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Are Private (Digital) Moneys (Disruptive) Social Innovations? An Exploration of Different Designs

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ABSTRACT

This article explores which private moneys qualify as (disruptive) social innovations. A case study into 30 Dutch-based complementary currencies and cryptocurrencies was conducted to understand the functioning of different designs of private money systems as well as the motivations and objectives of involved social innovators. We conclude that private moneys generally can be qualified as social innovations but that their potential for disruptiveness is limited by design. It is the externalities that come with the public and network nature of monetary systems that are likely to impede disruption by private (digital) moneys.

KEYWORDS

Private money; complementary currencies; cryptocurrencies; monetary system design; digitalization; disruption

Introduction

In this study, private moneys are defined as currencies that are neither issued nor guaranteed by governments (states) (or groups of governments as in the case of the euro) or a delegate thereof (central banks). Trust in private moneys is completely based on private arrangements (Bank of England 2015). Two well-known forms of private moneys are complementary currencies also referred to as alternative currencies or community currencies, and cryptocurrencies or digital currencies. In private money systems, the processes of money creation and governance differ from the processes in the current public–private bank credit system. Private money systems can be considered as group actions (meso) that affect individuals (micro) as well as groups as a whole (meso) (Nicholls, Simon, and Gabriel 2015, 4).

In the last decades, the number of private (digital) moneys has increased rapidly. Seyfang and Longhurst (2013) found 3,418 complementary currencies globally. After the introduction of the first cryptocurrency in 2009, Bitcoin, the number of cryptocurrencies has increased to 4,076 in 2017.[1] Although the total number of private moneys is currently above 7,000, the total market capitalization and the number of transactions are insignificant as compared to public moneys. Public moneys are defined as currencies that are issued and/ or guaranteed by governments (states) (or groups of governments as in the case of the euro) or a delegate thereof (central banks). Today, individuals and businesses generally use cash (public money) and bank deposits (insured private bank credit) for transactions. But do private moneys deliver significant non-economic benefits to their members as some scholars suggest (e.g. Seyfang and Longhurst 2013, 2016)? And can we therefore consider them social innovations?

Some scholars and supervisors argue that private digital moneys can have a disruptive impact on the financial system (BIS 2015, 3–7; Ali et al. 2014, 1; Camera 2017). Often they emphasize the importance of new technologies. 'Thanks to new developments in cryptography and computing, it is now

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possible to develop digital alternatives to traditional currencies that are as peer-to-peer as cash, as convenient as a debit card, and potentially cheaper to use and safer than deposits' (Camera 2017, 126). In contrast, other scholars argue that it is not easy to realize a well-functioning private money system (Boonstra et al. 2013; Groppa 2013; Dittmer 2014). For example, Boonstra et al. (2013, 22) 'conclude that many [complementary currency] projects are initiated with much enthusiasm and great objectives, but that many face a difficult route from there'. In other words, there is no consensus on the (disruptive) potential of private (digital) moneys.

Therefore, the research question of this article is: 'Which private money systems qualify as (disruptive) social innovations?' In order to answer the research question, this paper classifies different private money systems and analysis the mechanisms that may provide private moneys with a disruptive character. This is further explored with the help of a case study of 30 private money systems in the Netherlands.

This paper is structured as follows: Section 2 presents a theoretical classification of four different designs of private money systems: 'mutual credit systems (MCSs)', 'non-convertible token systems (nCTSs)', 'fixed-convertible token systems (fCTSs)' and 'open-convertible token systems (oCTSs)'. Section 3 describes the case study into 30 Dutch based private (digital) moneys. Based on the results of 30 qualitative interviews of the case study, Section 4 explains how the four different systems function in practice. Section 5 discusses which designs of private money systems qualify as social innovations. Section 6 explores if private money systems have the potential to become disruptive. Section 7, finally, draws some conclusions and suggest topics for further research.

A theoretical classification of private money systems

In recent years, several researchers have developed classifications of complementary currencies and cryptocurrencies (e.g. Blanc 2011; Seyfang and Longhurst 2013, 2016; Boonstra et al. 2013; and Dittmer 2014; Blanc 2011) distinguishes community currencies, complementary currencies and local currencies, and explicitly excludes currencies based on 'sovereignty' and currencies driven by profit motives. Seyfang and Longhurst (2013, 2016) distinguish four categories of complementary currencies: service credits (e.g. time banks), mutual exchange (e.g. LETSs), local currencies and barter markets. Dittmer (2014, 32) distinguishes between LETS, time banks, HOUR currencies and convertible local currencies. Boonstra et al. (2013) distinguish three categories of complementary currencies: currencies with social objectives, currencies with economic objectives and digital money systems (electronic and virtual money).

We argue that categorizations so far have failed to address the main novelty of private money systems and propose therefore to classify private money systems based on the way money is created and governed. The classification proposed here is based on two characteristics of 'the medium of exchange' distinguished by Michael Kumhof (Bank of England 2015). In addition to 'sovereign power' and 'private arrangements' (or 'public' and 'private'), Kumhof distinguishes between 'token-based money' and 'credit-based money'. In token-based systems 'the medium of exchange does not represent debt, just money'; and in credit-based systems 'the medium of exchange ultimately represents someone else's debt' (Bank of England 2015). Examples of credit-based systems are the accounting systems in Mesopotamia (3000 BC–600 BC) and the current banking system. In Mesopotamia, the ruling priest class provided an infrastructure for transactions and settlement by recording debts centrally on clay tablets. The current public–private bank credit system combines an infrastructure for transaction and settlement with an infrastructure for investments. New bank deposits are created in the process of credit extension. In the words of the Bank of England's Monetary Analysis Directorate, 'whenever a bank makes a loan, it simultaneously creates a matching deposit in the borrower's bank account, thereby creating new money' (McLeay, Radia, and Thomas 2014, 1; for details on money creation by private banks, see Ryan-Collins et al. 2012; McMillan 2014; McLeay, Radia, and Thomas 2014; for details on similar processes in the shadow banking system, see McMillan 2014; Ricks 2016). Examples of token-based systems are the systems based on coins in Greece, Rome, India and China

(600 BC–600 AD). In the Roman Empire, the Emperors spent physical coins into circulation. These coins facilitated decentral market exchange and were for a long time the predominantly used medium of exchange. Based on Kumhof's distinction, we classify existing *private* money systems into four categories: (1) MCSs; (2) nCTSs; (3) fCTSs; and (4) oCTSs.

MCSs are systems in which mutual credit (nominated in an internal currency, IC) is created and exchanged. Mutual credit is non-convertible in legal tender (euro in the euro area) and generally interest-free. The medium of exchange represents, in Kumhof's terminology, 'someone else's debt.' Examples of MCSs are local exchange trading systems (LETSs) and (commercial) barter systems.

nCTSs are systems in which a central organization spends IC into circulation. In nCTSs, IC does not represent a debt but is 'just money' — in Kumhof's terminology. IC circulates between the members and is non-exchangeable for legal tender. Examples of nCTS are time banks and most social currencies.

In fCTSs, money is not created in a different way, but only 'regained' after issuing (Boonstra et al., 2013, 18). In fCTSs, IC emerges when a participant exchanges legal tender for IC; that is, without legal tender it is, by design, impossible to start an fCTS. Examples of fCTS are most local and regional currencies.

oCTSs generally bring money into circulation without asking for a 'real' economic performance. Examples of oCTSs are most cryptocurrencies. For instance, in Bitcoin participants 'mine' IC. When the computer of a participant processes Bitcoin payments, he/she is rewarded with Bitcoins. The main difference between oCTS and other private money systems is that there is an open market for IC; that is, IC could be bought with and sold for legal tender at free exchange rates.

To understand the functioning and the (social and/or disruptive) objectives of different private money systems, we use the results of a case study into 30 Dutch-based private money systems.

Case study description

The case study into private money systems described here is part of the EU research-project creating economic space for social innovation (CrESSI). Work package 7 of this project consists of a comparative investigation into three social innovations in three countries: interest communities for communal drinking water supply in Germany, solidarity purchasing groups in Italy, and complementary currencies and cryptocurrencies in the Netherlands. This case study description only explains the Dutch data collection methodology — similar methodologies have been used in Germany and Italy (see for more details on the data collection Chiappero-Martinetti et al. 2016; von Jacobi and Chiappero-Martinetti 2017).

The methodology adopted for the data collection in the case study into 30 Dutch-based private money systems is a mixed-method approach; that is, a combination of qualitative and quantitative methods. Moreover, the data collection was nested, meaning that each social innovator, each member and each person in the control group belongs to a particular private money system. For the selection of the 30 private money systems, stratified sampling was used: a list of all known functioning private money systems in the Netherlands was compiled and categorized into three degrees of vulnerability (high, medium and high). Subsequently, 30 private money systems were randomly selected.

The first phase combined a 'pre-qualitative questionnaire' and semi-structured interviews with social innovators (initiators and organizers) involved in 30 different private money systems. The pre-qualitative questionnaire gathered standardized information as the year of constitution, the number of members and the organizational structure. During the 30 semi-structured interviews, the researchers discussed the answers of the pre-qualitative questionnaire with the interviewees and asked questions about among others the background, the objectives and the practical functioning of their private money systems.

The second phase focused on the members of private money systems and aimed to assess how and to what extent private money systems affect the autonomy of the members in six dimensions:

Table 1. Number of private money systems (global estimations based on Seyfang and Longhurst 2013 and Crypto Coin Charts 2017).

	Examples	Global	Case study
Mutual credit systems	LETS, (commercial) barters	1,460	21
Non-convertible token systems	Time banks, social currencies	1,715	3
Fixed-convertible token systems	Local and transition currencies	243	4
Open-convertible token systems	Cryptocurrencies	4,076	2
Total		7,494	30

the cultural, economic, security-related, natural, artefactual and political dimensions (distinguished by Michael Mann and extended by Risto Heiskala 2015, 2016). A focus group with members was organized to identify how participation benefits members in practice. The most important everyday benefits mentioned in the focus group were subsequently used as input for the online questionnaire (see for more details on the measurement of autonomy, Chiappero-Martinetti et al. 2016; von Jacobi and Chiappero-Martinetti 2017; Chiappero-Martinetti et al. 2018). The researchers used the network of social innovators to invite members and people with similar characteristics (control group). A total of 185 current members, 16 past member and 39 individuals in the control group completed the online questionnaire (sample population = 240). We focus on the qualitative interviews of the case study results as far as relevant for investigating the research question. The private money systems are classified into the categories presented in Section 2 (see Table 1).

The functioning of four different designs in practice

In the following subsections, we explore how the four different private money systems function in practice using the results of the qualitative interviews and accounting.

Mutual credit systems

MCSs are systems in which mutual credit is created and exchanged. Examples of MCSs are LETSs (19 out of 30 private money systems in the case study) and (commercial) barter systems (2 out of 30). Generally, LETSs have individuals as members and barter systems small and medium-size enterprises. The original objective of LETS was to increase exchange between its members (accountholders). Today, however, social objectives are more important according to involved social innovators. The objective of (commercial) barter systems is to increase the revenues of its members (entrepreneurs). MCS-members pay a membership fee and/ or a transaction levy to the MCS-organization in euro's and/or IC. Most MCSs organize (network) events to stimulate exchange and/or to improve social cohesion.

We will now give an example to explain how MCSs function. In this example, A, B and C have goods in stock (respectively chairs, lamps and tables), demand for goods that they do not possess and no legal tender (euros) to purchase these goods. A, B and C could be individuals as in the case of LETSs or could be enterprises as in the case of barter systems. The first step is that A, B and C become members of the MCS and the MCS-organization opens an account for each of them.

Mutual credit system	
Account A	0
Account B	0
Account C	0
Total	0

A	Balance sheet A		L
Chairs	100	Equity	100
Total	100	Total	100

A	Balance sheet B		L
Lamps	100	Equity	100
Total	100	Total	100

A	Balance sheet C		L
Tables	100	Equity	100
Total	100	Total	100

Subsequently, A purchases the lamps of B. They agree on a price of 100 IC. In the MCS, the account of A is debited (-100) and the account of B is credited (+100). The sum of all accounts stays equal to zero; that is, by design, the quantity of money is equal to zero in MCS. The balance sheet of A expands because A receives the lamps (an asset) and accepts a liability of 100 IC. B exchanges the lamps for 100 IC on the asset side of the balance sheet.

Mutual credit system	
Account A	−100
Account B	100
Account C	0
Total	0

A	Balance sheet A		L
Chairs	100	Equity	100
Lamps	100	IC	100
Total	200	Total	200

A	Balance sheet B		L
Lamps	0	Equity	100
IC	100		
Total	100	Total	100

A	Balance sheet C		L
Tables	100	Equity	100
Total	100	Total	100

Subsequently, B purchases the tables of C for 100 IC. In the MCS, the account of B is debited (100 − 100 = 0) and the account of C account is credited (0+100 = 100). B and C exchange lamps for IC on the asset side of their balance sheet.

Mutual credit system	
Account A	−100
Account B	0
Account C	100
Total	0

A	Balance sheet A		L
Chairs	100	Equity	100
Lamps	100	IC	100
Total	200	Total	200

A	Balance sheet B		L
Tables	100	Equity	100
IC	0		
Total	100	Total	100

A	Balance sheet C		L
Tables	0	Equity	100
IC	100		
Total	100	Total	100

Finally, C purchases the tables of A for 100 IC. In the MCS, the account of C is debited (100 − 100 = 0) and the account of A is credited (−100+100 = 0). The balance sheet of A shrinks because A sold the chairs (an asset) and nets the IC − liability and received IC − asset (100−100 = 0). C exchanges IC for chairs.

Mutual credit system	
Account A	0
Account B	0
Account C	0
Total	0

A	Balance sheet A		L
Chairs	0	Equity	100
Lamps	100	IC	0
Total	100	Total	100

A	Balance sheet B		L
Tables	100	Equity	100
IC	0		
Total	100	Total	100

A	Balance sheet C		L
Chairs	100	Equity	100
IC	0		
Total	100	Total	100

The essence of MCSs is that without having legal tender, participants are able to exchange goods (and services); that is, in the words of social innovator CC08, '*it is possible to create new liquidity … and to circulate this liquidity in a restricted network*'. Only a registration of names and accounts and an agreement between participants to exchange in IC is needed. The organization of a mutual credit system does not need a bank account, a formal legal structure or a balance sheet to perform its operations; 11 out of 30 private money systems in this case study had no formal association/organization.

Social innovator CC05, who has been involved in private money systems since the introduction of the first LETS in the Netherlands in 1993, explained the problem of most MCSs as follows:

> *The best performers often receive too much money. And what happens then? They quit. In all barters and all LETSs, you will see that the best-selling actors leave the system. This is not very promising for a system. What you often see is that LETSs have over time fewer transactions, and that it is more about cosiness. That is ok. That is why we call it social systems.*

In other words, the main disadvantage of MCS is that '*it is [by design] impossible to exchange internal currency for other units, for example, for euros or dollars'(CC08)*. In practice, some members receive too much IC to spend it reasonably within the private network. When this happens, these members accept less IC or even leave the MCS. This is indeed '*not very promising' (CC05)*.

Non-convertible token systems

In nCTS, IC does not represent a debt but is 'just money' — in Kumhof's terminology, and IC is non-exchangeable for legal tender. The central organization brings IC into circulation and subsequently IC circulates between the members. Examples of nCTSs are time banks (1 out of 30 private money systems in the case study) and social currencies (2 out of 30).

NCTSs have a wide variety of objectives. For example, the main objective of time banks is promoting exchange based on equality by using the principle '*1 hour equals 1 hour*' (CC11) — no matter if a member is an accountant, website builder or cleaner. When members work for the organization of the time bank, these members get generally paid in IC, that is, new money is spent into circulation. Subsequently, members provide each other mainly services in exchange for IC (hours). Social currencies have (obviously) social objectives; for example, stimulating participation in a neighbourhood. In an nCTS in this case study participants receive IC for activities contributing to a cleaner and safer quarter, and for activities improving social cohesion. Entrepreneurs accept IC because they benefit from a cleaner, safer, more social neighbourhood. For the same reason, the municipality subsidizes (in euro's) the organization of this social currency.

We will now give an example to explain how nCTSs work. In this example, A, B and C participate in an nCTS and exchange services instead of products. The organization pays A and B 100 IC (1 IC = 10 minutes) for work they did, respectively, building the website of the nCTS and building the accounting system of the nCTS. The account of A and B are credited with 100 IC. The total amount of IC in circulation is 200.

Non-convertible token system	
Account A	100
Account B	100
Account C	0
Total	200

A	Balance sheet A		L
IC	100	Equity	100
Total	100	Total	100

A	Balance sheet B		L
IC	100	Equity	100
Total	100	Total	100

A	Balance sheet C		L
IC	0	Equity	0
Total	100	Total	100

Subsequently, A and B ask C to fill in their tax return. C works 200 minutes on A's tax return and 500 minutes on B's tax return; the price is, respectively, 20 IC (200/10 = 20) and 50 IC (500/10 = 50). The accounts of A and B are debited with 20 and 50, and the account of C is credited with 70 (20 + 50 = 70).

Non-convertible token system	
Account A	80
Account B	50
Account C	70
Total	200

A	Balance sheet A		L
IC	80	Equity	80
Total	80	Total	80
A	Balance sheet B		L
IC	50	Equity	50
Total	50	Total	50
A	Balance sheet C		L
IC	70	Equity	70
Total	70	Total	70

To finance their activities, the nCTS-organization can decide to spend more IC into circulation or to tax its members (or to use more voluntary work). In this example, each member pays a yearly tax of 5 IC. The accounts of A, B and C are credited with 5 IC and the nCTS-organization receives 15 IC (3×5).

Non-convertible token system	
Account A	75
Account B	45
Account C	65
Account org.	15
Total	200

A	Balance sheet A		L
IC	75	Equity	75
Total	75	Total	75
A	Balance sheet B		L
IC	45	Equity	45
Total	45	Total	45
A	Balance sheet C		L
IC	65	Equity	65
Total	65	Total	65

Subsequently, the nCTS-organization can spend (recirculate) 15 IC; for example to update the website. One of the main challenges is to decide how much money is spent into circulation, that is, to govern the quantity of money. Social innovator CC11 explained how the quantity of money is governed: '*One of the central questions within CC11 is when it is allowed and justified to create hours. If we [the core team] think it is justified, the people working for CC11 get paid. If it is not needed, they don't receive money.*'

The essence of nCTS is similar to MCSs. Without having legal tender, participants are able to exchange goods and services. Only a registration of names and accounts and an agreement between participants to exchange in IC is needed. The nCTS-organization can spend IC into circulation without having a bank account, a formal legal structure or a balance sheet. The main (psychological) advantage of nCTS is that none of the members needs a negative account — therefore, also 4 MCS-

organizations (LETS) in the case study decided to start with a positive amount (for example 100 IC) instead of 0 IC.

Fixed-convertible token systems

In fCTSs, money is not created in a different way, but only 'regained' after issuing (Boonstra et al., 2013, 18); that is, IC emerges when a participant exchanges legal tender for IC. Usually fCTSs use at a fixed exchange rate, often 1 to 1, and a penalty fee when IC is exchanged back into legal tender. Between these two currency exchanges, members can use IC for payments within the network; that is, the circulation is 'regained' because IC can only be spent in a certain area (village, city or region). Examples of fCTSs are (most) local currencies (2 out of 30 private money systems in the case study), regional currencies and transition currencies (2 out of 30). The main objective of fCTSs is to stimulate exchange between the members. To reach this objective, fCTS sometimes use demurrage; that is, a negative interest fee to increase the velocity of money in the network.

We will now give an example to explain how fixed-convertible money systems work. In this example, A, B and C have goods in stock (again chairs, lamps and tables) and demand for goods that they do not poses. The main difference is that one of the members needs a bank deposit. In this example, A has a bank deposit of 100 euro

A		Balance sheet fixed-CTS	L
Total	0	Total	0

A		Balance sheet A	L
Bank deposit	100	Equity	200
Chairs	100		
Total	200	Total	200

A		Balance sheet B	L
Lamps	100	Equity	100
Total	100	Total	100

A		Balance sheet C	L
Tables	100	Equity	100
Total	100	Total	100

A, B and C open an fCTS-account, and A exchanges the bank deposit of 100 euro for 100 IC. Contrary to MCSs and nCTS, the fCTS-organization needs a bank account and a balance sheet to perform its operations. The fCTS balance sheet expands with 100 euro, on the asset side a bank deposit is added and on the liability side the IC account of A increases with 100

A		Balance sheet fixed-CTS	L
Bank deposit	100	Account A	100
		Account B	0
		Account C	0
Total	100	Total	100

A	Balance sheet A		L
Bank deposit	0	Equity	200
IC	100		
Chairs	100		
Total	200	Total	200

A	Balance sheet B		L
IC	0	Equity	100
Lamps	100		
Total	100	Total	100

A	Balance sheet C		L
IC	0	Equity	100
Tables	100		
Total	100	Total	100

Subsequently, A purchases again the lamps of B for 100 (IC). On the fCTS balance sheet the account of A is debited (100-100 = 0) and the account of B is credited (+100). A and B exchange lamps for IC on the asset side of their balance sheet.

A	Balance sheet fixed-CTS		L
Bank deposit	100	Account A	0
		Account B	100
		Account C	0
Total	100	Total	100

A	Balance sheet A		L
Bank deposit	0	Equity	200
IC	0		
Lamps	100		
Chairs	100		
Total	200	Total	200

A	Balance sheet B		L
IC	100	Equity	100
Lamps	0		
Total	100	Total	100

A	Balance sheet C		L
IC	0	Equity	100
Tables	100		
Total	100	Total	100

In this example, B does not use IC to purchase the tables of C but decides to convert 50 IC into legal tender. In accordance with the rules of this fCTS, B pays a penalty fee of 10%; that is, B receives 45 euro for 50 IC. On the fCTS balance sheet the account of B is debited (100 − 50 = 50) and the bank deposit shrinks (100 − 45 = 55). As a result of this transaction, equity of the fCTS-organization increases with 5 and equity of B decreases with 5.

A	Balance sheet fixed-CTS		L
Bank deposit	55	Account A	0
		Account B	50
		Account C	0
		Equity	5
Total	55	Total	55

A	Balance sheet A		L
Bank deposit	0	Equity	200
IC	0		
Lamps	100		
Chairs	100		
Total	200	Total	200

A	Balance sheet B		L
Bank deposit	45	Equity	95
IC	50		
Lamps	0		
Total	95	Total	95

A	Balance sheet C		L
IC	0	Equity	100
Tables	100		
Total	100	Total	100

The essence of fCTS is that IC circulates between members. Compared to MCS and nCTS, the main advantage of fCTS is that IC is covered by and exchangeable for legal tender. The main disadvantage is, in the words of social innovator CC08, '*that you need scarce money [legal tender] to create interest-free local money… . You don't really create new liquidity. This problem is unsolvable and therefore networks based on this infrastructure have never been very large*'.

Open-convertible token systems

oCTSs generally bring money into circulation without asking for a 'real' economic performance. Cryptocurrencies are examples (2 out of 30 private money systems in the case study). In some cryptocurrency systems, for example, Bitcoin, participants 'mine' IC; in other cryptocurrency systems participants who sign up receive IC in return. The main difference with other private money systems is that there is an open market for IC; that is, IC could be bought with and sold for legal tender at free exchange rates. In the case study, one social innovator build a local network around Bitcoin and another a national network. These social innovators promote the use of Bitcoin in their geographical environment; that is, they intentionally create network around a global cryptocurrency with the aim to make digital payments without commercial and central banks possible. Social innovator CC09 argued: '*Our long-term objective is to have the possibility to pay all daily expenses with Bitcoin in our city. At the moment this is already the case. I even paid my rent with Bitcoins.*'

We will now give an example to explain how oCTSs function. In this example, A, B and C again have goods in stock, and again A has a bank deposit of 100 euro. A, B and C sign up for an oCTS and receive immediately 100 IC. With two units of account (IC and legal tender) and an unknown exchange rate, it is yet difficult to compose balance sheets.

Open-convertible token system	
Account A	100
Account B	100
Account C	100
Total	300

A	Balance sheet A		L
IC	100	Equity	?
Bank deposit	100		
Chairs	100		
Total	?	Total	?

A	Balance sheet B		L
IC	100	Equity	?
Lamps	100		
Total	?	Total	?

A	Balance sheet C		L
IC	100	Equity	?
Tables	100		
Total	?	Total	?

A can use its bank deposit to buy the lamps of B or the tables of C, but can also exchange for IC. B needs legal tender to pay a bill outside the network and wants to sell 100 IC for 10 euro. A agrees to this deal. All accountholders now know that the exchange rate is 0.1.

Open-convertible token system	
Account A	200
Account B	0
Account C	100
Total	300

A	Balance sheet A		L
IC	20	Equity	210
Bank deposit	90		
Chairs	100		
Total	210	Total	210

A	Balance sheet B		L
IC	0	Equity	110
Bank deposit	10		
Lamps	100		
Total	110	Total	110

A	Balance sheet C		L
IC	10	Equity	110
Tables	100		
Total	110	Total	110

Notice that the value in the oCTS differs from the balance sheet values. The balance sheet uses legal tender as unit of account. The essence of oCTS is that they are open, have a global scope and generally have no central organization. This open design characteristic makes rapid diffusion of cryptocurrencies possible, but also makes them attractive as an investment product. The main disadvantage of the open design is that this leads to volatility in the price of IC. Volatility is closely linked to the store of value function of money and the governance of a monetary system. Many scholars link stability to the widespread use of a monetary system. For example, Camera (2017, 140) argues that 'instability [of a monetary system] is a problem because it gets in the way of widespread adoption'.

Which private money systems qualify as social innovations?

In this section, we discuss which private moneys qualify as social innovation. Nicholls and Ziegler (2015, 2) define social innovation as '*The development and delivery of new ideas and solutions (products, services, models, markets, processes) at different socio-structural levels that intentionally seek to change power relations and improve human capabilities, as well as the processes via which these solutions are carried out*'. Three key elements of this definition are novelty, intention and social focus (Nicholls and Ziegler 2015, 2).

In the literature, complementary currencies (MCSs, nCTSs and fCTSs) are often considered tools to stimulate change in (local) economic, social, political and environmental circumstances. For instance, Seyfang and Longhurst (2013, 75) argue that complementary currencies 'are developed with the aim of achieving a range of "new-economics"-inspired sustainable development objectives, principally community-building and social capital creation, boosting local economies and valuing marginalized labour, and enabling collaborative consumptions to reduce environmental impacts of current lifestyles'. The novelty of complementary currencies lies,[2] as explained, mainly in the fact that a private network of social innovators and members (accountholders), and not institutions like central banks and commercial banks backed by the state, govern money; that is, there is an intentional attempt to take control over a part of the monetary system. Important to notice is that complementary currencies are by design *complementary* to legal tender (euro in the Netherlands).

Cryptocurrencies (oCTSs) are a newer form of private money than complementary currencies are — Bitcoin, the first cryptocurrency, was launched on 3 January 2009 — and cryptocurrencies '*intentionally seek to change power relations*', but it is questionable if the focus of cryptocurrencies is social. In the literature and among the 30 interviewed social innovators, we find fundamentally different views on cryptocurrencies. Some argue that cryptocurrencies are (just another form of) complementary currencies (Boonstra et al. 2013; Groppa 2013; Dittmer 2014); while others argue that cryptocurrencies could serve as a full alternative (BIS 2015, 3–7; Ali et al. 2014, 1; Camera 2017, 126). The latter group considers the distributed ledger technology underlying cryptocurrencies the main novelty. This technology enables digital payments (transfers of money) directly from the payer to the payee without the balance sheets of one or more (private and central) banks. This is innovative, but not necessary social.

Satoshi Nakamoto, the anonymous founder of the first cryptocurrency Bitcoin, wrote in his white paper *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008, 1): 'What is needed is an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party.' With the launch of Bitcoin, Nakamoto introduced a new monetary system design: a design based on private digital token-based money. Like in complementary currency systems, the quantity of Bitcoins is not controlled by the network. Bitcoin uses an algorithm that, in advance, determines how many Bitcoins will be created and at what rate; that is, the growth rate of and the maximum quantity of Bitcoins are fixed.

The case study found that there are two types of social innovators: non-profit organizations and individuals who establish, promote and organize private money systems. Two international well-known complementary currency organizations are based in the Netherlands: Social Trade Organisation (also called STRO, till 2007 Strohalm; Strohalm was founded in 1970 and became active in CCs in 1993) and Qoin (founded in 1998). Both organizations have played, and still play an important role in the development and implementation of complementary currencies in the Netherlands. The second group consists of individuals who set up a complementary currency in their own city, town or village or promote the use of Bitcoin in their city or country.

In the qualitative interviews, the social innovators were asked what the objective(s) (that is, desired *outcome(s)*) of their private money systems is (are). The answers could be categorized into five groups (see Table 2).

Social innovators mentioned 'microeconomic' and 'social' objectives most often, respectively, 19 and 18 times. However, in the interviews, 14 (out of 30) social innovators stated that a lack of activity

Table 2. Objectives of Dutch private money systems.

Objectives	Examples	Number of times mentioned in 30 interviews
Microeconomic	'More local exchange' and 'poverty reduction'	19
Meta economic or macroeconomic	'An alternative monetary system' and 'to bring into circulation another kind of money'	9
Sustainability	'More repairing' and 'consuming local products'	8
Social	'Improving social cohesion' and 'promoting neighbourship'	18
Individual development	'Developing talents and skills' and 'encouraging people to use their imagination and skills'	5

and stagnation is the main problem of their private money system; according to interviewees, approximately 50%–70% of the members of Dutch private money networks is inactive (average number of members is 194). The results of the quantitative questionnaire confirm the non-economic focus of most private money systems. The researchers attempted to measure changes in the autonomy of the members and the control group in six dimensions. The results show that improvements in autonomy mainly take place in the natural, technological, cultural and political dimension, and not in the economic and security related dimension (Chiappero-Martinetti et al. 2018). However, the limited amount of observations of the control group (39 respondents) calls for caution in the interpretation of these results.

In conclusion, it is hard to draw general conclusions because different private money systems (sometimes even if they have the same design) have different objectives. However, we argue that almost all MCSs, nCTSs and fCTSs qualify as social innovation because they are relatively novel, '*intentionally seek to change power relations and improve human capabilities*' (Nicholls and Ziegler (2015, 2) and according to involved social innovators the focus of these systems is mainly social. oCTSs are more novel and '*intentionally seek to change power relations*' (Nicholls and Ziegler 2015, 2), but their focus is arguably not social. This judgement mainly depends on the definition of social and the analysis of the current public-private bank credit system — many involved social innovators consider the current system 'asocial' as we will explain in the next section. Nicholls and Murdoch (2012, 4) emphasize that 'social innovation is never neutral but always political and socially constructed'; that is, social innovations are not per definition 'in and of itself, a socially positive thing'; they could have a 'dark side' (2012, 5). The next section explains that some private money arguably have a 'dark side', but that the main problem of private moneys is that they have an 'impossible side'.

Are private (digital) money systems disruptive social innovations?

In this section, we discuss if some private (digital) money systems qualify as disruptive social innovations as some social innovators and some scholars argue. Nicholls and Murdoch (2012) and Nicholls, Simon, and Gabriel (2015) identify three levels of impact-focus of social innovations: incremental, institutional and disruptive. Incremental social innovation focuses on products and services 'to address identified market failures more effectively', that is, 'to address social need more affective or efficiently' (Nicholls and Murdoch 2012, 4–5; Nicholls, Simon, and Gabriel 2015, 3–4). Institutional social innovation focuses on markets and aims 'to reconfigure existing market structures and patterns to create new social value' (Nicholls and Murdoch 2012). Disruptive social innovation focusses on politics (and/ or social movements) and aims 'squarely at system change from the start'. Social innovators acting on this level clearly aim at changing cognitive frames and power structures. For money systems, macroeconomic significance (stocks and flows of a particular private money as percentage of the total amount of stocks and flows of money) is possibly the most relevant disruptive indicator.

In the qualitative interviews, 9 out of 30 social innovators explicitly stated the objective(s) of their private money system is to develop an alternative for or to fundamentally change the mainstream monetary system; that is, they aim at society-wide (macro) change (see Table 2). Especially social innovators involved in cryptocurrencies (oCTSs) and transition currencies (a form of fCTSs)

emphasized to aim at disruption. Their main motivation is the discontentment with the current public–private bank credit system, its institutions and its values. Social innovator CC02 argued for instance that the focus of the current system is '*making more money as quick as possible*' and therefore CC02 has two objectives: (1) to support small entrepreneurs by offering '*a second wallet';* and (2) '*to show people at a meta level that we can deal completely different with money, money creation and the organization of money*'. Social innovator CC09 stated, '*Maybe it isn't a good idea to put money in the hands of commercial parties, maybe it is also unfair*'. According to social innovator CC08, '*The big disease of our time and the core value of capitalism is making money with money,'* and '*The current monetary system is the a-social factor in society*'.

The financial crisis of 2007/2008 and the emergence of new technologies, underlying oCTSs (cryptocurrencies), appear to have radically altered the idea behind private money systems and the motivation of social innovators last decade. Cryptocurrencies are by design global and not connected to a region, city or town, and facilitate digital peer-to-peer payments. This is almost opposite to complementary currencies, especially to LETSs. The case study found that today two groups of individuals are active in private money systems. The first group is generally socially engaged, idealistic and interested in (solving) environmental issues; their objectives fit in the definition of Seyfang and Longhurst (2013, 75) and their aim is not disruption but the development of a 'complementary' system. Most of them have a middle-class background, are between 40 and 80 years old, and about two-third is female (Chiappero-Martinetti 2016, 55). In the aftermath of the financial crisis, a new group of individuals became involved in private money systems (in particular in cryptocurrencies and transition currencies and in a lesser degree in other systems). Individuals in this group are generally younger and more often male (Chiappero-Martinetti 2016, 48). Their objective is often to develop an *alternative* system (instead of a complementary system); that is, to disrupt the current public-private bank credit system. For example, social innovator CC07 argued: '*Originally, CC07 was very anti-euro. The students wanted to offer an alternative for the debt based euro system*'. According to social innovator CC09, '*Bitcoin can bring power over money and payments back to people*'. And social innovator CC02 stated: '*In my view, our city is a starting point because we have a problem on the scale of north-west Europe. Our monetary system can't deal with a stationary economy. This is not only a problem of my city but of north-west Europe*'. In short, the ambition of more recently involved social innovators is more often directed at disruptiveness. But is this ambition realistic?

Monetary theory suggests that the disruptive ambition conflicts with some public and network characteristics of monetary systems. For example, undistorted prices are sometimes considered a public good because stable prices are non-excludable and non-rival (McMillan 2014, 160). All inhabitants of a country benefit from stable prices. Moreover, there are 'network externalities'; that is, the more individuals and businesses participate in a monetary system the more valuable this monetary system is. However, it is not only the number of participating individuals and businesses, but also the number of functions a money system fulfils. Private money systems generally provide a medium of exchange, but fail to provide other functions. We mention briefly four other functions of widely accepted moneys.

First, all private money systems fail in providing a widely used unit of account. The main reason is that although governments do not have the power to regulate the unit of account function of money, they can encourage the use of a certain 'public' unit of account in several ways (Buiter 2009). Governments can for instance stimulate the use of the 'public' unit of account by composing all contracts in this unit of account and by accepting only legal tender for taxation, fees and fines. This indirectly impedes the growth of private moneys and arguably even leads to instability in private money systems.

Second, private money systems have difficulties in providing a stable store of value and it is questionable if individuals and businesses will ever trust private money systems on a large scale to store money. A large-scale exchange of public money (including government guaranteed private bank deposits) into private moneys will likely only happen after a collapse of the banking sector and/or when monetary policy dramatically fails (Broadbent 2016). However, this has never happened in

history and in practice private money systems and especially oCTSs suffer from high volatility. This volatility impedes their growth.

Third, almost all private money systems do not provide an infrastructure of investments in capital goods. Only one private money system in the case study provided credit for investments on a small scale. Financing new business ideas does not only contribute to economic development but also to the expansion of a money system. If an entrepreneur borrows money, the entrepreneur has a debt (future obligations) in this specific money. This makes it more likely that this money is also accepted in the future — at least by the entrepreneur and the lender. Private banks, on the other hand, are by design involved in credit. The current public–private bank credit system combines an infrastructure for transaction and settlement with an infrastructure for investments.

Fourth, private moneys are not connected to the (public) tax system. This is problematic because many contemporary monetary scholars emphasize that 'taxes drive money' (Mitchell, Wray, and Watts 2016, 111; Desan 2014). The link between money and taxes appears to be fundamental not only in theory but also in practice. One of the most successful private money systems in the history, the experiment in the Austrian village Wörgl in 1932, was so successful because taxes could be paid with this currency:

> In Wörgl, residents could pay local taxes in the newly issued currency, and so we meet a further form of tax-driven money. The ability of residents to discharge their tax obligations in the local issued notes increased its circulation because it gave the notes a use beyond a medium of market exchange. (Peacock 2014, 710)

However, the question is if Wörgl should be classified as a full private money system; the local *government* issued money and accepted this money for *taxes*. The Wörgl experiment was so successful[3] that it was terminated by the Austrian central bank (Naqvi and Southgate 2013, 4). A fundamental problem of all private money systems (and local public money systems) is that when they become too successful (disruptive or macroeconomic significant), the national government or a delegate thereof prohibits them. Arguably, because tax income of the government (the state) is threatened. The conclusion is that some of the functions of monetary systems have a public and network nature and that therefore the disruptive potential of private moneys is per definition limited.

Conclusions and further research

This article has explored which private (digital) money systems qualify as (disruptive) social innovation. Based on Kumhof's distinction between 'token-based money' and 'credit-based money', we have classified existing private money systems into four categories: 'MCSs', 'nCTSs', 'fCTSs' and 'oCTSs'.

Subsequently, we used the results of a case study into 30 Dutch-based private money systems to explore how these four systems function in practice. Thereafter, we discussed if these four private money systems qualify as social innovations. We concluded that almost all 'MCSs', 'nCTSs', 'fCTSs' qualify as social innovation because their focus is clearly social and that the qualification of 'oCTSs' depends on the definition of social and the analysis of the current public-private bank credit system. According to at least some involved social innovators, the current system is an 'a-social factor in society'.

Finally, we explored the disruptiveness of private moneys. The case study found that the financial crisis and the emergence of 'oCTSs' (and the underlying distributed ledger technology) has radically changed the ideas behind private moneys and the motivation of involved social innovators: increasingly, the aim is disruption. However, monetary theory suggests that the externalities that come with the public and network nature of monetary systems will likely impede disruption by private moneys.

However, digital 'oCTSs' introduced an innovative peer-to-peer payment technology (distributed ledger) in practice and reintroduced token-based designs to monetary theory. For further research, we therefore recommend to explore the implementation of a digital token-based system on a public level. There are indications that the governance of money could be improved by implementing

(partly) a digital *public* token-based design and instruments already used in private money systems. Some scholars (McMillan 2014; Ricks 2016; Stiglitz 2016a, 2016b, 2017; Wortmann 2016; Yamaguchi and Yamaguchi 2016a, 2016b) already explore this direction and argue, for example, that it is possible in the digital age to implement an infrastructure for 'real time taxation' and credit guidance towards investments in capital goods. An interesting open question is how sovereign ('public') monetary power could and should be organized in the digital age. Further (empirical) research into private moneys could benefit from starting with the classification presented in this explorative paper. Another recommendation is to explore further the (theoretical) impediments of private money systems.

Notes

1. https://www.cryptocoincharts.info/coins/info (accessed March 22, 2017).
2. The history of complementary currencies dates back to at least the interwar period.
3. Another reason for the success was that the 'labour notes' in Wörgl depreciated 1% in nominal value every month unless users affixed stamps to maintain it (Naqvi and Southgate 2013, 4). This stimulated spending instead of hoarding.

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