

Mutual Credit and Universal Basic Income: Situating Two Cryptocurrencies Within Economic Theory

Complementary Currencies and Societal Challenges Conference

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This paper is a critical comparison of two complementary currency (CC) projects, the Trustlines Network and Circles. The two initiatives are similar in many ways. Both are blockchain-based multi-hop bilateral mutual credit systems, both share the concept of economic inclusion or accessibility in their mission statement, and in addition they feature shared values of decentralization and an emphasis on empowering local economic communities. However, the projects appear to differ greatly in economic theory: Trustlines is fundamentally a mutual credit framework, indicating it is debt-based; while Circles is designed under a universal basic income framework, indicating it is more similar to fiat money. This analysis opens with a review of each of the two highlighted CC projects, followed by a discussion of the relationship between mutual credit systems and universal basic income from the lens of monetary theory. Finally, the two highlighted CC projects are examined from a practical perspective, discussing how to best implement these ideas, as well as whether each framework logically complements existing currency regimes, or should instead be understood as an alternative. In the latter case, this would entail developing a coherent system of monetary governance and introduce several further challenges. In our conclusion we emphasize that the two initiatives are compatible.

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1.0 Introduction

Complementary currencies (CCs) are often designed to address a variety of societal challenges, with one recurring focus being economic inclusion. The term “complementary currency” is a broad one and may also refer to local, social, regional, community, or alternative currencies. Additionally, CCs tend to include in their definition not just physical printed currencies but also non-governmental electronic currencies, such as cryptocurrencies. The focus of this paper is on Trustlines Network and Circles, two similar but distinct cryptocurrencies. These projects are radical new payment systems that seek to address economic inclusion in the tradition of CCs, but in the process, may invite the world to rethink the role of currency.

CCs have grown more plentiful and ambitious over the years, especially since the 2008 financial crisis (Arjaliès, 2019). One contributing factor is that advancements in electronic currencies offer the opportunity to re-imagine the definition of money on a much larger scale than previously thought possible. There are several forms of governmental and non-governmental electronic currency (see Figure 1), however there remain inconsistencies in how to define the specific term “cryptocurrency”. In this paper we use the description given by Bech and Garrat (2017): “Cryptocurrencies utilise DLT [Distributed Ledger Technology] to allow remote peer-to-peer (p2p) transfer of electronic value in the absence of trust between contracting parties.” In contrast, they explain: “Usually, electronic representations of money, such as bank deposits, are exchanged via centralised infrastructures, where a trusted intermediary clears and settles transactions.”

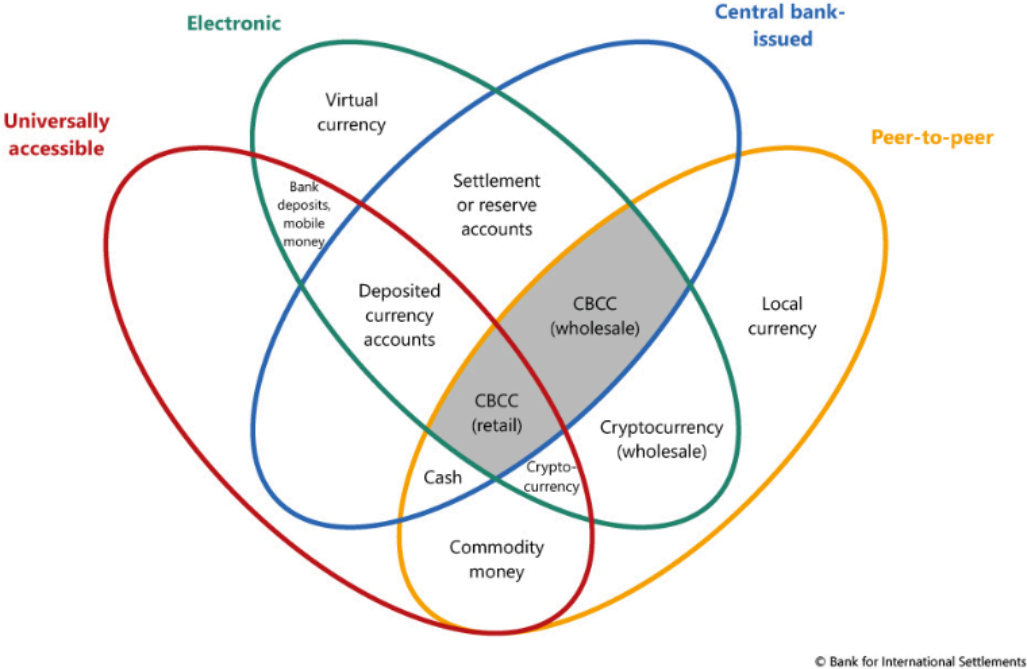


Figure 1. “The money flower: a taxonomy of money.” (Bech & Garratt, 2017)

Due to their trustless, decentralized architecture, cryptocurrencies offer a level of security that has been previously unavailable to non-governmental electronic currencies. Public blockchains² are therefore a technology paving the way for *universally accessible* complementary payment systems, as illustrated by the placement of cryptocurrency in the “money flower” (see Figure 1). The quality of accessibility makes blockchain-based CCs more resilient, and potentially more scalable, than their centralized predecessors.

However, the particular technological achievement that the Trustlines and Circles models share—beyond being another two cryptocurrencies—is what this paper refers to as “multi-hop bilateral mutual credit”, a concept that will be explained in depth in Chapter 2.

A brief history of this concept begins with a popular type of digitally-agnostic CC known as the Local Exchange Trading System (LETS). This is an accounting system that allows its members to exchange goods and services without using the national currency, simply by recording transactions and the resulting member balances on a centralized ledger (Williams, 1996). LETS is based on the principle of mutual credit: “A mutual credit system operates not through money as the initiator of exchange but through exchange as the creator of a debt or credit.” (Hutchinson, Mellor, & Olsen, 2002, p. 188)

But this system is not without its weaknesses. Friis and Glaser (2018) note that the stability of mutual credit LETS systems tends to decline if the community size grows too large. This is likely caused by a decrease in trust between members, and a higher prevalence of “free-riders”. It is a consequence of the fact that the risk of default by any member is borne by the community as a whole. This problem was addressed by Rumblepay (formerly known as Ripplepay, or the original Ripple project), the predecessor to Trustlines and Circles (Fugger 2004). Rumblepay was designed to solve the accountability³ problem by converting a multilateral mutual credit arrangement into a granular bilateral mutual credit network.

Although the two cryptocurrency initiatives in question may have been born in the image of centralized mutual credit systems like LETS, they re-imagine the idea on a much larger scale. They take the new improvement of granular peer-to-peer value transfer, and implement it on top of decentralized infrastructure.

This results in a highly scalable design, suggesting these two payment systems have the potential to grow rapidly. It is an achievement that may simply represent an opportunity for existing mutual credit systems to take advantage of more sophisticated technological architecture; but it also introduces the question of what role such currencies can or should play in the broader economy.

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³ source: [“Is the Rumblepay service a LETS system?”](#)

How can we use monetary theory to contextualize these innovations? And how can we use the lessons learned from existing CCs to situate these currencies in an environment where they will thrive? To address these questions, Chapter 3 discusses the relationship between mutual credit and universal basic income, and Chapter 4 then discusses opportunities and weaknesses of these two cryptocurrencies, concluding with a strategic examination in Chapter 5 of how these projects may or may not fit into today's economy.

2.0 Trustlines Network

The Trustlines Network mission statement is: "promote financial & economic inclusion of all people through decentralized and open source systems" ("The Trustlines Network", n.d.).

Trustlines was originally conceived as "permissionless mobile payments based on people-powered money" (K. Nærland, personal communication, 2019), and later described as an "immutable accounting system for netted IOU ["I Owe You"] balances between trusted parties" ("People Powered Money", 2019), inspired by the original Ripple project (Fugger, 2004). In other words, it is a peer-to-peer interest-free "credit network": ideologically based on the principle of mutual credit, and made scalable by a system of hawala. In a p2p credit network, participants extend lines of credit to individuals whose reputation they trust ("trustlines"). Complex payments are then possible by settling chains of IOUs that may pass through multiple hops of trusted individuals (See Figure 2). For example, if Alice seeks to transact with Charlie, with whom she does *not* share a direct line of credit, she may instead adjust her credit balance with Bob, who *does* share a trustline with Charlie — Bob, in turn, would mirror that credit adjustment in his trustline with Charlie, so that Charlie ultimately gains IOUs. Many friends of friends may cooperate to enable such a transaction, at no cost to themselves. This settling process is commonly referred to as "rippling".

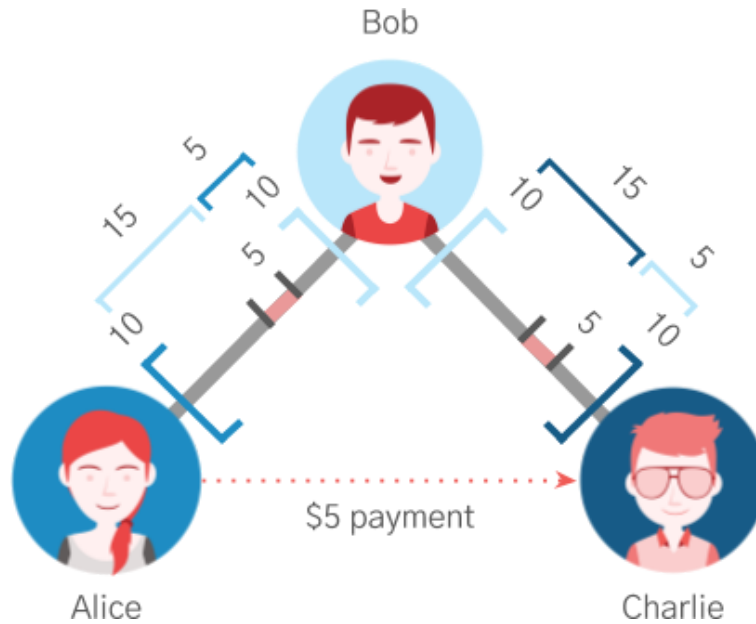


Figure 2: Alice pays Charlie \$5 by passing an IOU through their trusted mutual connection, Bob. After the transaction, Bob holds an extra \$5 of Alice’s IOUs, while Charlie holds an extra \$5 of Bob’s IOUs. (“The Trustlines Protocol”, n.d.)

In this way, the Trustlines Network is a far more scalable currency system than projects with similar values, like LETS. That is because Trustlines is decentralized, not just in its underlying infrastructure but also in its system design: the risk of default is borne by each individual loaning to her peers, rather than by the greater community (as in LETS). Since the state of every trustline is globally accessible, complex multi-hop credit balance rippling is possible, turning a credit network into a robust payments system. Liquidity barriers tend to be a central concern among skeptics of this currency model, however there is evidence that it is possible to reach high levels of liquidity based simply on p2p credit networks (Dandekar, Goel, Govindan, & Post, 2011).

2.1 Circles

The Circles mission statement is: “create and distribute a globally accessible Universal Basic Income” (“Circles: A Basic Income on the Blockchain”, n.d.).

The technical architecture underlying Circles is identical in concept to that of Trustlines, although the language is often different. Participants extend lines of credit to those whose reputation they trust, and payments then pass through multiple hops of trusted individuals. The critical difference is this: instead of starting off with an account balance of zero, all users start off receiving regular positive deposits, in the spirit of a universal basic income. The process of automatically receiving these deposits is referred to as “minting”, and the sum is denominated in “personal currencies” unique to each user. In other words, each user regularly mints an equal

number of IOUs that are redeemable only with the one who minted them. When transacting with peers, users then have a maximum spending cap equivalent to their individual account balance — despite whatever personal trust limits they form between peers. In other words, even if you extend a credit line of one million units to your best friend, the maximum she can pay you is only the amount she has in her account. (“Circles Money System Overview”, 2018)

The Circles currency offers a compelling model for how to implement a universal basic income in a straightforward, grassroots way. It “was designed to get started creating a UBI [universal basic income] economy today” by leapfrogging political and logistical barriers, particularly the challenge of identity verification (“Circles Money System Overview”, 2018). In contrast to Trustlines, which may be understood as a mutual credit accounting system, Circles is better classified as “fiat-type private money” (Selgin & White, 1994, p. 1733). Personal currencies in the Circles system are implicitly given value by “decree” (i.e., fiat), whereas in Trustlines a user’s currency has value only based on her creditworthiness (i.e., her peers’ willingness to hold her personal IOUs).

Circles integrates an additional monetary tool as well: a pre-programmed demurrage, or negative interest rate, which continuously devalues all currency as time passes. Circles and Trustlines thus may be very similar on a technical level, but the economic framework is considerably different.

The general spirit of the Circles system is that each user will have only one account, and thus receive only one basic income. The assumption is that this rule will be naturally enforced because the majority of users would only agree to hold personal currencies (i.e., IOUs) belonging to people who use the system honestly. If a user should accept IOUs from a dishonest person using a duplicate account, she personally takes on the risk of not being able to re-spend those IOUs with the rest of the network (i.e., the majority-honest users). In this way, all the personal currencies can appear to be one uniform currency, while users can be reasonably certain that nobody is receiving an extra basic income with a duplicate account.

A key difference between the Circles and Trustlines models is that users in Circles are expected to form trusted connections not based on perceived creditworthiness, but instead simply on the confidence that the other party is a real human being and thus eligible to receive a basic income. Circles suggests the use of organizations called “validators” (note that usage of this term is unrelated to “blockchain validators”) to facilitate this type of connection-making: “When a user trusts a validator, they automatically trust the currency of every user that the validator trusts. This means all the users that the validator trusts can transitively use the currency of anyone who trusts the validator... Users might be validated as citizens of a city, tenants of an apartment building, or practitioners of a certain trade.” (“Circles Money System Overview”, 2018)

3.0 Mutual Credit and Universal Basic Income

This analysis takes the “money view” perspective, which “places banking at the center of attention, views banking as fundamentally a swap of IOUs, and views money as nothing more than the highest form of credit” (Mehrling, 2017). Under this economic framework, Mehrling emphasizes the importance of credit in providing liquidity to the monetary system, particularly in the face of a scarcity of “real” money.

Mehrling (2012, p. 8) illustrates the relationship between the scarcity of money versus the elasticity of credit by envisioning a hierarchy of money. “Even at the bottom of the hierarchy, if you and I want to make a trade and you are willing to accept an IOU from me then we can trade, and what makes the trade possible is an expansion of credit. The elasticity of credit thus offers a degree of freedom that relaxes the constraint posed by the scarcity of money.”

Mutual credit is a system of accounting intended to supplement traditional systems like fiat money or commodity money. Alone, both fiat and commodity money are inelastic systems that could result in a scarcity of money. There are several advantageous features to using mutual credit as a supplementary medium of exchange in this context. First of all, it is highly elastic: it is created where and when money is needed, and it disappears when debts are settled. Thus, there are never liquidity constraints. It is also decentralized, in the sense that there is no monetary authority dictating the terms by which peers may lend to each other. Trades may thus occur organically wherever two parties agree on the terms, without the inefficiencies of a barter system—allowing complex markets to operate even under a shortage of “real” money.

Although it challenges folk wisdom, most economists agree that some level of debt reflects economic growth, and in fact must not be repaid (Galbraith, 2010). Otherwise, the risk is creating a regressive, deflationary monetary system, where benefits accrue to the money-holders. In this light, debts such as those created under a system of mutual credit could be described as “deficit spending by the people”. Like deficit spending by governments, such debts (up to some natural limit) would not need to be repaid to underlie a sustainable monetary system (Furman & Summers, 2019).

The random availability or scarcity of commodity money can impose artificial limitations on growth (therefore causing economic inefficiency). To surmount these limitations, most economists agree it is necessary to have a currency that can expand at a rate commensurate with economic growth. We must therefore have some flexible system of money creation; in fiat currencies today, this is achieved through loans created by private commercial banks in the so-called “fractional-reserve” lending process (McLeay, Radia, & Thomas, 2014).

However, there are disadvantages to the bank-money model of monetary growth. For example, not only do private banks find this an undeservedly lucrative arrangement (Macfarlane, Ryan-Collins, Bjerg, Nielsen, & McCann, 2017), but as commercial interests are the arbiters of new money creation, it is short-term profit-seeking activity that guides growth patterns rather than bottom-up investment from a broad population with diverse values. This may contribute to credit-related instability in the economy, as well the funneling of resources away from

environmentally or socially responsible industries (Doorman, 2015). Instead, the most efficient and egalitarian system of money creation is arguably to distribute new money as universal basic income (Huber, 2000, Howitt 2019).

How would it change people's relationship to mutual credit if they learned to look at negative balances not as debts to be repaid, but instead as a basic income? A universal basic income system acknowledges economic growth; a system of mutual credit does not. From this perspective, a mutual credit system *in isolation* would not be able to unlock the economy's full productive potential, in contrast to its usefulness *in complement* to other currencies. As a standalone system, mutual credit is in fact a deflationary economic model (which rewards money-holders). As long as debts are expected to be repaid, there is no possibility to evenly spread the gains in collective wealth. Again, it is those who hold the credit, i.e. the money-holders, that would benefit disproportionately from such a system. This is a relevant point to note in Chapters 4.3 and 5, because it has implications for how to position these different types of complementary currencies within the real economy.

4.0 Opportunities, Concerns, and Implementation

Cryptocurrencies tend to draw a mixed crowd, and some notable projects have attracted severe criticism. For example, not only does Bitcoin suffer from dramatic wealth inequality (Babayan, 2019), but running the protocol uses more electricity than Switzerland (Vincent, 2019). Thus skeptics may question whether Trustlines and Circles, which are also cryptocurrencies, are inadequate or incomplete technical solutions to complex socio-economic problems. However the truth of the matter is more layered. These two initiatives are not simply cryptocurrencies; they are “multi-hop bilateral mutual credit” cryptocurrencies, and thus may in fact represent viable technical solutions to begin addressing a hybrid of technical, economic, and social problems.

However, because of the multifaceted nature of addressing financial inclusion, it is crucial to consider product design in parallel with demonstrated needs of the community. Bearing this point in mind, what kinds of factors should be taken into consideration when implementing a payments system like Trustlines or Circles in an economic community? The following sections highlight some interesting opportunities afforded by these new technologies, as well as a discussion of possible weaknesses, and concludes with a strategic examination of how these projects may or may not fit into today's economy.

4.1 Providing Credit Scores

One of the problems facing the unbanked and underbanked is a lack of access to credit scoring services. This is an issue that may be highly relevant for initiatives like Trustlines or Circles. Trustlines in particular seeks to provide users with access to credit, with the expectation that everyone can find someone who trusts them with a debt. Although Circles does not frame these

trust relationships as “debt”, the underlying architecture is identical and thus could still be a valuable source of data. (Aitken, 2017).

It is theoretically possible to harvest “trust limits” and transaction data for the purposes of giving users a reliable method to prove their creditworthiness and thus develop a credit score. Similar initiatives are already underway with microfinance companies like Kiva (Huang, 2019). However, Kiva does not provide the potential for the ubiquitous, peer-to-peer credit network that Trustlines and Circles could offer. The sheer volume of credit-score-related data that these new payments systems might produce would be unprecedented.

4.2 Accessibility Concerns

Accessibility is a fundamental concern for any product seeking to address economic inclusion. As currently designed, Circles is browser-based, thus accessible on any device with a web browser. Trustlines is currently slightly more restrictive as it requires the use of a smartphone app, although as an open source project it is feasible that motivated users would later improve on the software and make it accessible on web browsers and feature phones.

Regardless, both designs are inherently exclusionary simply because much of the world still lacks access to the internet, and two thirds of the global population remain without smartphones. However, this number is expected to shrink as mobile phones and internet service grow increasingly available to even the poorest communities. The global trend is towards wider adoption of smartphones (and thus, presumably towards mobile app payment systems as well): it is expected that three in four internet users will be mobile-only by 2025 (McDonald, 2019).

Confining an economic system to browser-based or smartphone app transactions may yet present significant barriers to portions of the population, even in developed countries. For example, the elderly may be particularly resistant to using digital devices for making simple transactions.

It is entirely possible that as these projects mature, they will integrate more accessible options, like a linked debit card. Several electronic currency and mobile banking apps already offer such features. However, it does not seem possible that either of the systems in question would be able to integrate a physical voucher or printed cash option.

It is worth noting that the use of electronic currencies introduces a host of known and unknown security risks. Cryptocurrencies in particular have been criticized for poor user experience related to “key management”, i.e. the practice of securely storing the password to one’s digital wallet. However, printed currencies are also subject to many demonstrated risks like forgeries and theft, contributing to their high cost and low scalability (Diniz, Siqueira, & van Heck, 2019). Thus many CC initiatives appear to be moving towards electronic payments systems anyway. Cryptocurrencies may be the most complex and unforgiving of the electronic payment options,

at least from a perspective prioritizing accessibility. However, proponents will argue that the security benefits of cryptocurrencies outweigh such concerns.

4.3 Defining the Boundaries of an Economic Community

In designing a currency suitable for any particular economic community, one consideration is setting the boundaries for currency use; whether those boundaries are geographical, ideological, or political.

Digital currencies are far more scalable than physical currencies, for a variety of reasons. But just because a digital currency could grow doesn't mean it should. Are these currencies better suited for distinct local economies or for a larger, potentially global currency system?

One of the strengths of the Trustlines system is its agnosticism to community size. By its very nature, Trustlines organically maps onto existing trade patterns between individuals. It is designed to grow only to the extent that real economic loops start expanding within the community. An entire Trustlines currency network could therefore consist of just a tiny group of friends; or it could grow into a worldwide network, while naturally preserving the resilience of exchanges made within those friends and within myriad other local economic networks of varying sizes.

In contrast, since the Circles system assumes an even distribution of economic growth across the community, it would not have the same flexibility in setting boundaries. Rather, the pattern of universal basic income distribution, and thus the economic boundaries of the system, would have to map on to the productive capacity of each Circles community through some intentional mechanism. From the perspective of being able to set appropriate monetary policy, the Circles system is thus more appropriate for well-defined economic communities.

In its current design, the Circles app allows open signups but enforces at least two trust connections before allowing the member to receive a basic income. In isolation, this does not seem sufficient to set meaningful economic boundaries. While it may not make sense to limit the Circles app to closed signups (since a potential user would not be able to transact with a community that ultimately rejects him, anyway), there may be reason to set informal boundaries on the system. For example, a user living in Berlin could join the Circles-Berlin network, and receive a rate of basic income calibrated to that region's economic activity; whereas a user living in Brussels could join the Circles-Brussels network, and presumably receive a different rate of basic income. Such communities could feasibly take shape in a decentralized, self-governed way, since all that would be required is a social agreement that each user must join the network belonging to her particular community.

The crucial assumption that Circles makes is that each member of the economic community is owed an equal share of basic income. To the extent that this idea is scalable, the Circles

currency network may grow. Indeed, the Circles team expects that many iterations of distinct, interoperable Circles currencies would emerge from diverse geographical communities.

5.0 Mutually Compatible Ideas

Both Circles and Trustlines explicitly emphasize their positions as complementary to existing and future currencies. Unlike many fashionable modern cryptocurrencies, neither advertises itself as the next dominant world currency. In fact, the Trustlines literature sometimes avoids the use of the term “currency” entirely, opting instead for euphemisms like “accounting system”. Despite their humble origins, it is worth examining these new initiatives from a broad theoretical perspective: Whether or not the teams behind such projects intend to see their ideas scale globally is unrelated to the logical possibilities inherent in the design.

As argued in Chapter 3, an ideal currency should offer liquidity wherever mutually beneficial trades would be possible. Trustlines has an advantage over Circles in this regard, in that its supply is perfectly elastic, such that there will never exist an artificial cap on lending between peers. However, the psychology of using a debt-based currency is likely to affect economic activity differently. As long as users expect always to be repaid their IOUs, such a system could not evolve into a standalone monetary system. Trustlines as envisioned today may complement, but cannot replace traditional dynamic monetary systems.

By the same argument as stated in the previous paragraph, Circles is in contrast a non-deflationary currency model that could theoretically succeed as a standalone monetary system. Nevertheless, the Circles project faces some tough obstacles. As a potential standalone currency, not only would it be inherently positioned to challenge or replace the status quo currency systems—thus, if widely-adopted, it may eventually invite backlash—but it also necessitates some system of monetary governance that would enable a dynamic entity to moderate the rate of inflation or amount of basic income. Implementing monetary governance within a cryptocurrency is no small feat, although there are promising directions for designing an appropriate model due to a growing body of e-governance research and experiments with Decentralized Autonomous Organizations (DAOs). Nevertheless, governance at all is a tricky topic within the cryptocurrency community, because it introduces points of centralization—usually perceived as a weakness in decentralized systems.

The crucial point to make is that these two CC initiatives are not based on mutually exclusive ideas. In fact, it is both ideologically and technically feasible that either project could integrate the ideas of the other at some point in the future. The Trustlines team has explicitly left the door open for variations on the original concept, and in informal communication the Circles team appears open to adding new features as well. In addition, both projects are open source and available for tinkering and innovation from the public.

The ultimate goal for both of these initiatives is financial inclusion, and both designs show the potential to reach that goal, albeit under differing economic frameworks. Regardless, both initiatives are built on the assumption that access to credit or currency is fundamental to a healthy, more productive, and more equal economy. The age of experimental currencies is upon us—only time will tell the impact of these two fascinating new payments systems.

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