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RESEARCH ARTICLE

THE CYBERNETIC ETHOS OF CRYPTOCURRENCIES: ECONOMIC AND SOCIAL DIMENSIONS

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ABSTRACT: The last years have experienced an effervescence in the field of monetary innovation, concerning both complementary currencies and cryptocurrencies. The scenario of innovation has been intensively investigated with regard to economic and socio-political aspects. Against the peculiar multidimensionality of the phenomenon, the paper argues that the analysis should take the opportunity of grasping a co-belonging between the economic and the social. Whether they seem related to a proliferation of new forms of sociality (as in many experiences of complementary currencies) or to a disquieting desocialization (as in certain domains of the cryptocurrencies' world), the social dimensions of the new monies can be fruitfully analyzed by focusing on how they are consonant with certain basic conceptions of economic life. After a brief discussion of this point with regard to complementary currencies, the above-mentioned theoretical approach is used to investigate the cybernetic ethos of cryptocurrencies. The analysis shows that the socio-technical imaginaries of some cryptocurrencies (with particular regard to Bitcoin) call into question the relationship between human and non-human agency and are complicit with certain ideas of economic life, one of whose main traits concerns the demand for unconditionally "assuring" the economic and for denying the dimension of uncertainty.

KEYWORDS: complementary currencies; cryptocurrencies; cybernetic ethos; monetary innovation; economic dimensions; social dimensions.

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1. Introduction

The last years have experienced an effervescence in the field of monetary innovation, concerning both complementary currencies (CCs) and cryptocurrencies.

The highly variegated scenario of innovation has been intensively investigated from different perspectives. While a corpus of analyses has focused on the economic aspects of the projects (by addressing issues concerning, for example, the stability of the new currencies or their contribution to the local economy), the socio-political dimensions of the phenomenon have also been intensively debated.

Monetary innovation has been indeed considered as proof of the pluralization and diversification of the monetary phenomenon: money can be significantly shaped by various social practices and relations (see Dodd, 2014; Zelizer, 1997).

As for complementary currencies, the scientific reflection has highlighted the emergence of peculiar processes of institutional experimentation and the proliferation of social relations, meanings and practices; CC projects have been often regarded as laboratories of social innovation and social creativity.

As for cryptocurrencies, instead, the debate has tended to play to a fairly different tune. Several scholarly analyses have indeed focused on the interpretation of a highly controversial trend towards the desocialization and depoliticization of monetary dynamics. In particular, Bitcoin's ideology - with its faith in an algorithm-based governance of economic processes – tends to be seen as complicit with a *cybernetization* of social life, in which the role of human agency is deeply called into question.

Monetary innovation appears then to point to different issues which refer to various dimensions. The point, however, is how to address the peculiar multidimensionality of the phenomenon. The task, in my view, is not to separately analyse the economic significance of the projects and their socio-political implications; nor one should merely consider the interrelations between social dynamics and economic outcomes. The opportunity instead emerges of grasping the very *co-belonging* between the economic and the social in monetary innovation.

This, in my view, has to do with the possibility of a proper sociological investigation of money, in the sense in which Ingham (2004, 11) construes the term, in his attempt to reclaim the study of money for sociology: “Throughout this work, ‘sociological’ is construed in what is today a rather old-fashioned Weberian manner in which, as Collins (1986) has persuasively argued, the social/cultural, economic, and political ‘realms’ of reality are each, at one and the same time, amenable to ‘social/cultural’, ‘economic’, and, above all, ‘political’ analysis”.

Indeed, at least with regard to certain experiences that are particularly significant in terms of monetary content, the socio-political and economic meanings of innovation should be viewed as different sides of the same coin. The social dynamics and the social imaginaries of the new monies (whether they seem related to a promising proliferation of new forms of sociality or to disquieting processes of desocialization) can be thus fruitfully scrutinized by investigating how they are *consonant* with certain basic ways of understanding money and its role in economic life.

After having briefly discussed this point in paragraph 2 with regard to certain typologies of CC projects, in paragraph 3 I will deal with the analysis of cryptocurrencies[1].

I will try to show how some crucial elements of the socio-technical imaginaries of cryptocurrencies – which seem to point to a cybernetization of the social - are profoundly complicit with conceptions of economic life embodied in the currency design.

2. The social and economic meanings of monetary innovation: a brief reference to CCs

As anticipated, I will investigate some important social dimensions of cryptocurrencies by paying specific attention to their close relationship with certain conceptions of the economic.

This is an approach which can be profitably used with regard to the whole sphere of contemporary monetary innovation, including the multiple typologies of complementary currencies (see on the typologies of community, complementary and local currencies, Blanc, 2011). Indeed, a similar approach characterizes some recent contributions such as Doria and Fantacci (2018).

Of course, as noted above, the socio-political scenario of CCs appears to be quite different from that of the cryptoeconomy. While in the case of cryptocurrencies some of the main keywords are desocialization and depoliticization, as for many recent CC experiments the scholarly attention has been directed towards lively processes of social innovation. In recent years, many CCs projects have developed in a very close relationship with a series of socio-political agendas (of a localist, social, environmentalist, anti-globalist, or anti-capitalist nature; see for example North, 2006, 2007; Pacione, 1997; Seyfang, 2001, 2002) and, around the experimentation of new monetary forms, specif-

1 The sphere of cryptocurrencies – as well as the field of the applications of the blockchain – is quite variegated and contains practices that may differ as for their conceptual frameworks. I will focus on Bitcoin - that is only one of the numerous cryptocurrencies that have been created in the last years – and I will also refer to certain other blockchain-based practices.

ic social formations emerged, characterized by peculiar modes of sociality (Dodd, 2014; Zelizer 2011).

As Zelizer (2011) points out, meanings, cultural and symbolic materials, understandings, information, and obligations come to be generated around the construction – often at a local level – of innovative means of exchange. What is at stake is not only the richness of the social implications of many CCs projects, but the peculiarity of the social relations that pervade those initiatives. The latter have been investigated also through innovative analytical categories; see, for example, the notion of *circuits of commerce* (Ibidem) that refers to social formations that differ both from communities and from networks.

The development of CC circuits has been even seen as providing support to certain theses emerged within the recent scholarly debate on monetary issues. I refer, *in primis*, to the question concerning the differentiation and pluralization of monetary forms. According to scholars such as Zelizer (1997) and Dodd (2014), money is not necessary uniform (as the dominion of the official all-purpose money would suggest) but can be continually invented and reinvented by its users (Dodd, 2014). Nor money necessarily homogenizes social life; the monetary and social spheres are instead linked by open, complex, biunivocal relationships.

Against this scenario, Doria and Fantacci (2018) argue that the analysis and the evaluation of CC developments is not merely a matter of adding the assessment of economic results to the analysis of a number of different socio-political values. The attention should be instead also focused on a *specific* form of sociality that emerges from a properly monetary field. This sociality is intrinsic to the monetary design and depends on how the currencies perform certain basic monetary functions (Ibidem).

In certain typologies of CC circuits, some relevant social meanings are closely related to the monetary design of the initiatives and thus to the way in which money is issued and circulated. It is the case of *mutual credit circuits* (see on these circuits Sartori and Dini, 2016), based on the principle of *clearing*. The latter "has to do both with the establishment of a measure for exchanges and for the payment of debts that is not itself an object of exchange and with re-establishing a balanced relationship between debtor and creditor" (Lucarelli and Gobbi, 2016, 1401).

The fact that the members of the mutual credit circuits accept a set of principles and rules (which embody conceptions of the nature and functions of money) leads to the emergence of shared meanings, social bonds and specific modes of "social responsibility". The systematic settlement of all accounts through multilateral clearing - the basic economic logic of local mutual credit experiments and of certain important macroeconomic projects such as Keynes' *International Clearing Union* (see Amato and Fantacci,

2012) - plays a crucial role in the generation of particular forms of mutual obligation and interdependence among the members. The mutuality that characterizes local clearing initiatives leads to a unique economic commonality, based on the shared acceptance of both the spatial limits of the circuits and of the peculiar temporality of the clearing dynamics (Doria and Fantacci, 2018). Hence distinctive forms of sociality which, however, do not automatically follow from the currency's design but may develop along non-linear paths and involve complex learning processes.

In the case of mutual credit systems, what is at stake is a sort of *co-embedding* of the social and the economic.

As Lucarelli and Gobbi (2016, 1405) point out with particular regard to complementary currencies based on the principle of clearing: "The very idea of distinguishing between the social and the economic aims and features of money is, however, questionable (Ingham, 2004). This is true also in the case of complementary currencies, which have indeed shown to a greater extent even than official currencies the capacity to rise above such distinctions by combining social and economic aspects with the use of the most innovative technologies".

Clearing, indeed, names a specific logic for organizing monetary and credit dynamics but it also concerns a certain way of thinking the social and institutional nature of the monetary phenomenon – a way, that, as we will see below, is somehow diametrically opposite to Bitcoin's ethos.

3. On the economic and social dimensions of the cybernetic project of cryptocurrencies

Bitcoin refers to both an innovative payment system and a currency[2]. While, as pointed out by Amato and Fantacci (2018), the payment system and the infrastructure on which it is based represent a disruptive innovation that deserves careful scientific consideration, bitcoin as a currency is definitively poor. The construction of a currency that is artificially scarce appears as a wrong solution to the many serious flaws of official money; a solution - I will return to the question below - which somehow takes some problematic characters of capitalist money to the extreme.

[2] For a discussion of the whole Bitcoin project, based also on a critical analysis of Nakamoto (2008), see Amato and Fantacci (2018); for an analysis of the phenomenon of cryptocurrencies see also Vigna and Casey (2015).

Now, the bitcoin and blockchain phenomena have been accompanied by the emergence of very significant forms of socio-institutional innovation, which have been the object of a considerable attention from the perspective of social, political and juridical studies.

If we were to identify some pillars of the Bitcoin's ethos we would naturally find, first and foremost, the aim of deconstructing the official monetary system. This project of institutional deconstruction has a first dimension that concerns a specific target: central banks and commercial banks as actors that dominate the monetary sphere and "pollute" the latter with their power dynamics, their inefficiencies, their corruptibility. The main aim of the Bitcoin project is precisely to take away money creation and management from the banking system, blamed for undermining the "natural" freedom of economic life.

The attack on monetary institutions develops through a strategy based on *disintermediation* and *decentralization*. On the one hand, the protocols governing the new currency are deemed to be capable of eliminating any form of gatekeepers and middlemen from the monetary scene. On the other hand, the blockchain is built on the idea of horizontal, distributed power; according to the Bitcoin's ideological vision no centre whatsoever can exercise control over the monetary system and the payment infrastructure. See how Schneider (2019, 272) summarizes some main traits of the discourse of decentralization:

> Among the Internet's early architects, and even more among recent blockchain evangelists, decentralization has become a folk media theory, interwoven with a business-model logic, each reinforcing the other's appeal. It has spurred a kind of moral theory as well, and a kind of piety. […] Decentralization represents a range of perceived benefits from across economic, political, biological, and computational domains. It means transferring control over complex systems from constrained human minds and institutions to high-bandwidth, self-regulating interactions. It means eliminating gatekeepers, enabling more widespread access to systems and more efficient, meritocratic incentives within them. The evangelists expect this will result in freedoms and efficiencies unavailable to bureaucracies of old.

The libertarian and quasi-anarchist socio-political ideology of Bitcoin speaks the language of the absolute autonomy of the economic agent, who operates within seamless, horizontal, a-centrical networks in which power and knowledge are distributed.

The idea of a private, "automatic" currency is very far from the conception of money as a *social institution*. Indeed, according to Nelms et al. (2018, 25, italics in the original) in the universe of Bitcoin, as well in that of sharing economy practices, a new conception of the social[3] seems to emerge, related to the goal to disintermediate "*all* mediating entities, whether the state or the firm or the family or even the institutions of the market, which were previously trusted to intervene between political and economic actors and provide the basis and the frame for social action".

At the core of the Bitcoin's conception of the nature of money there seems to be a refusal of the idea of money as a *social relationship* that requires trust. Bitcoin appears as a currency that does not need trust, or rather as a monetary form that can transcend trust (as something constitutively embedded in social relations), by means of a technically produced certainty[4].

The Bitcoin's imaginaries oscillate between the dream of a desocialization of economic life and a technological conception of the political, with the latter being reduced to the sphere of automatic management. What seems to characterize Bitcoin as well as

[3] "This social" – Nelms et al. (2018, 25, italics in the original) wrote – "is, then, at least in theory, 'just us', and just us in the fleeting moments of our transactional encounters. Ideally, whatever infrastructure facilitates those encounters - the cryptographic protocol, the proprietary software that matches us with our Uber driver - disappears into the encounters themselves. Our ties are neither weak nor strong, because to the extent that they bind, they do so in interactions that are designed *not* to endure. No state. No society. No network. Just nodes. Just peers. Just us".

[4] With regard to Bitcoin, a position concerning the embedding of sociality in the code can be found in Maurer et al. (2013), who also address the relationship between Bitcoin and the theories of money. "The digital metallism of Bitcoin echoes the materialism of commodity theories of money, such as those championed by Locke, the bullionists of the nineteenth-century, and the gold-standard supporters of today", they wrote (Ibidem, 273). However, by focusing on the role in Bitcoin of a distributed network of shared trust in the code, they argued that (Ibidem, 274): "This distributed network of shared trust in the code - and, via the code, in a chain of relationships between nodes in the network - resembles not so much commodity money theories, in which the value of money derives from the stuff from which it is made, but credit theories of money". Insofar as the promises of Bitcoin's – that, in their opinion, concern materiality, privacy but also community - are the stuff of credit, they wrote that (Ibidem, 263): "Bitcoin provides a useful reflection on the sociality of money, despite its embedding of that sociality of trust in its code itself. In this world, there is no final settlement - as with a state demanding payment in the form of taxes or tribute - and trust in the code substitutes for the (socially and politically constituted) credibility of persons, institutions, and governments. It is this - not the anonymity or the cryptography or the economics - that makes Bitcoin novel in the long conversation about the nature of money". Commenting on this last passage, Dodd (2018, 45) wrote: "If this is right, Bitcoin would resemble robot money, circulating in a robot society. But for all of its value as a reading of the significance of Bitcoin for the theory of money, I want to suggest that this particular reading of Bitcoin – as a horizontal network that simply embeds trust into computer code – misses some crucial aspects of the reality of Bitcoin's actual operation, and replicates the ideology behind it".

a part – but not the totality[5] – of the fast-growing sphere of non-monetary applications of the blockchain is the dream of an *algorithmic governance* of ever more extended (and potentially unlimited) range of social domains. The role of human agency – I will come back to this point later - is profoundly called into question in the blockchain's techno-utopia; on the scenario of the emerging algorithmic economy we find indeed the continuous reference to human-machine composite, to autonomous software agents, to machine-to-machine communications and to the blending of human and non-human agency. See, in particular (Wright and De Filippi, 2015, 3), the emblematic case of software-based organizations such as the decentralized organizations (DOs) and decentralized autonomous organizations (DAOs):

> These organizations can re-implement certain aspects of traditional corporate governance using software, enabling parties to obtain the benefits of formal corporate structures, while at the same time maintaining the flexibility and scale of informal online groups. These organizations also can be operated autonomously, without any human involvement. They can own, exchange, or trade resources and interact with other humans or machines, raising novel questions around traditional notions of legal personality, individual agency, and responsibility.

The examples of economic processes and institutions being "replaced" by their algorithmic "equivalents" are numerous and constantly growing (see, in particular, the case of *smart contracts* and *smart property*[6]) and the room for the growth of the power of algorithms is apparently unlimited. See, for example, the emerging discourses on techno-democracy (Ibidem, p. 39, italics in the original):

[5] It should be noted that the conceptions and uses of the blockchain and of other *Distributed Ledger Technologies* (DLTs) may differ from those typical of the Bitcoin world. On the one hand, there are forms of monetary innovation - see the *smart tokens* framework promoted by Bancor (https://www.bancor.network/ last accessed on 7 March 2020) or certain typologies of *stable coins* - that are based on blockchain technologies but have a different monetary architecture compared to Bitcoin. On the other hand, certain blockchain-based projects – such as the DisCO Project (https://disco.coop last accessed on 7 March 2020) - are characterised by a co-operativistic approach that refers to the logics of the commons.

[6] On the relationship between smart property and machine-to machine communications see Wright and De Filippi (2015).

> As blockchain technologies develop, governments themselves may be replaced by decentralized (autonomous) organizations. People could band together and set rules for their own governance, collect taxes, and distribute wealth in ways the group believes is fair. Communities could form into nations, unbounded by geographical boundaries, and governed through a set of algorithmic rules that can be both established and enforced through voting mechanisms and smart contracts. This could lead to the emergence of a constellation of *techno-democratic systems*, allowing for a diaspora to be governed and organized into a self-governing state.

What appears to be prefigurative is a sort of cybernetization of socio-economic life that directly calls into question the relationship between the human and the non-human. In the algorithmic economy, human and machinal agents make themselves one into the other in continuous, recursive loops. Cryptoeconomy - Amato and Fantacci (2018) wrote – represents as a sort of computer-based simulation of economic life; it is a kind of Matrix, in which man is only a resource within an automated and self-referential process of empowerment.

Now, certainly there are scholars who, like Dodd (2018), radically call into question the actual outcomes of this cybernetic project, by highlighting the gap between the rhetorical-ideological frameworks and the social reality of Bitcoin.

Dodd criticizes, in his analysis of the Bitcoin techno-utopia, both the alleged separation between the world of the algorithm and the "corruptible" social system and the replacement of human agency with machine code. Bitcoin, far from being a fully machinized currency that transcends social life, "has many characteristics that the ideology behind it would seek to deny, such as social organization, political hierarchy and even trust" (Ibidem, p. 37).

The replacement of social relations with machine code is, according to Dodd, a fiction. He refuses to read Bitcoin as a horizontal network that simply embeds trust into computer code and finds instead in Bitcoin's life human, social, and political factors. "As a form of money, Bitcoin has been sustained by sociological characteristics – e.g. structure, leadership, hierarchy, friendship and community – much more than it has evaded them" (Ibidem, p. 46).

One of the arguments that Dodd puts forward to refute the thesis of the asocial and apolitical nature of Bitcoin concerns the question of mining processes. The role of mining pools in the development of cryptocurrencies implies the possibility of concentrations of power that are in stark contrast to the "horizontalist" ideology. "Bitcoin's *production* is being dominated by a very small number of mining pools; indeed the soft-

ware favours the most powerful producers and incentivizes monopolistic practices (p. 45-46, italics in the original) […] the Bitcoin network is not quite as 'distributed' as its advocates claim; indeed, one could argue that it demonstrates quite a strong tendency towards the centralization of monetary production by massively favouring those with more processing power" (p. 46).

But there is something more. According to Dodd, Bitcoin's social reality (which is at odds with the theory behind it) can be understood only by considering how a strong sense of community and collective identity has decisively contributed to the development of the system. The Bitcoin "revolution" has taken advantage of a set of socially shared meanings and of the establishment of specific communities of practices.

In a similar vein, Zook and Blankenship (2018), in their analysis of algorithmic governance, reject the idea of an algorithmic agency capable of purifying the social; technical agency is deeply influenced by human action and is not at all separate from society. They wrote (Ibidem, p. 253):

> It is this disconnect between the rhetoric of the disruptive power of algorithmic governance and the reality of practice that is one of our most striking findings. In short, the power of blockchain technologies seems primarily to be in the discursive trope emphasizing the advantages of algorithms as a technical agency separate from the messiness of society and the economy. The problem, of course is that such a separation is false, a fact repeatedly established within the histories of Bitcoin and blockchain

Several elements discredit the idea of a technical governance that by-passes social dynamics: the reference is to the role of social factors in the network of miners or to the dynamics of social interaction that characterize the processes of updating software protocols, particularly in case of misfunctioning (Ibidem). However, one the most significant arguments concerns the co-optation of the Bitcoin system by mainstream financial environments and therefore the emergence of a particularly evident form of *re-intermediation*.

The idea of blockchain-based systems being perfectly de-centralized networks of peers is critically scrutinized by Schneider (2019) in his deconstruction of the contemporary discourses on de-centralization. The functioning of blockchain-based networks provides examples – concerning again, for example, the Bitcoin's proof-of-work mining processes - that contribute to de-mystify decentralization discourses[7].

[7] On the unequal distribution of wealth among Bitcoin accounts see BambouClub (2017) and Schneider (2019).

A refusal of the idea of Bitcoin being an apolitical system, devoid of governance structures can be found in Kostakis and Giotitsas (2014) with regard to certain intrinsic neo-liberal characters of the currency's conceptual architecture; the latter makes the Bitcoin's environment very different from the image of an horizontal space populated by *equipotential* autonomous individuals: "by promoting scarcity and competition this project aggravates the over-accumulation of capital and exacerbates the social inequalities that it is supposed to combat" (Ibidem, p. 437).

Now, in my view, some elements of these critiques of the supposed a-political and a-social nature of Bitcoin are undoubtedly acceptable. It is the case, in particular, of the arguments that criticize the idea - implicit in the Bitcoin discourse - of a separation between technology and society and of a sort of social "neutrality" of the algorithmic logic. What characterizes bitcoin's ideology is a naïve, "machinic" conception of technology that fails to acknowledge the social conditions of the development of technological systems and the way in which the latter embody and reproduce social relations and processes.

However, in my view, these arguments should not lead to simply loosen attention to the cybernetic character of the Bitcoin project. The latter may be surely considered as constitutively incomplete or even techno-utopian; nonetheless, it points to a set of issues which deserve to be taken into account. What Bitcoin *wants* and the *symbolic* relevance of its discourse - see on this point Amato (2018) with regard to the Bitcoin's aim of being the final form of capital - merit, in my view, careful consideration, at least for two, strictly interrelated, reasons.

On one hand, in Bitcoin we find an even more dogmatic version of certain basic, highly problematic conceptions of economic life that play a major role in the intellectual history of capitalism.

On the other hand, at the very core of the cryptoeconomy, we find issues that directly refer to the broad question concerning the so-called post- or trans-human – a question, that stirs the contemporary scientific and philosophical debate.

Indeed, even those who, as Zook and Blankenship (2018), call into question the Bitcoin's ability to de-socialize socio-economic life, highlight the emergence on the Bitcoin's scene of a blending of human and algorithmic agency. The cryptoeconomy seems to be populated by sociotechnical assemblages that take the form of human/non-human composite, in a context in which agency comes to be distributed between human and machinal agents.

Not surprisingly, the ANT's arguments and particularly Latour's theorization often stand as some of the references in the debate on the phenomenon. In the Latourian theoretical approach the continuous, recursive passages between the human and the non-human appears to be constitutive of agency itself; the human and non-human *actants* are made of the translations, the passages, the relationships they build with other actants (see on these and related topics Latour, 1993; 1996; 1999; 2005).

Now, of course, the mere acknowledgment of the blended, co-produced, co-constituted nature of agency can not in any way settle the very profound issues concerning the contemporary cybernetic ethos of cryptocurrencies. Those issues, indeed, need a renewed questioning and I will try to contribute to their investigation, by specifically focusing on the cybernetic character of certain conceptions of economic life. My analysis will take into account that the trend towards cybernetization in the economic and monetary domains proceeds along multiple dimensions that intersect and overlap in complex ways.

A first dimension has to do with a "new version" of the demand for unlimited calculability in economic life, within a framework, however, in which the "traditional" human economic agent is still the main player. A second dimension concerns, instead, a scenario in which the nature of agency seems to radically change and the identification of the economic agent with the human being becomes uncertain.

Let us consider the first of the aforementioned dimensions. As Amato and Fantacci (2018) point out, an analysis of Bitcoin focused on its properly monetary meaning highlights some "ancient" ideological dogmas which find new life in the current technological scenario.

One of the pillars of Bitcon's monetary ideology is the artificial construction (by virtue of "incorruptible" algorithms) of a scarce currency. This project seems to give substance to the dream - widespread in vast fields of monetary theory - of a currency that is definitely safe from the risk of inflation.

The fear of inflationary spirals (read as a "natural" outcomes of the institutional construction of official money, with all its attributes of inequality, opportunism and corruption) is one of the elements that link the Bitcoin's ideology with certain strands of economic thought, and in particular with Hayek. The goal of finally solving the problem of inflation legitimizes – in the Bitcoin's ideological vision - the attempt to respond to the many actual flaws of official money with an algorithmically "secure" currency. The problem is that the way in which Bitcoin aims at overcoming the problems of official money proves, from several perspectives, inadequate.

Bitcoin shows very poor results as a form of money: the use of Bitcoin as a means of exchange is very limited and the currency mainly shows up as a *speculative asset* (see

Fama et al., 2019), characterized by a very high volatility. And indeed, the Bitcoin conceptual bases, seen from a proper monetary point of view, appear to be definitively poor. The idea of building a "rigid" currency, with a pre-fixed path of quantitative growth, underestimates - as Amato and Fantacci (2018) point out - the need for a currency to breath together with the real economy. A currency whose issuance has a predefined trend radically refuses to accomplish its proper economic task: that of *accompanying* and *facilitating* trade and credit. Such a currency, if it were to actually take hold as a generalized medium of exchange, could only have deflationary effects; but deflation is an evil that Bitcon's ideology willingly accepts against the "assurance" provided by a solid currency (Ibidem). What we face is a calculative construction of a currency, which is in turn based on a mechanical idea of the economic.

The Bitcoin's design embodies a cybernetic conception of the monetary phenomenon, which calls into question the institutional character of socio-economic life. In order to grasp the point, we should focus on the relationship between money and credit; the Bitcoin's monetary ideology indeed can be seen as being deeply complicit with a certain way of dealing with time, uncertainty and credit.

By virtue of a certain conception of the functions of money and of their relationships, capitalist credit comes to essentially coincide with the sale of a certain amount of money accumulated in advance; in capitalism, credit is nothing else than a relationship between a quantity of money at time x and another quantity of money at time y. Money and credit are both reduced to commodities, whose prices can be fixed, thanks to a very complex calculative machinery; the latter - in which the models and formulas produced by economics play a major role - is based on the faith in the unconditional and unlimited calculability of all risks (Amato and Fantacci, 2012).

But what else could credit be? Credit - Amato and Fantacci (Ibidem) point out - has essentially nothing to do with a sale of money. The nature of credit has to do with an *anticipation* with a view to a *closure*. See the following passages:

> In order to take place as an anticipation, credit has no need whatsoever of the prior accumulation of money, but rather of *the institution of a shared space of promising and waiting*: a space in which the debtor appears credible and the creditor is prepared to wait; a space where the promise and the waiting can meet at a point in time (Ibidem, 29, italics in the original) […] *The granting of credit is essentially an advance against settlement*. Precisely in order to be what it has to be, however, this advance binds the debtor and the creditor jointly within the framework of the promise. Like trade, credit is essentially not a thing but a *relationship* (ibidem, 29, italics in the original) […] Even though each party

> will obviously be tempted to shift onto the other as much as possible of the burden of uncertainty and thus to make its position more 'sustainable' also with respect to its own errors of evaluation, the fact remains that this burden can never be wholly resolved in a calculation of risk. The burden of the fundamental uncertainty characterizing their relationship is something to be shouldered and borne by the debtor and the creditor together (Ibidem, 30).

In proper economic terms, the relationship between debtors and creditors is a matter of fundamental uncertainty[8]. Economic actors - traders, debtors and creditors - *share* a dimension of uncertainty which is not merely an unfortunate feature of economic activity - something from which one can imagine being freed through the forecasting of all the future events and the calculation of all possible actions. It is not something that each "isolated" individual can be freed, possibly thanks to a technical-cybernetic apparatus that takes care of freeing everyone. Instead, it is something which all economic actors are called to face *together* - and the Keynesian animal spirits[9] have precisely to do with the way in which humans deal with the fundamental riskiness of life.

Clearing represents a truly important economic principle precisely because it pays respect to the social nature and the institutional meaning of credit. In clearing systems bilateral debt relationships arising from trade are transformed into multilateral purchasing power to be spent in the trade circuit (Fantacci, 2013). This can generate a particular co-belonging of trade and credit - both to be understood as *social relationships* - and can lead, as noted above, to the emergence of specific social obligations and peculiar modes of economic mutuality.

In capitalism, instead, credit and its relationship with money come to be somehow de-socialized. Capitalist credit is linked to money by a mere principle of convertibility and interchangeability. The principle of *liquidity* – i. e. the principle of the unconditional convertibility between money and credit – is what characterizes financialised capitalism, in its complicity with the dogmatic belief in the calculability of all the risks relating to money and credit markets (Amato and Fantacci, 2012). Through the dogma of calcu-

[8] "Uncertainty is fundamental in the sense that it underlies every economic act, simply because economic action is performed in the temporal dimension and each economic calculation and act entails evaluation of future events. Some are foreseeable, in the sense that we can at least attribute to them a certain probability. Others aren't" (Amato and Fantacci, 2014, 25).

[9] "The uncertainty of life can be faced with neither fear or fearlessness, but with a reasonable degree of courage. The 'animal spirits' referred to by Keynes are not blind and 'irrational' drives but the vivacity, backbone and self-control with which it is possible and desirable to look to the future, not least in economic enterprises" (Amato and Fantacci, 2012, 56).

lability, capitalism systematically refuses fundamental uncertainty as something that economic actors share.

Now, in the Bitcoin algorithmic economy, that refusal takes on, so to speak, a more decisive and more *extreme* tone. Bitcoin is a currency that does want to know little about the relationship between money and credit, even less than official money does.

Unlike official (central) bank money, bitcoin is not the financial debt of anyone who issues it. Bitcoin is money without debt. The issuing of Bitcoin does not keep trace of credit relationships; not even, we might say, of the "degenerated" version of credit that is characteristic of capitalism.

Let us address this issue from the point of view of the theories on the nature of money. The interpretation of money *as a social relation of credit and debt*[10] represents a fundamental line of thought in the history of monetary theory – a line that Ingham (2004; 2008) recently brought at the core of the socio-economic debate.

Now, reading capitalist money as a credit-debt relationship – which means reading the *power* relations and conflicts that pervade capitalist credit-money in that perspective – may lead to consider what credit *has become* in the capitalist system and how this affects the social life of capitalism itself.

However, what the Bitcoin's ideology consciously or unconsciously wants is precisely to hollow out such questions. Bitcoin parades as a debt-free money, or better a pseudo-monetary form that wants to be – on a theoretical and practical level – free from the dimension of debt. It can be undoubtedly considered as a form of commodity money, or better an hyper commodity money; a commodity money whose design is completely detached from the trading relationships of the real economy, since the quantity and the way in which bitcoins are created are not at all related to the needs of trade (see on these points Amato and Fantacci, 2018).

In the Bitcoin's scenario there is nothing but a *thing* called money: something that can possibly buy goods but whose proper mission is to be held as an unconditional property and to be *hoarded* (see on this point Amato, 2018). The only relationship that Bitcoin has with uncertainty concerns the prices at which bitcoins as (very volatile) financial assets, can be traded against official money.

In Bitcoin's dreamland, a certain conception of time, credit and uncertainty – a conception basically saying that monetary life has nothing to do with them – plays to the tune of the obvious. It appears as something that can be recognized in its "natural" ob-

[10] With regard to the credit theory of money Ingham (2008, 69, italics in the original) wrote: "*money is a social and political construction*, but this does not merely mean that money is produced socially. Rather, this theory argues that money is actually *constituted by a social relation of* credit—debt, denominated in an abstract money of account".

viousness, once it is freed from the veil of institutional constructions; it parades as self-evident without the social life of capitalist money (with its power imbalances, hidden conflicts and recursive crises) being an opportunity for experiencing the fragile dogmatic foundations on which capitalism itself is built.

Now, what the Bitcoin ideology definitively refuses – the need for dealing with fundamental uncertainty – can be deemed to be the properly human trait of *economic* and *social* life. As already noted, what that ideology denies is indeed the fact that the economic relationship between a creditor and a debtor is intrinsically, constitutively *hazardous* (Amato and Fantacci, 2014). But the demand for unconditional assurance against all risks is precisely the root of the trend towards a de-socializing techno-governance of an ever-wider range of social domains. See what Cunningham (2016, 244, italics in the original) wrote about one of the pillars of the algorithmic ideology, i. e. the radical re-shaping of trust:

> In theory, Nakamoto is right; it is arguable that trust is completely defined by an acceptance of the possibility of betrayal. In other words, trust incorporates an understanding that no one person can be trusted completely. Without this element of risk, there is no trust. Arguably, however, what is more important than being assured that one can trust someone 100% is instead a guarantee that one can trust them to be competent in the trust relationship *in some way*. Therefore, I argue that from the very beginning, Nakamoto fundamentally misunderstood the notion of trust, expecting it to be perfect, neglecting inevitable problems associated with the element of trust in transactions.

The cryptoeconomy's ideology has to do with the purification of economic life from uncertainty through its purification from uncertain social relations; but this is specular to the project of transforming social relations into algorithmically secure interactions.

The obsession for assurance that characterizes Bitcoin's imaginaries calls into question the human character of economic and social life – and it does so, we might say, even before non-human agents appear on the scene. In fact, "traditional" human actors still parade on the Bitcoin scene, in the form of miners, traders and speculators. Surely, the mask which these humans wear is even more grotesque than that of the "old" *homo economicus*. The capitalist of the Bitcoin era is a hyper-autonomous, hyper-individualist agent, somehow "protected" from the dangerous relationship with social relations and institutions.

It is true, however, that the anonymity of the Bitcoin's environment makes it highly problematic to understand whether, behind anonymous codes, there is a human being

or a software which operates autonomously from human intervention[11]. The calculations provided by algorithms (which also play a growing role in the sphere of mainstream finance) can not be always linked to a natural or legal person who acts according to the traditional notions of responsibility.

This is a bridge to the second dimension of cybernetization concerning the nature of the economic agent in the cryptoeconomy.

As mentioned above, the tumultuous development of DAOs, DOS or smart property troubles the distinction between human and non-human economic action. The scenario of the cryptoeconomy seems indeed to be characterized by the continuous migration between human and machine, by a sort of unconditional "expansion" of the human within machine networks and vice versa – and this raises very profound questions concerning social ethics and the very meaning of social action.

On this terrain, economic reflection may receive significant hints from analyses concerning certain socio-political domains, where the role and the power of algorithms (particularly regarding the ethical implications of risk management) are vividly discussed. Consider, to grasp the tone of the debate, the following passage on the subject of the relationship between human and algorithms in security matters (Amoore and Raley, 2017, 7):

> What would an ethical security decision look like in the context of the human–algorithm composite, in the entangled nexus of what Tarleton Gillespie (2014: 183) terms a 'recursive loop between the calculations of the algorithm and the "calculations" of people'?
>
> The critical and political responses to these kinds of questions have overwhelmingly sought to reinstate the human as the proper figure of sovereignty, its executive decisions bound by juridical and ethical codes of conduct. Thus the 'human in the loop' often functions as a fail-safe for the speculative imaginary of driverless cars, autonomous weapons and robotic surgery. However, taking seriously the generative and world-making capacities of algorithms means troubling the human as the sole locus of security decision, authorship, interpretation and

[11] Fantacci (2019, 123) calls into question some aspects of the Hayekian character of Bitcoin and of the Hayekian nature of the competition among cryptocurrencies, by stressing the automatic, machinal nature of the management of the cryptocurrencies: "There can be no competition where there is no freedom, in the form of the discretionary and responsible management decisions of an entrepreneur. Or is it possible to talk about a competition between machines, intended as the algorithms governing the issue of cryptocurrencies?".

> ethico-political responsibility (Raley, 2016). After all, humans and algorithmic systems can be said to have co-evolved in complex processes of technogenesis, with human knowledge and logical structures migrating between people and software agents (Hayles, 2012).

In the background of the debates on human-algorithmic agency[12] loom certain well-known technological macro-projects concerning the post/transhuman scenarios, around which a very lively discussion has recently developed.

I refer to the uploading of the human mind into a computer (Bostrom, 2009) and to the construction of *conscious machines*, i. e. of machines that, according to Kurzweil (2000), will surpass humans in their capacity for experience and will claim to be *spiritual*.

The new machinal agents are expected to ever better simulate human behaviour, possibly including euphoria, anguish, fear, or the entrepreneur's *animal spirits*. The transhuman techno-utopia seems to point towards an indefinite process in which the human makes itself in the non-human and vice versa (Doria, 2013).

Now, how can this project be seen from a properly economic perspective? And how can a questioning on the nature of economic life help to understand it?

In my opinion, what we should mainly focus on is the temporality of economic life and its relationship with the dimensions of *closure* and *end*. The time of the closing of the accounts is indeed the time when economic agents are called to deal with fundamental economic uncertainty.

Within certain theoretical perspectives - particularly those that are indebted to Keynes's thought – the above issue play a crucial role in the critical reflection on capitalism. The dimensions of closure and finitude is precisely what capitalism programmatically refuses to deal with, through a procrastination-based deformation of the temporality of the economic. See what Amato and Fantacci (2012, 61-62, italics in the original) wrote about capitalism:

> Nevertheless, even if it can indefinitely postpone the closing of the accounts, it cannot actually abolish it – simply because it cannot abolish time, the end, and

[12] On the risks associated to the new scenarios of technical control, see Wright and De Filippi (2015, 43-44, italics in the original): "This could potentially lead to the emergence of the modernized version of a totalitarian regime—a society based upon a restrictive technical framework that is almost exclusively controlled by self-enforcing contracts, *walled gardens* or *trusted systems,* owned and managed by a sophisticated network of decentralized organizations that dictate what people can or cannot do, without any kind of constitutional safeguards or constraints".

> death. If nobody ever died, it would be better. If humans were not mortal – finite beings called upon to assume their responsibilities – this way of organizing the relations of debt and credit really would be perfect. But people do die, and it is for this very reason that they have an economic life in which they are required to live on the fruits of their labour, and not on unearned income; to pay their debts and not to make the payment of other people's debts impossible; to face risk and not to avoid it; to think about the future and not to discount it.
>
> Let us try to restate this in more technical terms. Capitalism is a historical manifestation of the debt/credit relationship characterized by the fact of removing from this relationship, *on principle*, what makes it humanly bearable, namely the end.

Capitalism *lives*[13] by means of a conception and a practice of debt management based on the systematic refusal of closure and clearing. What can be read in the ideology of Bitcoin is instead a sort of even more radical bypassing of the dimensions of finitude and of its economic configurations.

Let us think of algorithmic agency. The power of algorithms has naturally little to do with the mere execution of hyper-complex computational tasks. Algorithmic (or human-algorithmic) agency should be instead understood with regard to the notion of *living* algorithms; whereas, however, the very concept of life is radically called into question when it no longer plays to the tune of the human, but, instead, to the tune of the open-ended translations between the human and the machinal.

In my opinion, the issue of *open-endedness* is what we should mainly focus on to understand the meaning of the cybernetization of the economic. The latter is not so much a matter of robotization/mechanization; it has instead to do with the tendency to introduce an element of unconditional open-endedness, into the core of the economic. The recursive loop between human and non-human, the continuous migration between human life and algorithmic life, the "stretching" of the human in the networks that "live indefinitely" precisely point to the effacement of the dimension of the end.

Distribution – as a keyword of the cryptoeconomy - certainly refers to an a-centrical spatiality, made of horizontal networks and *open-sourced*[14] organizations; but it should

[13] As Amato and Fantacci (2012) remind us, according to Bloch (1954), capitalism is a system that would perish if all the accounts were settled at the same time.

[14] I refer here to the term in the sense in which Wright and De Filippi (2015, 16, italics in the original) employ it: "Interactions and organizations can be predefined by smart contract, and people or machines can interact without having to trust the other party. Trust does not rest with the organization, but rather with-

also be intended as referring to a distribution of agency between humans and non-humans. This distribution has the character of *indefiniteness*. This is not only because it is characterized by an unlimited, recursive movement; it is also because it tends to hollow out the "traditional" human relationship with finitude. The new social and economic agents are made of temporally undetermined, open-ended translations between the human and the machinal. The latter tend somehow to hollow out the time and the space for a proper economic action; in other terms, they tend to prevent the possibility of socially and institutionally dealing with fundamental economic uncertainty, which is also the possibility of experiencing uncertainty (and its capacity of generating social meanings) in the concrete contexts of daily social life.

We might say that the basic demand for assurance (for unconditionally "assuring" economic life), which lies at core of the algorithmic economy, develops along different paths, that have to do with different ways of refusing to economically deal with the uncertainty of (economic) life.

On the one hand, as mentioned above, in the Bitcoin world we find the construction of *artificial certainties* that are deemed to solve the problem concerning the unpredictability of human action: the quantity of money and the pace of its growth are predetermined, contractual relationships are automatically managed, a number of economic actions and decisions are made immutable, incontestable and irrevocable and so on.

On the other hand, economic life seems to be projected in a dimension of indefiniteness, as the refusal of the dimensions of finitude and closure is brought to the very core of economic agency. The commitment towards closing the accounts, the obligation to clearing – as roots of a properly economic ethics – tend to be radically hollowed out when economic action is a matter of human/non-human loops, developing *without an end*.

As noted above, Nelms et al. (2018) argue that certain fields of economic innovation are characterized by the proliferation of instantaneous transactional encounters; the latter develop outside the traditional socio-institutional frames and are based on *non-enduring interactions*. Now, in my view, we should consider - as challenging as it may be - how this "instantaneity" lives together with the emerging open-ended temporality of economic action. What seems to result is a sort of *endless present* and an economic life that does not know neither *duration* nor the *end*[15].

in the security and auditability of the underlying code, whose operations can be scrutinized by millions of eyes. In that sense, decentralized organizations can be thought of as *open-sourced organizations*".

[15] Trends such those I refer to in this paper tend to profoundly affect the pillar themselves of the economic, with regard not only to credit but also to the sphere of market exchange. While I can not properly ad-

4. Conclusions

The perspective from which I have analysed the social dimensions of cryptocurrencies can usefully contribute to the debate.

It is certainly true that a series of arguments that refer to specific topics of the contemporary socio-political reflection (including those concerning the notions of decentralization and disintermediation) offer crucial insights on the social scenarios of the cryptoeconomy.

However, investigating the social meanings of the "crypto-revolution" by focusing on the basic conceptions of the economic involved may provide distinctive advantages.

On the one hand, it helps to bring to light some basic questions about money which, despite a long interpretative history, remain open. Monetary innovation, in fact, does not proceed on the edge of the monetary architecture, affecting marginal elements. Instead, at least in its most interesting configurations, it may deal with the conceptual core – which is at the same time powerful and very fragile - of the contemporary monetary system.

On the other hand, the aforementioned interpretative posture may offer a specific view on the very meaning of the cryptoeconomy's tendency to radically reshape the social and the institutional.

I have tried to show that the cybernetic ethos of cryptocurrencies is a phenomenon that is as economic as it is social; it should be understood by considering the issue of the incalculable uncertainty of economic and social life and its relationship with the question of temporality. In the ideological imaginaries that Bitcoin and certain blockchain-based practices share we can find a demand for "assuring" economic life and for evading uncertainty. This happens through the techno-utopian project aimed at constructing artificial spaces of certainty and automatic solutions to the non-predictability

dress the issue here, I refer to certain proposals (which share many elements with Bitcoin's imaginaries) concerning post-money economies, based on new forms of resource allocation. The purpose of those proposals is to overcome monetary exchange (considered as reductive and unable to mediate multidimensional values) with other forms of resource allocation. See, for example, the proposal concerning *offer networks*, i. e. allocation mechanisms that work through a sort of direct matching of demand and offer, without the intermediate of money (see Goertzel, 2015 and Heylighen, 2017). This system requires complex and pervasive processes of reputation assessment, based on the power of distributed intelligence. Now, in my view, a task for scholarly reflection might be to ask whether these innovative allocation systems, in their aim of overcoming the reductionism of current economic systems, risk to quickly dismiss monetary exchange as a social relation, by not fully acknowledging its institutional depth.

of socio-economic action. But it also happens through a movement that merits careful consideration, as it somehow raises, in the new technological landscapes, a question that points to fundamental theoretical issues for economic thought: the translation of economic life into a dimension of open-ended temporality, in which the elements of closing and clearing tend to be precluded. When the economy becomes a matter of recursive, endless loops between the human and the non-human, economic decision and economic responsibility seem to play to a new problematic tune. This appears to be profoundly consonant with the tendency towards an open-ended distribution of agency itself, which, in the new transhuman spaces, promises to reshape the very meaning of social life.

The analysis which I have developed can also help to prefigure criteria for making distinctions within the variegated field of monetary innovation.

If the Bitcoin universe proves problematic precisely because of its demand for unconditionally assuring the economic, other monetary innovation projects may speak a radically different language. It is the case of the above mentioned complementary currency projects based on clearing; but it is also the case of multiple, perspective innovation paths, that can use the blockchain within conceptual frameworks that are very different from those of the artificially scarce currencies (see Amato and Fantacci, 2018).

Precisely against the multicoloured and tumultuous development of monetary innovation, a careful consideration of the differences among innovation paths remains the task of both theoretical investigation and institutional experimentation.

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