, consumer protests are a common occurrence in our society. The price of most commodities in the Netherlands are nearly double the price of those in Germany, so shopping across the border is commonplace in border regions. Chinese webshops offer commodities for a fraction of our own retail price, and many have utilised their service in recent years. A consequence of the roughened competition on a global scale among capitalists is an according increase in the neglect of values, of labourers in developing countries or environmental/animal values in Western society. A recent example is the treatment of animal life in bio-industries, which resulted in a lower price of meat than plant-based products. Societal protests against the devaluation of animal life have taken the shape of advertisements like in figure 11, urging a change in consumer behaviour by appealing to their sense of morality.

¹⁹ By reproductive labour domestic labour is meant, meaning labour necessary for the renewed capacity to work under the command of Capital. Activities like cooking, buying groceries and cleaning are considered as reproductive labour, which meant that feminists actively participated in labour debates on value, as they deemed this type of labour not appropriately valued or exploited (Collins 2016, 107).



(Figure 11: Advertisement declaring the difference in price between corn and processed chicken meat an outrage in the Netherlands. Source: <https://www.wakkerdier.nl/persberichten/wakker-dier-is-gesol-met-ah-kip-zat/>, accessed 23-07-2020.)

Marx stresses the difference between value and price by calling price the “money-name of the labour objectified in a commodity” (Fuchs 2014, 51). By this, he means that price is a mere assessment of value, subject to change over time. This reasoning allows Marx to defend his labour theory of value against criticism from other economic theories, like Keynesian economic theory in which demand rather than labour is taken to be the constituent of value (Denis 2018), or even modern readings of *Capital*.²⁰ The labour theory of value is not capable of predicting price: it alludes to a subjective value-concept, around which price fluctuates under the influence of push- and pull factors instigated by the respective classes.

At this point we are equipped to discuss how bitcoin fits the narrative of Marx’ labour theory of value. Essentially, bitcoin exerts the function of a general equivalent, as a type of money. However, rather than being a traditional general equivalent, that is a material which has been designated to serve as the valuable object with which value, as abstract labour inherent to a commodity, can be expressed, bitcoin is itself produced. In this sense, the value of bitcoin coincides with the value of its inherent abstract labour. This is the revolutionary aspect of bitcoin as a type of money: rather than exerting the function of a mediator between commodities, it is itself an expression of value in a direct sense.

²⁰ The interpretation of *Capital* is the subject of debates that occur to this very day, like the *Neue Marx-Lektüre* debate in Germany starting in 2008, in which adaptations to the first version of *Capital* have been deemed overly simplified for the sake of reaching a greater number of readers outside Germany (Fuchs 2014, 40-45).

Through this formulation of the value of bitcoin we have moved beyond the Marxist narrative that served to explain the function of money as a mediator between commodities. As we will see, however, bitcoin poses not just a departure from the labour theory of value, as practice has shown a more traditional form of labour, ironically enough mimicking mining work in developing countries (Calvão 2018).

This is of course a preliminary answer that raises more questions than it answers. In the following chapter, these questions will be answered to arrive at a conclusion which serves to answer the question to bitcoin's value: we know how it takes its shape as a direct expression of the labour used to produce bitcoin. However, firstly, we don't know what kind of labour is practiced to produce bitcoin, as the nature of labour determines the value of the commodity it produces. Secondly, we don't know what kind of commodity a bitcoin is, aside from the fact that it is a general equivalent, a medium of exchange. Bitcoins are not tangible, but they exist as a kind of credit money, i.e. a number on a ledger. How are these types of things producible commodities? And thirdly, how can we explain the magnitude of bitcoin's value given these discoveries? When the answer to these questions is known, it is possible to attempt to outline an ontology of bitcoin.

One of the most influential developments of the past decades is the internet. It seems impossible to mention an aspect of society that has gone untouched by this technological innovation, which led some to believe we stand at the dawn of a digital era or an information age (Bynum 2016, 203-4). Naturally, the internet has not left the economic sphere untouched, which implies that the commodities that make up economic circulations have also been influenced by digitization. To understand the consequences of the internet to the mode of production facilitating economies at most localities of the Western world, it is necessary to understand how traditional labour became digital labour, “a concept that has become a crucial foundation of discussions within the realm of the political economy of the Internet” (Fuchs & Sevignani 2013, 237).

A first attempt at understanding digital labour could be taken by considering the role of technology. In chapter 6.1 it was stated that technology necessarily mediates labour, as labour-instruments facilitating the labour process. Defining bitcoin mining as digital labour requires us to point at the technology that mediates this labour, which shows the different nature of digital labour compared to traditional labour. Moreover, it allows for a claim about the structure of contemporary society, which necessarily is structured by the type of technology used in the production process (see chapter 6.1). In addition to this consideration, it is necessary to elaborate on a number of key aspects of digital labour, like alienation, play labour and informational commodities.

7.1. Alienation and play in digital labour

By exploiting the worker’s labour-time in an industrial mode of production, the capitalist alienates this labourer from the work he is performing. This alienation is crucial to the exploitation of labour and the resulting accumulation of wealth by Capital, and it occurs in many aspects of the production process. Essentially, the worker needs to be disconnected from any kind of property in a work-setting. To arrive at this point, “the worker is alienated from (a) herself/himself because labour is controlled by capital, (b) the material of labour, (c) the object of labour and (d) the product of labour” (Fuchs 2014, 32). This fourfold alienation can be interpreted as being Hegelian in nature, since both the subject and object of labour as well as the subject-object, i.e. the product of labour, are alien to the labourer. The importance of this process to Marx is that it serves as the basis of class relations, a dominated and a dominant class, which in turn serve as the basis for the structure of society. I will discuss digital labour with reference to information and communication technologies (ICT’s), to show the continuation of Marxist theory in our current society, and to highlight some aspects of digital labour that make bitcoin an entry in this development that exhibits a discontinuity with traditional Marxist value theory.

Digital labour signals a continuation of the post-industrialised society's class relations to our contemporary age. ICT's are media that facilitate the alienation of the labourer in the same way as the factory-setting did, to a more rigid extent. The labourer, in producing digital 'information commodities', is not aware of the fact that they are actively producing. In this sense, they are alienated from their own activity (Fuchs & Sevignani 2013, 288). The alienation the factory worker used to experience towards the final product, of which their contribution meant an insignificant part of the assembly-line process, is similar to the alienation a social media user experiences towards the data they generate. The fact that this data, one of the many information commodities produced through the digital labour concerned with ICT's, is used by the owners of both the social medium as well as those of the instrument used to access the medium (like a smartphone) to generate a profit, signifies the continuation of traditional class relations in the digital age. What distinguishes the production of information commodities from factory-produced commodities, however, is the type of labour exercised. As opposed to assembly-line labour, digital labour in social media usage is exercised not as a laborious activity, but rather as a fun activity: play labour.



(Figure 12: Still from a smartphone advertisement. The notion of play labour in contemporary society becomes explicit in the case of smartphones, as their capacity to be used for play and work activity is a marketing tool. The smartphone, in this sense, is the exemplary technology at the fusion of the public and private spheres. Source: <https://www.youtube.com/watch?v=DWRcNpR6Kdc>.)

In the age dominated by technological applications that use the internet as a medium, “corporations accumulate profit by exploiting the play labour of users” (Fuchs 2014, 126). Digital labour has contributed to the crumbling of the walls between the professional and private spheres. Whereas play used to be associated with free time, relaxation, non-work, it has now become synonymous with work, if possible. Conversely, “entertainment in spare time tends to become labour-like” (Fuchs 2014, 267), which one could experience quite clearly in the repetitive exercise of finding new shows to watch on a medium like Netflix – all the while producing valuable data which contribute to the accumulation of profit by the owners of the medium. The invasion of the process of exploitation in the private sphere,

enabled by ICT's, has resulted in what has been called a new ideology of capitalism: "objectively alienated labour is presented as creativity, freedom and autonomy that is fun for workers. That workers should have fun and love their objective alienation has become a new ideological strategy of capital and management theory. Facebook labour is an expression of play labour ideology as an element of the new spirit of capitalism" (Fuchs 2014, 267). The goal of this strategy is the commodification of all of the worker's time, or in more hyperbolic terms: every waking moment is to be an exploitable moment of production.

Bitcoin mining can be conceived as an expression of this modern type of labour at the verge of both the public and private sphere. This becomes evident from the play-character of bitcoin mining, which takes the shape of a guessing game, a miniature lottery. At least, that was the idea the creators of bitcoin and the blockchain had in mind, which is how the system started. Nowadays the practice of mining has become professionalized, to the point where it resembles factory work, in a development analogous to that of traditional labour.²¹ Calvão (2018, 129-30) illustrates this by describing the mining practice in one of China's oldest bitcoin mines. Here the staff live in grey, desolate buildings, accompanied by the perpetual noise of heat conducting ventilators. Their work consists of check-ups and occasional repair work, which nevertheless requires them to be on site all the time, whilst receiving no more than minimal wages (Calvão 2018, 130). Note as well how they exercise wage labour, and are therefore alienated from the product of their labour, whereas originally bitcoin miners would be rewarded for their mining efforts directly.

7.2. *Informational commodities and their value*

Now that we know that bitcoin mining is a type of digital labour, characteristic of the information society, it remains necessary to denote the type of commodity that results from this kind of labour. As a result, it is possible to propose an ontology of bitcoin that satisfies the conditions of the labour theory of value, as visualized in figure 10. In chapter 7.1 data packets were mentioned as an example of informational commodities. These packets comprise preferences of ICT users ('cookies'), and the sale of these pieces of information without the consent of its producers has led to a number of controversies in recent years, most notably the Cambridge Analytica scandal (Confessore 2018). Is it possible, then, to understand bitcoin as an informational commodity, in the same way we understand data packets like cookies?

Bergstra and Weijland (2014) answer this question by conducting an analysis of the commodity-status of bitcoins. Specifically, they seek to label bitcoin by ascribing it to a particular type or class, in this way answering the very general question 'what is bitcoin?'. They are careful not to denote bitcoin as a type of money, which has a number of reasons, the most obvious of which is the fact that their research was conducted at a time quite early in the development of bitcoin. After making

²¹ It should be noted that the process of altcoins, like Ripple or Ethereum, still feels like a playful activity according to interviews conducted by Calvão (2018, 127-28).

clear that bitcoin is an informational commodity, i.e. a good consisting of information, they point to the commodification of this entity, which “transforms a type of disparate (though somehow related) entities into a class of entities that can be exchanged on a free market and which are paid for by money” (Bergstra & Weijland 2014, 15). Bitcoin is a result of the commodification of disparate information, which is a claim analogous to ‘bitcoin is a result of bitcoin mining’. Since it would be inaccurate to call bitcoin a money according to Bergstra and Weijland (2014, 8), given the fact that in order to be a currency, something must possess a certain level of acceptance which bitcoin did not at the moment of its inception, they define bitcoin as a ‘money-like commodity’. Since it can exist “in terms of information only” they speak of a “money-like informational commodity” (14), which is an exact denomination of the type of commodity bitcoin belongs to.

Thus, bitcoin is an informational commodity that can be produced through the exertion of digital labour. It can therefore be analysed through a Marxist lens, given that it satisfies the requirements for a labour theory of value interpretation. This leaves the question of how we are to fill up the value aspect of the theory, which originally took the shape of the labour process being transformed into an inherent aspect of the commodity. Since both of the conditions for a theory of value (labour and the commodity) are in this context best put in italics to express their changed nature in the information age, it stands to reason that the value of bitcoin cannot be approached through a traditional Marxist lens either. The volatile character of the price of one bitcoin throughout the past years already hints at this expectation.

7.3. *The protest character of bitcoin*

As we have seen, value is expressed with a money-name, a price, as an estimate of the labour expended in the production of the commodity which is to be valued. What this entails is that value is largely dependent on the attitude of people in charge of pricing and commodity demand towards a given commodity as being valuable. This is known in debates on the labour theory of value as the visibility of certain types of labour in an economy: labour that is not deemed important to the economy is not valued, kept invisible (Collins 2016, 104). Examples of this are domestic labour (see note 16), or the more recent digital labour in developing countries like the assemblage of iPads (Fuchs 2014, 186-7), but also the earth itself, as an exploited factor of the modern production process (Collins 2016, 107-8). The latter case has caused numerous forms of protest in recent years, against the exploitation not just of nature, in the shape of deforestation for instance, but also against the treatment of animal life, reduced to a negligible factor in an ever-increasing mode of production (Collins 2016, 108). These protests are crucial signals for debates on value, as they signify dissent with value practices by governing agencies and financial institutions.

As environmentalists continue to fight for an appropriate sense of value for ecological factors, and feminists for an appropriate share of the value ascribed to their previously deemed inferior labour,

so too bitcoin enthusiasts conceive of cryptocurrencies as a type of rebellion against value practices. It should come as no surprise that all these types of protest seek to alter processes of valuation, i.e. making invisible contributions to the economy visible, by redistributing social labour. In the case of bitcoin, this redistribution takes the shape of making digital labour visible to the economy by putting people back in their place as the subject of their (digital) labour process. As mentioned, bitcoin's decentralized character makes it so that the digital labour required for bitcoin mining is not an exploited mode of production. The product of bitcoin mining goes directly to the labourer (or set of labourers in the case of a mining pool²²), which in this sense flies in the face of the prevalent capitalist mode of production: it resets the development Marx sketched in *Capital*. The volatility of the value of bitcoin is a volatility of price, since investors are unsure of its actual value. The recent crises have shown that in unsure times investors tend to trust the claim on the value of private digital labour bitcoin puts forward. The rise of bitcoin's value is a speculation towards the perceived persistence of the visibility of digital labour. In other words: investors expect bitcoin's value substance to be as robust as the value of gold.

In the information age, bitcoin has become the expression of the value of information.²³ The fact that the internet is not privately owned, and is the foremost medium for the distribution of information, has contributed to the restoration of the concrete labour process in a digital context. In this sense bitcoin is more than just a protest against third party transaction fees, or even a revolution to the currency practices that have been in place for centuries. It revolutionizes the way in which we understand digital labour, as being made visible through a protest against the nature of capitalism. Analogous to gold, bitcoin signifies that society deems information, or digital labour, to be a fitting expression of the concept of value.

²² As a response to the ever increasing difficulty of bitcoin mining, bitcoin miners have bundled their mining rigs to form a cloud or pool of computational power, allowing them a greater share of the bitcoin reward through their greater capacity of guessing hash codes.

²³ A possible continuation of this research could be about the role of information with regards to energy. Vopson (2020) defines information as a type of energy, which makes bitcoin an expression of not just information but energy as well. Viewed from this angle, it is possible to make claims about bitcoin's future, as energy accumulation and distribution has played a decisive role in the structure of Western society.

To assess the value of bitcoin a research has been conducted towards the thing that makes bitcoin valuable. To ask this question entails asking what value consists of, which makes this research an endeavour towards the ontology of money, specified towards the instance of bitcoin.

To this end, bitcoin was analysed in terms of the ontology of previous money systems. Three such systems were identified: the commodity system, the fiat system and the credit system. It appeared that bitcoin shared characteristics with each of these systems, but could not be determined to have value using any of these systems exclusively, as some key differences were to be distinguished in every respective instance. This meant that the research, up to this point, arrived at the same conclusion Bjerg (2016) formulated with regards to the ontological constitution of bitcoin, namely that it is “commodity money without gold, fiat money without a state, and credit money without debt” (53).

At this point the context of bitcoin, as situated in historical and political developments, was of importance to nevertheless approach the substance of its value. Familiar with this context, it was possible to distinguish an aspect of bitcoin that has not received much attention in the literature on its value: the fact that contrary to previous currencies bitcoin is produced by its users. In the oft quoted work of Bjerg (2016), in this research as in a number of other researches involving bitcoin’s ontology, this crucial difference that sets bitcoin apart from previous money transaction systems has gone unnoticed. Thus it was possible to put forward a fourth value system, applicable to bitcoin because of its characteristic of being a money that is privately produced: the labour theory of value. Using Marx’ work on the labour theory of value, it was shown how labour serves as the thing that makes commodities valuable, as an inherent aspect approached through a money-name or price.

Having described the process of transforming labour into value through production, a number of adjustments were made to the case of bitcoin. The type of labour involved in bitcoin mining is on the one hand not traditional, since the commodity being produced is money (a commodity meant to be exchanged or a ‘general equivalent’) rather than a commodity that serves to sustain human life. On the other hand, bitcoin mining mimics the concrete labour Marx envisioned to occur in a non-capitalist setting, since it rewards labourers for their production directly. Another traditional aspect of bitcoin mining is its exploitation of workers in developing countries, which mimics the development from concrete labour towards factory labour Marx described as the event that caused class society historically. The increased value of bitcoin signifies the changed stance of people towards informational commodities, which are deemed to be more valuable according to the shape society has taken. With regards to this one can once again invoke Marx, as he stated that the nature of society is largely determined by its mode of production, which is necessarily mediated by technology.

At this point we are capable of providing the initial research questions with a satisfactory answer. Bitcoins have value because they are made up of a unique hash function that has been produced through valuable digital labour. Their value surge can be sought in bitcoin's protest character which lets it be defined as a response to the claim on value bitcoin puts forward: digital labour as the generally accepted denomination of value. The pricing of one bitcoin is a mere response to the trustworthiness of bitcoin's value substance, i.e. information, as a rigid type of value denomination in the same way as gold is. Recent crises have continuously pushed the value of bitcoin to new heights, which signifies society's consensus towards information as the new commodified general equivalent, which they saw fit to bestow upon cryptocurrencies like bitcoin.

In this research, some necessary limitations of scope as well as a number of opportunities for further types of research have been addressed. Since an approach of money ontology through a Marxist lens is rather novel, given the fact that the novel phenomenon of cryptocurrencies puts forward the radical notion of producing one's own money, this research could serve as an entry point into a number of consequent researches. Any type of speculation towards the future of a digitalized economy would not benefit the questions this research set out with, but it can at the very least be posed that we are still at the very start of a development that will certainly impact society in unexpected ways in the near future.

9

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