

The Role of Money in the Ecological Transition

David Barmes¹
McGill University

¹ I owe many thanks to Romain Svartzman, Tom Naylor, and Charles Guay-Boutet for their guidance and feedback on drafts of this paper, and I would also like to thank Peter Brown for supervising the independent project course for which the paper was written.

Abstract:

Money, in its current form, is usually conceptualized by heterodox economists as being either a barrier or potential aid to the ecological transition. A number of varied proposals from ecological economists, post-Keynesian economists and others, claim to demonstrate how we can make the institution of money work for people and the environment. Yet these proposals arise from different theoretical understandings of money and, therefore, the matter remains highly inconclusive. This paper reviews the justifications for, and limitations of, three broad categories of proposals: full-reserve banking, ‘controlling’ money, and complementary currencies. I conclude that complementary currencies may be the most promising tool for the ecological transition, while ‘controlling’ money must play a role but is highly limited, and full-reserve banking should not be recommended as it appears to be based on a flawed conceptualization of money.

Résumé:

Dans sa forme actuelle, la monnaie est généralement considérée par les économistes hétérodoxes soit comme contrainte à la transition écologique, soit comme un facteur aidant si elle est utilisée correctement. Diverses propositions, élaborées par des économistes écologiques, post-Keynésiens et autres, prétendent montrer comment on devrait faire fonctionner l'institution de la monnaie à la fois pour les citoyens et pour l'environnement. Cependant, ces propositions émanent de différentes conceptions théoriques de la monnaie. Cet article passe en revue les bons et les mauvais côtés de trois catégories générales de propositions: la ‘monnaie pleine’, le ‘contrôle’ de la monnaie, et les monnaies complémentaires. Je conclus que les monnaies complémentaires ont le potentiel d’être l'outil le plus efficace pour la transition écologique, alors que le contrôle de la monnaie est nécessaire mais reste très limité, et que la ‘monnaie pleine’, fondée sur une compréhension erronée du système monétaire, ne devrait pas être recommandée.

Introduction

Increasing ecological and financial fragility has resulted in a growing field of enquiry, particularly since the Great Financial Crisis (GFC), surrounding the question of what role money might play in the ecological transition. As natural scientists continue to document multiple overlapping environmental crises, including accelerating climate change (Smith et. al 2015), sea-level rise (Nerem et. al 2018), and mass extinctions (Wilson 2003), it is clear that we must re-envision certain structural aspects of our economy. Money, in its current form, is usually conceptualized by heterodox economists as being either a barrier or potential aid to the ecological transition. There now exist many varied proposals on how to make the institution of money work for people and the environment. Yet these proposals arise from different theoretical understandings of money and, therefore, the matter remains highly inconclusive. This paper aims to review core aspects of this debate in an attempt to provide some clarity on the merits and limitations of the different theories and their corresponding policy proposals.

Based on historical, empirical, and anthropological evidence, this paper rejects neoclassical economics' view of money. Conventional economic wisdom holds that "money arose because of the inconvenience of barter" (Ragan and Lipsey 2011: 695); as such, its main function is to serve as a lubricant that facilitates exchange of goods and services in the market. The mainstream has largely adopted Friedman's (1969) argument, as summarized by his critic Davidson (1972), that money is best assessed when treated as an exogenous variable that "enters the system as manna from heaven, or dropped from the sky via a helicopter" (ibid: 877). The implications of this are twofold: first, money, banks, and debt play no role in mainstream economic models; second, the status quo of the monetary system is never challenged by

mainstream economists, as there are no logical grounds to change something that serves neutral, useful, and efficient functions.

In reality, however, money is a profoundly social and political institution with an elaborate history that does not begin with inconvenient barter (Graeber 2011). Three dimensions of money as a social institution can be outlined at this stage. First, money has been created as debt and has been endogenous to socio-economic dynamics for the past 5,000 years (Graeber 2011). Today, money is an accounting convention: it is created through loans, and it gets destroyed through the repayments of these loans (Mcleay et. Al 2014). Second, what constitutes economic value within a given community is represented precisely by the institution of money. In this sense, money signals value; it is the symbol that a community agrees to recognize and use not only for economic transactions but also for social purposes and for the reproduction of society itself (Aglietta 2016). Third, money enables a person to accumulate wealth for its own sake, and it is therefore at the heart of capital accumulation (Harribey et al. 2018).

While some scholars have made interesting ecologically-oriented monetary proposals to be implemented at the international level, such as an ecological *bancor*² (Brown and Garver 2009: 120-121), I will focus on national and subnational proposals, as these have been most common and contentious in the literature. The paper will proceed as follows. The first section will assess the concept of full-reserve banking, finding it to be a potentially flawed solution to

² This proposal is modeled on Keynes' plan for an International Clearing Union that would issue a currency called the *bancor*, intended to prevent trade imbalances. Brown and Garver (2009: 120) propose the *ecor*: "Credits or debits of *ecors* could be tied to a nation's management (or mismanagement) of its ecological capacity, including but not limited to national net primary productivity (NPP)"

a problem that may not exist. The second section will assess proposals that revolve around controlling money for the benefit of the environment, arguing that this represents an important though highly limited approach to the ecological transition. The third and final section will assess proposals for complementary currencies, showing that, if designed with certain features, they have the potential to play an important role in the ecological transition. The majority of the references throughout this paper are drawn from the literature in ecological economics and post-Keynesian economics.

Section 1: Full-Reserve Banking for the Ecological Transition

Although different proposals vary in detail, the essence of full-reserve banking (FRB) is that private money creation is prohibited. In other words, banks would not create new money in the form of bank deposits in the process of bank lending (which they currently do, as will be shown below). These proposals are also sometimes made under different names, such as sovereign money, given that only government money would be in circulation. Mirroring the post-Great Depression era, when the FRB proposal known as the Chicago Plan gained much traction (Benes and Kumhof 2012), the post-GFC years have seen FRB proposals become increasingly popular. Some countries are even officially discussing a possible political implementation. For example, Switzerland will hold a referendum on nationalizing the monetary creation process in June 2018 (Bachetta 2017). This section will outline the ecologically-focused theoretical justification for FRB – the monetary growth imperative – as well as its critique to show that FRB may be a misguided solution to a misunderstood problem.

The monetary growth imperative argument:

In order to grasp the primary justification underpinning many FRB proposals, it is first essential to understand the dynamics of money creation. In recent years, economists from the Bank of England (Mcleay et. al 2012), the IMF (Benes and Kumhof 2012), and the post-Keynesian tradition have all shown that money is in fact created through bank credit. In a process that is indeed “so simple the mind is repelled” (Galbraith 1975: 18), “whenever a bank makes a loan, it simultaneously creates a matching deposit in the borrower’s bank account, thereby creating new money” (Mcleay et al. 2012: 1) and when that loan is paid back, money is, in effect, destroyed. Thus, money in circulation represents only the principal of a loan, while interests due 'do not exist' and can therefore only come from further bank loans.

On this basis, numerous ecological economists have identified and analyzed a “monetary growth imperative”, which they argue biases the economy towards a quest for infinite growth, an impossibility on a finite planet (e.g. Daly 1996; Douthwaite 2010; Farley et al. 2013). Much of this recent work has drawn on the writings of Frederick Soddy, often considered today as one of the founding fathers of ecological economics. After having won the Nobel Prize in Chemistry in 1921, Soddy turned his mind to the study of monetary relations and argued that the monetary system was in deep and unsustainable contradiction with the laws of thermodynamics (Daly 1980). Well ahead of his time, Soddy (1926) described how money is created in the form of interest-bearing debt and how this results in a pro-growth bias inherent in the monetary system. Whereas money can grow exponentially, following the laws of mathematics, future production is 'doomed' to confront biophysical limits sooner or later. Therefore, Soddy (1922: 30) argued that "you cannot permanently pit an absurd human

convention, such as the spontaneous increment of debt against the natural law of the spontaneous decrement of wealth".

Full-reserve banking as the ecological solution:

As a solution to the apparent unsustainability of the monetary system, leading ecological economists have advocated for the eradication of interest-bearing debt. For example, Farley et al. (2013: 2813) argue that in the long-term, "money creation ... cannot be debt-based and interest-bearing" and that "a steady-state economy would require that the effective money supply fluctuate at approximately the same rate as economic activity fluctuates" (ibid: 2813). The underlying logic is simple: given that the source of the problem appears to be the power of commercial banks to create interest-bearing debt, remove this power and the crux of the problem will be solved. In this scenario, the government becomes the sole issuer of the national currency, with banks acting simply as intermediaries between depositors and borrowers (precisely the role that many people believe banks currently play). Hence, many ecological economists have come to support FRB proposals that effectively prevent commercial banks from creating money.

Post-Keynesian critique of the monetary growth imperative and FRB:

However, post-Keynesians have strongly criticized FRB proposals and the analyses that accompany them, including the argument that a monetary growth imperative exists in the first place. First, it is important to note that the idea of a monetary growth imperative is in part premised on Soddy's separation between the 'real' and 'virtual' (i.e. financial) sides of the economy. Soddy (1926) conceptualized the economy as being split into three layers: one of

debt-debt consisting of purely virtual financial transactions; one of debt-real wealth corresponding to financial claims that could be repaid by creating 'real' economic value; and one of real-real wealth taking place entirely within the real economy. According to post-Keynesian theory and other endogenous approaches to money, this conceptualization remains highly incomplete. In a “monetary economy of production”, conceptually detaching the sphere of the ‘financial’ from that of the ‘real’, which is precisely what neoclassical economics does, cannot constitute an adequate starting point for analyzing the monetary system. In practice, money needs to be created so that production – Soddy's "real-real" layer – can actually take place. In other words, no matter how money is created, money will always need to be created in order to 'signal' economic value.

As such, recent work criticizes the argument that money created as interest-bearing debt would generate a 'Soddyan growth imperative'. For example, Cahen-Fourot and Lavoie (2016), who outline the core dynamics of endogenous money, argue that positive interest rates do not necessarily require growth. Their analysis shows that a steady-state economy can "bear positive interest rates if the stock of debt remains constant while output and prices remain so as well [...] What has to remain constant is the stock, namely the debt, but the flow, namely the interest payment, does not need to be set to zero" (ibid: 165). In other words, it is not because some economic agents who need to reimburse a loan need to grow – barring inflation – that the entire economy suddenly needs to grow. Further, two prominent ecological economists – Jackson and Victor (2015: 44) – also found, through the use of a stock-flow consistent model, that “neither credit creation nor the charging of interest on debt creates a ‘growth imperative’ in and of themselves.”

Beyond the argument that a monetary growth imperative does not exist, post-Keynesians have suggested that FRB proposals are based on further misconceptions regarding the dynamics of the monetary system. In particular, Fontana and Sawyer (2016) argue that the following points are not understood by FRB advocates. First, while banks create assets (loans) and liabilities (deposits), assets (deposits) and liabilities (loans) are created for the non-bank public, and as such, there is no net wealth creation and banks do not create their own wealth in the money creation process. Second, according to endogenous money theorists, the processes of inflation are rarely caused by increases in money supply; reversely, it is inflation (caused by socio-economic factors) that results in increases in the money supply. Therefore, inflation is rarely a monetary phenomenon and it cannot be controlled by a managed rate of increase of the money supply, as often advocated for in FRB proposals. Third, the money supply is not solely determined by banks but also the decisions of the non-bank public, as the stock of money which remains in circulation is subject to the willingness of the non-bank public to hold money.

Section 2: ‘Controlling’ Money for the Ecological Transition

Given that the very nature of money may not be the root of the problem, could controlling finance, and by default, money, be sufficient to re-embed the monetary system within societal and ecological goals? According to Harribey et. al (2018), looking at various reports on the topic, 3% of global GDP for at least 10 years seems to be a realistic number for what is needed to accomplish an ecological transition. To steer such vast amounts of money into the required long term investments needed for such a transition, Harribey et al. (2018: 121-122) highlight three directions for monetary policy: first, central bank control of credit to banks for private “clean” investments; second, central bank guarantees for public loans destined to finance investments linked to the transition; third, the possibility for central banks to finance

investments through the creation of money, using a strategy of “ecological quantitative easing.”³ Further, some scholars (Forstater 2001, Lawn 2010) have proposed Job Guarantee programs that promote environmental sustainability. Such programs, funded through deficit spending, entail the government providing “green” employment “including monitoring, clean up, recycling, education, and more” (Forstater 2001: 21) to anyone who is ready and willing to work. This section will address the historical and theoretical justifications for, and limitations of, controlling money for the ecological transition.⁴

Historical and theoretical justification for controlling money:

Historical and anthropological evidence shows that money is inherently a social relation (Graeber 2011, Aglietta 2016, Rossi and Rochon 2013). Money did not appear as a means of solving the inefficiencies of the double coincidence of wants, as the common “barter” narrative claims, but rather predates modern exchange markets (and by default, capitalism). Since ancient times, social relations implied “a means of payment in order for individuals to settle their social debts, such as arising from status, kinship, convention or religion” (Rossi and Rochon 2013: 220). This shared confidence in a particular means of payment signifies communal belonging; it institutes a relationship between the individual members of a society to the entire society. As such, money is a social rapport first, and an economic instrument second (Harribey et. al 2018). Therefore, money must be assessed as an essential dimension of the evolution of complex societies (Graeber 2011), and not as an afterthought that would just grease or disturb the 'real' or 'productive' economy.

³ Also sometimes referred to as *green* quantitative easing, this policy would entail the Central Bank issuing money to purchase bonds that serve to fund investments required for an ecological transition.

⁴ The more common technical and institutional arguments regarding the insufficiency of piling up 'green' investments to solve complex socio-ecological problems will not be addressed here.

This historical perspective suggests that money itself may not require a fundamental transformation, and indeed, given that “money is endogenous irrespective of the historical period or of specific institutional arrangements” (Rossi and Rochon 2013: 212), there are constraints on the extent to which it is possible to transform money. As such, current money may only be socially and environmentally unsustainable in its context of financial capitalism and neoliberal politics. In recent decades, finance has permeated itself throughout society, as a direct result of an explosion in the scale and intensity of financial activity. For example, between 1980 and 2007, the ratio of financial assets relative to world GDP rose from 1.2 to 4.4 (Palma 2009). Further, between 1970 and 2011, the world experienced 147 banking crashes, 218 monetary collapses, and 66 sovereign debt crises (Laeven and Valencia 2012). Thus, it may be the systemic instability of an ever-growing financial sector, rather than money in and of itself, that has undesirable social and ecological consequences.

Theoretical limitations to controlling money:

Although there may not be a monetary growth imperative as many ecological economists claim, money and economic growth are still intimately inter-connected. Indeed, money does not demand unlimited accumulation; rather, it anticipates unlimited accumulation. Capitalist economies are dynamic systems that perpetually seek to grow via increases in the quantity and quality of goods and services produced from any given period to the next. This dynamic of growth requires increases in money, as well as the constant circulation of money, for the realisation of both production and the profit derived thereof (Harribey et. Al 2018).

In a monetary economy of production, money is a condition of production. Businesses purchase inputs such as machinery and raw materials and employ workers, all with the goal of producing and investing. In order to do so, businesses must advance financial capital, as “net investment on the macro scale necessitates an advance of money to anticipate the production of an economic surplus” (Harribey et. al 2018: 91). This advance of money originates in the banking system extending loans to businesses, and the credit is used to invest, employ, produce, and provide monetary revenue to households, namely through salaries and dividends. Part of this revenue is consumed and the rest is saved. Money then flows back to businesses through the sale of goods and services, and to banks via household savings, business savings, repayment of principal and interest. As explained by Harribey et al. (2018: 92), “the key concept of this conceptualization is that of the *financing* of production, which intervenes *a priori*, before the the initiation of production that will be the creator of value added.”

The closing of this macroeconomic circuit inextricably binds money and economic growth. In order for the value added that is extracted from the production process to be transformed into money, creation of money must anticipate the profit that will be brought about by productive work. The closing of the circuit involves the purchase of new inputs of production (i.e. net investment on the macro scale), which is made possible by an injection of additional money into the economy. Thus, through its creation of money via the extension of credit, the banking system anticipates that businesses will turn a profit and by virtue of this anticipation, it simultaneously allows for this profit to be realised (Harribey et al. 2018). Wherever money is created to anticipate accumulation, and this accumulation does not end up materializing, the inevitable result is financial crisis, often with serious social repercussions. As such, an inevitable tension exists between endlessly seeking accumulation to fend off crisis, or actively trying to halt accumulation, voluntarily triggering crisis.

Historical limitations of controlling money:

While the post-Keynesian literature displays a profound understanding of the socio-economic history of money, it completely ignores biophysical dimensions that may render insufficient the approach of controlling money for an ecological transition. According to Lohmann and Hildyard (2014: 69), “the history of modern finance is intimately intertwined with that of thermodynamic Energy”. Finance and energy have ‘co-evolved’ through a symbiotic process. The concentration of energy required vast concentrations of capital, and in turn, new and larger financial institutions were necessary to manage the profit generated by this increase in fossil fuel exploitation and usage. Thus, the current system of accumulation may be even more dependent on the fossil fuel industry than is commonly thought; just as the fossil fuel industry would not be able to function as it does without the modern financial system, the reverse is also true.

Historically, the funds required for the expansion of industry “played a key role in transforming capital, rendering it more mobile” (Lohmann and Hildyard 2014: 70) so that it could exploit vaster amounts of natural resources. This included the revival of the joint stock company, which solved the problem of immobile, geographically dispersed capital in the 18th century. In this model of corporate ownership, investors remain owners but have little to no say in the daily management of the company. After emerging under the Dutch republic, joint stocks were regulated in Britain following the South Sea bubble of 1720. Yet pressures from industry in the early to mid 19th century resulted in regulations being virtually removed. This allowed for the concentration of sufficient capital to finance, for example, the construction of railways, canals and mills, and deepen the exploitation of coal mines (Ibid.). Subsequently, the

tremendous surpluses generated by concentrated energy required new financial institutions to handle newly-created profits. Thus, it is not a coincidence that the financial players involved in the creation of the U.S. Federal Reserve in 1913 were all connected to the rise of oil (Auzanneau 2015: 112). Further, throughout the 20th century, a vast range of what would become significant financial instruments were developed to further facilitate the raising of funds for fossil fuel companies (Lohmann and Hildyard 2014; Auzanneau 2015)

Going even deeper, financialization may be linked to particular biophysical dimensions. Moore (2015) observes that throughout the history of capitalism since the sixteenth century, the ecological surplus that sustained capital accumulation in the core of the world-system tends to fall relative to the capital accumulated. Such declines in ecological surpluses result in fewer investment opportunities for appropriation relative to the accumulated capital. When ecological surpluses fall, "the possibility of renewed capital accumulation ... depends upon finding new frontiers of appropriation" (Moore 2015: 101). Historically, this has been done in two ways. First, through bio-material restructuring that created opportunities for windfall profits through the restoration of cheap food, energy, raw materials, and labor. Second, by financializing capital, meaning disconnecting the reproduction of capital gains from the biophysical limits of its socio-economic system: "as accumulation in the real economy falters, a rising share of capital gravitates towards financial rather than productive activities" (Moore 2015: 227). Expansion of capital can therefore take place through physical space, by appropriating new resources through technological innovation and/or militarization, but also through time, by increasing the immediate amount of financial wealth relative to what biophysical and technological conditions would allow.

As such, it seems misguided to assume that controlling money while maintaining the current structure and size of the financial system could be fit for the ecological transition. In order to meet the basic needs of all humans while remaining within planetary boundaries, it will indeed be necessary to make long-term investments in sustainable infrastructure, energy, agriculture and more, yet it will also be necessary to change dietary habits, work less, consume less, and so on, at least in advanced economies. We know that money can be controlled to accumulate capital in a marginally more socially and environmentally desirable manner, but can current money achieve the overall ‘de-accumulation’ of capital that may be necessary to avoid the further breaching of planetary boundaries? For this, a deeper transformation of money may be necessary, but what transformative options exist within the constraints of money’s necessarily endogenous features?

Section 3: Complementary Currencies for the Ecological Transition

Complementary currencies are alternatives to conventional money. They are circulated in addition to the established legal tender of a country (or bloc of countries), often at the local level. In the past 40 years, complementary currencies have exploded in number: while only a small number were in circulation before 1980, over 4,000 exist today (Liettaer and Dunne 2013: 5). This trend has been particularly spurred by environmentalists (Helleiner 2000), including to a large degree proponents of degrowth (Dittmer 2013), signaling that many believe that complementary currencies have an important role to play in the ecological transition. Complementary currencies can take a wide variety of forms and be designed to serve many different purposes. This section will provide a cursory glance at this diverse world in an attempt to provide some insights into the potential benefits and drawbacks of such currencies for the ecological transition.

Justifications for complementary currencies:

In theory, complementary currencies have much potential for stabilising the economy and supporting earth's life-support systems. Complex flow systems, including biological ecosystems, tend to achieve stability by maintaining a balance between efficiency and resilience (Lietaer et. al 2012; Lietaer and Dunne 2013). Arguably, the monetary system's structure dooms it to instability as it prioritizes efficiency over resilience. A 'monetary ecosystem' with multiple diverse complementary currencies may contribute to stabilising the monetary system by ending the current monetary monopoly of conventional money (Lietaer et. al 2012; Lietaer and Dunne 2013; Dron 2015; Douthwaite 2010). Of more relevance to the purpose of this paper, however, many types of complementary currency are not subjected to the same limitations of 'controlling' money explored in the previous section: first, they do not promote the illusion of limitless substitutability; second, they can be designed in such a way that they are disconnected from endless accumulation.

As "special-purpose" money,⁵ complementary currencies can go a long way in building more ecologically-grounded communities for the ecological transition. "General purpose" money⁶ has been an important enabler of the forces of globalisation that are at the root of many of our environmental challenges (Hornborg 2016). As conventional money has commodified all material and social life, signaled as homogenously interchangeable with the cultural symbol

⁵ I define special purpose money as money that is designed for a specific purpose, commensurate with a particular sphere of value, and as such cannot be used in any economic exchange.

⁶ General-purpose money, on the other hand, is seen as commensurable with all goods and services on the market, and as such can be used to purchase anything. Conventional money is general-purpose money.

that is money, we have inevitably lost connection to the people and the land that sustain us (Eisenstein 2011). Indeed, this is what makes it so easy for many to turn a blind eye to the social and environmental ills caused by the global supply chains that churn out the goods they purchase. Complementary currencies, however, as forms of special-purpose money, have the potential to counteract these alienating forces, distinguishing between different values and stimulating local economies that re-establish bonds between humans and the spaces they inhabit. (Eisenstein 2011; Hornborg 2016; Hornborg 2017)

Furthermore, complementary currencies can have certain built-in features that serve particular environmental goals, such as encouraging long-termism and disconnecting money from accumulation. For example, currencies can bear negative interest rates. This is known as demurrage, a concept strongly supported by Silvio Gesell (1916). Instead of being an exception to the second law of thermodynamics, money becomes subject to the same force as all other commodities, whose preservation of value requires continual maintenance. Successful examples of demurrage currencies have existed in Ancient Egypt and Western Europe in the 10th to 13th centuries (Lietaer et al. 2012: 73). A more recent example is that of Wörgl, Austria, in 1932, in which a monthly stamp costing 1% of each unit of the currency's face value was required such that the unit of currency remain lawfully valid. Thus, accumulation of wealth became burdensome rather than profitable (Eisenstein 2013: 443). During the short 13-month period that the currency was operational (before being shut down by the Austrian Central Bank) the town flourished, with all intended public works projects being completed, long-term investments being made, and forests replanted (Lietaer and Dunne 2013: 177).

Complementary currencies can also be designed to accomplish even more specific goals. In fact, the most widespread complementary currency today is frequent flyer miles,

issued by airlines for the very specific purpose of fulfilling their need for customer loyalty and filling empty seats on flights (Lietaer and Dunne 2013: 74). The goals sought by such currencies, of course, can be explicitly environmental and/or social in their nature. For example, Farley (2017) has proposed a currency that could aid in restoring Brazil's Atlantic forest, which is on the verge of ecological collapse due to lack of tree cover. A unit of the currency would be issued by the government to any landholders that restore a certain amount of forest land, and a tax to be paid in this currency would ensure its demand (Farley 2018). Another example of a currency with a very specific – in this case, social – goal is the Fureai Kippu, a highly successful Japanese communal currency that supports the elderly. One unit is equal to one hour of service to help an elderly person with tasks that are not covered by the Japanese national health care system (Lietaer and Dunne 2013: 166-169).

Shortcomings of complementary currencies:

On a practical level, however, many complementary currency initiatives have ultimately failed to create their intended impact. According to Collom (2005), of the eighty-two identified community currencies set up in the US since 1991, only 17 of them were still active by 2005. Further, Eisenstein (2011: 206) notes that “even where local currencies have been relatively successful, they comprise an insignificant portion of total economic activity.” Local currencies that are convertible into conventional money do not have as much transformational potential, yet currencies that are not convertible tend to have trouble building a sufficiently large and sustained user network, failing to significantly impact economic activity (Kalinowski 2014). Dittmer (2013) has reviewed the impact of complementary currencies specifically in the context of the degrowth movement, finding little to no evidence that they are capable of assisting in the achievement of voluntary degrowth goals, including

community-building, the advancement of alternative values, the facilitation of alternative livelihoods, and eco-localization.

There are at least two separate, though interacting, reasons for the practical shortcomings of complementary currencies. First, globalization has drastically withered away the infrastructure of local production and distribution. As a result, it is difficult to keep local currencies in circulation: if people are using the local currency to purchase goods, but they themselves are not producing locally consumed goods and services, the currency will tend to accumulate in the few businesses that have agreed to accept it but have nowhere to spend it (Eisenstein 2011). Second, complementary currencies tend to be citizen-driven initiatives that inevitably face an uphill battle in gaining the confidence of potential users (Dittmer 2013). Not only do they usually lack the backing of local or national government, but governments tend to actively oppose them (Lietaer and Dunne 2013). As such, community-initiated local currencies encounter difficulties in building strong networks of users that could themselves aid in re-establishing the infrastructure of local production and distribution, or achieve any of the other goals that the currencies may be intended to achieve.

Designing impactful complementary currencies:

These practical failures, however, as well as the few successes, are helpful in determining what kind of complementary currency might be most promising in building communities that are sustainable, just, and resilient. Given that convertible currencies do not have all the benefits of special-purpose money, and citizen-driven currencies often fail to maintain momentum, currencies that are likely to be most successful in assisting an ecological transition are those that have government backing, and are not convertible to conventional

money. Hornborg (2017) has recently advanced a proposal that contains these features and correspondingly appears to have much transformational potential. The idea is as follows: “each country establishes a complementary currency for local use only, which is distributed to all its residents as a basic income” (ibid: 1). Such a currency would be in widespread circulation, while maintaining the crucial function of special-purpose money to promote a different cultural conception of commensurability. According to Hornborg (2017: 1), “the distinction between two separate spheres of exchange would insulate local sustainability and resilience from the deleterious effects of globalization and financial speculation.” One could also envision a currency being issued through a job guarantee, favoured by many post-Keynesian economists over the basic income. Forstater (2017), for example, has recently put forth this kind of proposal, in which a non-convertible complementary currency issued by local government would be used to pay for community service employment.

Meanwhile, such an ambitious, widespread complementary currency is not the only kind that might be of use in the ecological transition. More targeted and potentially politically viable currencies like that proposed by Farley (mentioned above), also have enormous transformational potential. Indeed, Farley’s (2017) proposal is an urgent measure to prevent the complete collapse a large ecosystem rich in biodiversity. Furthermore, convertible currencies that are inevitably less ambitious in their goals can serve as pedagogical tools to raise awareness about complementary currencies in general (Kalinowski 2014, Eisenstein 2011), and potentially lead to stronger political support for more ambitious proposals. In sum, however, while relatively smaller scale initiatives are helpful and ought to be pursued in the immediate, it is only an ambitious plan like that which Hornborg (2017) proposes that may ultimately achieve the kind of results needed for the ecological transition.

Conclusion

While this paper has attempted to provide some clarity on what role money might play in the ecological transition, the complexity of this topic must not be understated, and many of the issues discussed above are subject to ongoing debate. In particular, the question of the existence or not of a monetary growth imperative has yet to be settled and “simplistic answers (...) should be mistrusted” (Strunz et al. 2015). The stance adopted here is that given the evidence available thus far, it would be unwise to recommend a complete overhaul of the monetary system towards full-reserve banking. Further, the approach of controlling money is necessary though clearly highly limited, while complementary currencies, with adequate political support, will likely be key in creating a monetary system for the ecological transition. In particular, non-convertible and government-backed complementary currencies, issued either through a basic income or a job guarantee, could play a significant role in the ecological transition.

A further conclusion to draw from this analysis is that post-Keynesian and ecological economists must continue to further dialogue on this topic. The former have developed a comprehensive theory of the endogeneity of money, yet often lack knowledge of biophysical dimensions. Meanwhile, the latter have a profound knowledge of biophysical dimensions, but at times lack a proper account of the dynamics of endogenous money and monetary economies of production. This results in greatly differing proposals coming out of both schools of thought, all with their own limitations. As such, it is essential for these two heterodox schools of economic thought to collaborate, and draw on economic anthropology, political ecology, environmental history and more, to build a “deep” (Spash 2013) ecological macroeconomics that will inform policy for the ecological transition.

References

- Aglietta, Michel, et al. *La Monnaie: Entre Dettes Et Souveraineté*. Odile Jacob, 2016.
- Auzanneau, Matthieu. *Or Noir: La Grande Histoire Du Pétrole*. La Découverte, 2016.
- Bacchetta, Philippe. "The Sovereign Money Initiative in Switzerland: An Assessment." *SSRN Electronic Journal*, 2017.
- Brown, Peter G., and Geoffrey Garver. *Right Relationship: Building a Whole Earth Economy*. Berrett-Koehler Publishers, 2009.
- Cahen-Fourot, Louison, and Marc Lavoie. "Ecological Monetary Economics: A Post Keynesian Critique." *Ecological Economics*, vol. 126, 2016, pp. 163–168.
- Collom, Ed. "Community Currency in the United States: The Social Environments in Which It Emerges and Survives." *Environment and Planning A*, vol. 37, no. 9, 2005, pp. 1565–1587.
- Daly, H. E. "The Economic Thought of Frederick Soddy." *History of Political Economy*, vol. 12, no. 4, 1980, pp. 469–488.
- Daly, H. E. *Beyond Growth: the Economics of Sustainable Development*. Beacon Press, 1996.
- Davidson, Paul. "A Keynesian View of Friedman's Theoretical Framework for Monetary Analysis." *Journal of Political Economy*, vol. 80, no. 5, 1972, pp. 864–882.
- Dittmer, Kristofer. "Local Currencies for Purposive Degrowth? A Quality Check of Some Proposals for Changing Money-as-Usual." *Journal of Cleaner Production*, vol. 54, 2013, pp. 3–13.
- Douthwaite, Richard. *The Ecology of Money*. Green Books for The Schumacher Society, 2010.
- Dron, Dominique. *Pour Une Régulation Écosystémique De La Finance*. Veblen Insitute, 2015.
- Eisenstein, Charles. *The Ascent of Humanity: Civilization and the Human Sense of Self*. Evolver Editions, 2013.
- Eisenstein, Charles. *Sacred Economics: Money, Gift & Society in the Age of Transition*. Evolver Editions, 2011.
- Farley, Joshua. TBD (presented at Ecological Economics Conference in Montreal 2017)
- Farley, Joshua, et al. "Monetary and Fiscal Policies for a Finite Planet." *Sustainability*, vol. 5, no. 6, 2013, pp. 2802–2826.

- Fontana, Giuseppe, and Malcolm Sawyer. "Full Reserve Banking: More 'Cranks' Than 'Brave Heretics'." *Cambridge Journal of Economics*, vol. 40, no. 5, 2016, pp. 1333–1350.
- Forstater, Mathew. "Complementary Currencies in the Solidarity Economy: The Local Job Guarantee." *Full Employment and Social Justice*, 2017, pp. 159–167.
- Forstater, Matthew. "Full Employment and Environmental Sustainability." *CFEPS - Working Paper No.*, www.cfeps.org/pubs/wp/wp13.html.
- Galbraith, John Kenneth. *Money, Whence It Came, Where It Went*. Penguin Books, 1975.
- Georgescu-Roegen, Nicholas. *The Entropy Law and the Economic Process*. Harvard University Press, 1971.
- Graeber, David. *Debt: the First 5,000 Years*. Melville House, 2011.
- Harribey, Jean-Marie, et al. *La Monnaie: Un Enjeu Politique*. Editions Points, 2018.
- Helleiner, Eric. "Think Globally, Transact Locally: Green Political Economy and the Local Currency Movement." *Global Society*, vol. 14, no. 1, 2000, pp. 35–51.
- Hornborg, Alf. "How to Turn an Ocean Liner: a Proposal for Voluntary Degrowth by Redesigning Money for Sustainability, Justice, and Resilience." *Journal of Political Ecology*, vol. 24, no. 1, 2017, p. 623.
- Hornborg, Alf. "Redesigning Money to Curb Globalization: Can We Domesticize the Root of All Evil?" *The Anthropology of Sustainability*, 2017, pp. 291–307.
- Jackson, Tim, and Peter A. Victor. "Does Credit Create a 'Growth Imperative'? A Quasi-Stationary Economy with Interest-Bearing Debt." *Ecological Economics*, vol. 120, 2015, pp. 32–48.
- Kalinowski, Wojtek. "L'impact socio-économique des monnaies locales et complémentaires." Veblen Institute, 2014.
- Kumhof, Michael, and Jaromir Benes. "The Chicago Plan Revisited." *IMF Working Papers*, vol. 12, no. 202, 2012.
- Lawn, Philip. "Facilitating the Transition to a Steady-State Economy: Some Macroeconomic Fundamentals." *Ecological Economics*, vol. 69, no. 5, 2010, pp. 931–936.
- Liettaer, Bernard A., and Jacqui Dunne. *Rethinking Money: How New Currencies Turn Scarcity into Prosperity*. Berrett-Koehler, 2013.
- Liettaer, Bernard A. *Money and Sustainability: the Missing Link: a Report from the Club of Rome - EU Chapter to Finance Watch and the World Business Academy*. Triarchy, 2012.

- Lohmann, Larry, and Nicholas Hildyard. *Energy, Work, and Finance*. The Corner House, 2014.
- Mcleay, Michael, Amar Radia, Ryland Thomas. "Money Creation in the Modern Economy." Bank Of England, 2010
- Nerem, R. S., et al. "Climate-Change–Driven Accelerated Sea-Level Rise Detected in the Altimeter Era." *PNAS*, National Academy of Sciences, 7 Feb. 2018, www.pnas.org/content/early/2018/02/06/1717312115.
- Palma, J. G. "The Revenge of the Market on the Rentiers.: Why Neo-Liberal Reports of the End of History Turned out to Be Premature." *Cambridge Journal of Economics*, vol. 33, no. 4, 2009, pp. 829–869
- Ragan, Christopher, and Richard G. Lipsey. *Economics*. Pearson Canada, 2011.
- Rochon, Louis-Philippe, and Sergio Rossi. "Endogenous Money: the Evolutionary versus Revolutionary Views." *Review of Keynesian Economics*, vol. 1, no. 2, 2013, pp. 210–229.
- Sawyer, Malcolm. "The Scourge of Green Monetarism." *Academia.edu - Share Research*, www.academia.edu/13012828/The_scourge_of_green_monetarism.
- Smith, Steven J., et al. "Near-Term Acceleration in the Rate of Temperature Change." *Nature Climate Change*, vol. 5, no. 4, 2015, pp. 333–336.
- Soddy, Frederick. *Wealth, Virtual Wealth and Debt*. Allen & Unwin, 1926.
- Spash, Clive L. "The Shallow or the Deep Ecological Economics Movement?" *Ecological Economics*, vol. 93, 2013, pp. 351–362.
- Strunz, Sebastian, et al. "Is There a Monetary Growth Imperative?" *Handbook on Growth and Sustainability*, pp. 326–355.
- Valencia, Fabian, and Luc Laeven. "Systemic Banking Crises Database: An Update." *IMF Working Papers*, vol. 12, no. 163, 2012
- Wilson, Edward O. *The Future of Life*. Vintage Books, 2003.