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How to Fulfil the UN Sustainability Goals

Rethinking the Role and Concept of Money in the Light of Sustainability

Dissertation

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1. Felix Fuders, *How to Fulfil the UN Sustainability Goals - Rethinking the Role and Concept of Money in the Light of Sustainability*, **Springer Nature**, Cham 2023, ISBN 978-3-031-37767-9, doi: https://doi.org/10.1007/978-3-031-37768-6.

Article

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Abstract

The cumulative dissertation consists of two publications, which complement each other. The main work is a book of 356 pages published by Springer Nature, which is a complex treatise on the role and concept of money in the light of sustainability. It concludes that true sustainability requires a reform of our monetary system in the way Silvio Gesell (1949 – first publication 1916) once proposed. The key arguments are that our monetary system, as it is designed today, is completely unnatural and represents not only an obstacle to achieving true sustainable development but also to achieving genuine monetary neutrality. The so-called **growth imperative** as well as the ever-increasing **income inequality**, which is generally recognized as an indirect obstacle to sustainability, are both linked to our monetary system.

Content

Background & Motivation

In the following it will be explained how the two texts fit into the larger scholarly context and how they are thematically connected.

In 2015, more than 190 world leaders recognized that the world is on a "collision course" (Max-Neef, 2010) and committed to 17 Sustainable Development Goals (SDGs). Many conferences and high-level meetings have been held since then, and one of the most frequently discussed topics is how to finance these goals. There is a widespread belief that coming up with more money for sustainable development will "do the trick". Usually, the discussions focus on finding additional financial resources in order to achieve the goals faster. In this dissertation it is argued that not only is more money needed, but it needs to be a **different kind of money**.

The book *How to Fulfil the UN Sustainability Goals - Rethinking the Role and Concept of Money in the Light of Sustainability*, Springer Nature, Cham 2023 (in the following the "book") seeks to demonstrate that all but one of the SDGs are linked to our monetary system, which can be seen as the most important, but at the same time least recognized, **reason for market failure**. It concludes that only if we change our unnatural design of money to a more natural one, will we be able to reach these goals. And only then we will have the chance to finally come close to what in economics is termed "perfect competition" –but which under the current system is unachievable– and to eventually reach what Max-Neef et al. (1991) termed a "development at human scale", that is a development where people can best satisfy fundamental human needs.

The article written with N. Namatama *Small is beautiful – the market structure best suited to produce development at "human scale": empirical evidence*, Research in Statistics, Vol. 2 No. 1 2024, p. 1-15 (in the following the "article") expands on this last aspect and provides empirical evidence to support the hypothesis that in order to get as close as possible to "human scale development", as proposed by Max-Neef and colleagues, we need to get as close as possible to the microeconomic ideal of so-called perfect competition, which in its perfect state requires natural money.

Objectives

Determining the macroeconomic causes of natural resource degradation is key for preventing further loss of global biodiversity. Many texts on ecological, environmental or bio economics indicate that the destruction of the environment and the overexploitation of natural resources can be partly explained by the "Tragedy of Commons" (Hardin, 1968). In this metaphor, the overexploitation of nature results from natural resources and ecosystem services being freely accessible goods (*open access regimes*). Classic economic theory conceptualizes this as a "market failure" that could be corrected by assigning these goods private property rights (Demsetz 1967; Cheung, 1970; Ault and Rutman 1979; Barkley and Seckler, 1972; Dales, 1972; Smith, 1981; Welch, 1983; see also: Stevenson, 1991; Common and Stagl, 2008; Daly and Farley, 2011). This argument is based on the assumption that only market goods (excludable and subject to competition) can be efficiently allocated by the market. To put it more simply, private actors will take care of their investment to maximize their economic benefit.

The dissertation aims to demonstrate that the real reason for the overexploitation of natural resources cannot be ascribed only to free access regimes. Rather, it originates from the **obligation**

to grow the real economy (so-called *growth imperative*). The dissertation defends the hypothesis that this obligation stems from the money interest rate as an opportunity cost of every productive investment and represents a pressure that applies to both private and commonly owned goods. Consequently, and contrary to conventional economic theory, the privatization of natural resources that had always been freely accessible will not eradicate the underlying problem or increase economic efficiency but can even decrease it, in case it permits earning monopoly rents. The book explains that the allocation of property rights for natural resources that were originally freely accessible does not necessarily avoid an unsustainable management of those resources, and in fact does not even ensure that those resources will not be exploited until their total extinction.

Here the book seeks to identify the problems inherent in our monetary system, especially in the unnatural design of our money, and to explain how this gives rise to:

- the obligation to grow economically and thus, in the long run, to overexploit natural resources.
- to the steadily growing income inequality, which can be understood as an indirect obstacle to reach sustainability.

In this context the book pursues to challenge the conventional understanding of the effect of increasing or lowering interest rates on growth. Having identified the role of money as actor in promoting the so-called growth imperative and income inequality the book discusses in total **17 different proposals** as solutions to tackle the identified problem. Based on the insights gained especially in chapters 4 and 5 it identifies the proposal of a reform of our monetary system made by Silvio Gesell (1949) in his masterpiece "The natural economic order" as best solution. This reform ideally goes along with a land reform as also proposed by Gesell and before him by Henry George (1881).

Main Contributions

The book offers a profound analysis of the current monetary system, linking it directly to the global challenges of environmental degradation and inequality. It is argued that achieving the UN's Sustainable Development Goals (SDGs) requires a fundamental rethinking of the concept and role of money. It defends the proposal of "natural money" that German Argentine economist Silvio Gesell's (1949) described in his masterpiece "Natural Economic Order" (first edition 1916), in which the market equilibrium is no longer distorted by a monetary system and territorial order that contradicts human nature. It shows that other solutions regularly presented, such degrowth strategies, decarbonize, circular economy, "Donough" economy, buen vivir, MMT, "100% Money", "positive money", "full sovereign money", gold standard money, among others, at its best cure symptoms, while Gesell's proposal tackles the underlying cause of these problems. This underlying cause can be described this way:

While everything in nature is subject to the rhythmic cycle of growth and decay, only money seems to escape the transience of all earthly things, as Silvio Gesell (1949) correctly analyzed. The unnatural storability of money gives rise to the economics of accumulation that Aristotle referred to as *chrematistics* (Aristotle, [384 BC] 1995): earning money as an end in itself. Since profits can be stored easily in the form of monetary units, this creates an **incentive to produce more than is actually needed** to satisfy fundamental human needs. The storability of money is also what gives rise to the phenomenon of interest, which Keynes (1936: 167) described as a "reward for parting with liquidity". Interest in turn not only incentivizes the production of more than is needed but essentially **obliges** us to do so and can be understood as the root cause of many of the main

challenges the world faces today, including unsustainability and income inequality. Unfortunately, very few scholars understand the linkage between these problems and the design of our monetary system. The book connects these dots and shows how these problems are rooted in our current monetary system.

The book concludes that the only way to rid ourselves of the so-called *growth imperative* is to replace our existing form of money with a truly neutral (and natural) monetary medium that does not automatically give rise to monetary growth. However, whether or not such growth imperative exits, is controversially discussed in ecological economics. After an extensive literature review, the book clusters the arguments usually brought forth against the existence of a growth imperative inherent in our monetary system in five groups and then discusses and discards each of them (chap. 5 in the book).

It is argued that one reason for why these connections are not yet generally understood is because the conventional view of monetary theory is inherently flawed. In fact, powerful arguments based on empirical evidence exist that the prevailing view of the relationship between interest rates and money supply (and economic growth) is, in the long run, exactly opposite to reality. Incidentally, this also sheds light on the phenomena of inflation and financial crises. If our monetary system reflected a more rational understanding of the effects of interest rates on the money supply, inflation as well as financial crises might be averted. Without a proper understanding of money, we cannot possibly achieve what Manfred Max-Neef, laureate of the Right Livelihood Award, once called "development at a human scale" (Max-Neef et al., 1991). Toward that end, the book offers some completely new insights:

- A comprehensive examination of the different views of money creation. One might assume that this topic is well understood, but it is not. In fact, there are two competing theories explaining money creation and followers of each theory are far from reaching consensus. This book offers an explanation where these different viewpoints come from.

- The standard view of the relationship between interest rates and the money supply is challenged and it is shown that the truth is exactly the opposite of what is usually taught, i.e., contrary to conventional wisdom, high interest rates actually promote the growth of the money supply, aggregate demand, inflation and GDP (and *vice versa*). Central banks should be thought of as trend followers, rather than trend setters.

- Regarding the cause of inflation, the book surveys the various explanatory theories and shows how they all boil down to one primary phenomenon viewed from different perspectives. In the end, it explains why there is only one true explanation for inflation, i.e., an increase in the supply of money relative to the quantity of goods and services in the economy. None of the existing inflation theories explain why money supply constantly grows. This book demonstrates that the primary responsibility for this fact does not lie with central banks.

- The book explains that powerful arguments exist that the so-called "Keynesian multiplier" is conflated with the "money multiplier". This is to say that the stimulative effect on demand (and GDP and inflation) does not come from spending alone but is rather caused by the expansion of the money supply associated with increasing government indebtedness. This is an important distinction because it means that "expansionary" fiscal policy that is not based on deficit spending has no expansionary effect.

- The aforementioned points help to understand why the constant growth of money supply and total debt gives rise to the so-called economic growth imperative. Perpetual economic

growth ultimately leads to the over exploitation of natural resources since, as the laws of thermodynamics teach us, we cannot produce something out of nothing. Hence, even if we achieved a 100% circular economy and even if all energy was gained by clean renewable resources, a steady increase in productive output must end up in more and not less use of resources.

- The solution presented in this book, based on Silvio Gesell's masterpiece "The Natural Economic Order", would not only mitigate but **fight at their roots** the great challenges the world faces today. It would pave the way towards a "development at human scale" (Max-Neef at al. 1991), i.e., a development that allows everyone to satisfy their fundamental needs in the best way possible. It would create an economy that serves the people rather than the other way around.

Here is where the article published together with N. Namatama *Small is beautiful – the market structure best suited to produce development at "human scale* connects with the book. While the book in chap. 15 only gives an outlook presenting the idea that, if we manage to implement natural money as proposed by Silvio Gesell, we could finally reach what Max-Neef et al. (1991) termed a "development at human scale", the paper gives empirical evidence that the market structure best suited to reach such a positive human development is one that gets as close as possible to perfect competition, which next to a courageous implementation of classic competition law requires the implementation of natural (and neutral) money as explained in the book (chap. 10 and 15).

The studies on which the book as well as the article with N. Namatama are based use a mixed methodology combining both quantitative methods as well as deductive and inductive reasoning to support the hypothesis that our monetary system counteracts the life on earth, under water and the wellbeing of humans.

Summary of the book

The book contains 17 chapters, grouped into five parts, which in the following will be summarized.

Part I Money and its role in the economy

1. Introduction: the world is on a collision course

If we take a look at any newspaper in any country, two mayor problems frequently are addressed: **inequality** and the **increasing destruction of the natural environment**, that is unsustainability in the *stricto sensu*. In 2015, more than 190 world leaders recognized that the world is on a "collision course" (Max-Neef, 2010) and committed to 17 Sustainable Development Goals (SDGs). All but one goals are either linked to the unsustainability of our current lifestyle (goals 9, 11-15) or to inequality (goals 1-8, 10, 16). Many conferences and high-level meetings have been held since then and one of the mayor topics regularly is how to finance these goals. However, it is not only more money that is required **but a different kind of money**. In fact, both the overexploitation of the natural environment and the income inequality are directly linked to our unnatural financial system, and especially a misunderstanding of what money is and what it should be (Soddy, 1934; Lietaer, et al., 2012).

2. What is money?

What Milton Friedman once had pointed out (Friedman, 1971), seems to be still true today: it is not well understood how money is created. There are **two theories**, that is the money creation *ex nihilo* (e.g. Fisher, 1945; Huber, 1998) and the so-called *money multiplier* model (e.g. Larroulet & Mochón, 2003; Mankiw & Taylor, 2014). The chapter presents and discusses both concepts and concludes that the problems inherent in the system to be explained in the following chapters **do not depend** on the way how money creation is understood, but on the unnatural design of money that, in difference to real goods, does not perish and is easily storable.

3. Money is like the 'blood' of the economy

Unlike real goods, money is easy to store and does, therefore, not easily circulate in the economy. However, this is what it is supposed to do. Money can be described as the blood of our economy. Blood needs to circulate, otherwise the body gets ill. Similar to the blood circulation in the human body also the economy gets ill if money does not circulate well. Money as calculation unit is supposed to be a medium to facilitate the exchange of goods and services (already Aristotle, [384 BC] 1995; Steiner, 1979; Mankiw & Taylor, 2014). But, because people tend to preserve what Keynes (1936: 165 ff., 194 ff.) called the "*preference for liquidity"* we like to save up money, the more the better. However, in nature it would only be possible to hoard goods in a very restrictive way, since real goods perish. Any excessive hoarding would, in time, result in the loss of the hoarded goods. But our money, as it is designed today, makes it possible to hoard any surplus almost without restriction. The unnatural design of our money makes possible the hoarding of values produced, which provides a strong incentive to **produce more than is actually needed**.

Part II Money and the unsustainability in *stricto sensu*

4. The growth imperative inherent in our financial system

4.1 The contradiction between the two main functions of money

The unnatural design of our money does not only give a powerful incentive to produce more than is needed for immediate consumption; it even **obliges us to do so** and here, again, the root cause is the unnatural storability of money (for similar argumentation see Costanza, et al., 2012; Löhr, 2012; Lietaer, et al., 2012; Farley, et al., 2013). Since unlike real goods money is easy to store it does not easily circulate in the economy. However, this is what it is supposed to do. Money can be described as the 'blood' of our economy. Blood needs to circulate, otherwise the body gets ill. Similar to the blood circulation in the human body, the economy gets ill if money does not circulate well. Money is supposed to be a medium to facilitate the exchange of goods and services (see already Aristotle, [384 BC] 1995; Steiner, 1979; Mankiw & Taylor, 2014).

Money stored under the mattress does not circulate and, therefore, cannot function as a medium to facilitate the exchange of goods and services. If everyone hoards money at home, demand for goods and services will decrease, prices will decline creating an incentive to postpone consumption since tomorrow products and services will be even cheaper. This downward spiral is known as deflation, and it is the worst possible economic scenario. Even healthy companies are forced into bankruptcy or to lay off employees and engage in other cost cutting measures, causing increased anxiety amongst households and business owners, increasing the Keynesian *liquidity-preference*

(Keynes, 1936), i.e., making people hoard even more, driving the economy into an even deeper depression.

The reason why we do not hoard our money under the mattress but bring it to a bank which then lends it out and causes it to circulate in the economy is the interest rate. Interest is a "reward for parting with liquidity" (Keynes, 1936: 167), creating an incentive to lend money out (or to bring it to the bank which then lends it out for us). To express it in the more extreme language of Silvio Gesell, it is the unnatural storability of money that puts the owner of money in a monopolistic-like position in which he can either choke off economic activity or extort those who are in need of money and "press" interest as a form of ransom (Gesell, 1949: 205, 344). If money could not be stored easily and (almost) without risk, holders of money would be unable to extract interest from borrowers. Seen in this light, interest results from a **contradiction** between money's two main functions: it is supposed to facilitate the exchange of goods and services while and at the same time serving as a medium to store value.

To return to the previous metaphor, if money is the 'blood' of the economy, then interest is the **drug that makes the blood circulate**. The drug is necessary since our money is born with a genetic design flaw and does not circulate well. And as with any drug that is used for a prolonged period, interest causes significant negative side effects for the health of our economies (and the people living within) as well as for our natural environment. Interest is the underlying reason for i) the constant need to grow economically and ii) for the constantly growing income inequality, which can be observed in any country worldwide.

4.2 Interest makes the money supply and debt grow exponentially

To understand the above-mentioned dynamic, we need to recall the following effect of interest and compound interest: Interest makes deposits and thus the money supply (defined as cash plus deposits) grow. But the money supply and debt do not grow in a linear fashion, but rather according to an exponential function. This is because any amount deposited in an interest-bearing bank account will have doubled after a certain period. Any amount that doubles at regular intervals grows according to an exponential function: slowly at first, but then faster and faster. Note that even at low interest rates compound interest grows exponentially because eventually the original amount will have doubled. In the case of a low interest rate, the flat part of the exponential growth curve is longer, but at some point, the curve will steepen and eventually become almost vertical.

In fact, banks use this feature of interest as a selling point to attract customers. For example, the European Investment Fund Deka uses a metaphor to explain exponential growth by comparing the growth of compound interest with chickens laying eggs (Deka, 2014). Yet, such a metaphor is inappropriate, since nothing in nature grows exponentially forever. And because nothing in nature grows endlessly –and certainly not exponentially– the lack of constraints on the growth of financial assets is fundamentally different from anything that exists in nature. A good way to visualize this effect is the so-called 'Joseph's penny'. If Joseph had bequeathed just one cent to Jesus, and if it had been invested at 5% interest, in the year 2000 the investment would have grown to a ball of Feingold 589 billion times larger than earth (Kennedy, 2006)[1]. Even the most powerful computers in the world would at some point be unable to calculate the amount of money that is accumulated in this way, due to a lack of memory. This is the logic of an exponential function (Kennedy, 2006; Lietaer, et al., 2012). Yet this is the logic that underlies our current unnatural (see already Soddy, 1934) monetary system, a fact that was remarked upon as far back as Aristotle ([384 BC] 1995).

[1] The calculation presumes a fixed gold price.

Since there is no interest without debt, money is the counterpart of debt: the **money supply and total debt** of an economy must grow in a likewise manner. To recall the words of Frederick Soddy (Soddy, 1934: 25) "Money is a credit-debt relation from which none can effectually escape". Fig. 1. depicts the money supply and total public debt for the US economy. We can recognize that not only do the money supply and debt grow in tandem but also that they grow according to an exponential function. The same exponential growth of money supply and debt can be observed in every country on earth over a long period of time.

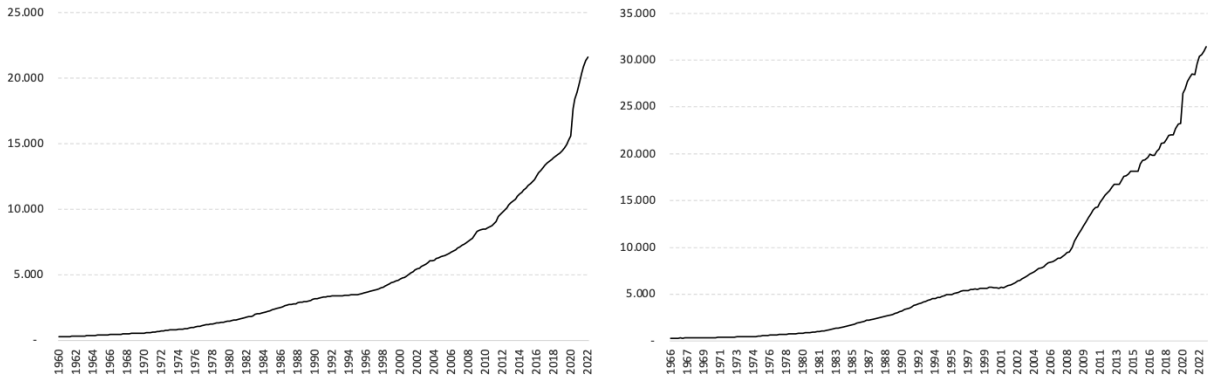

Fig. 1. US money supply and public debt. Left: US money supply M3 (in billions of USD). Right: US total public debt (in billions of USD). Source: own work. Data provided by OECD (2024), and US Department of Treasury. Retrieved from Federal Reserve Bank of St. Louis.

4.3 Interest originates a growth imperative

Having now understood the effect that the interest rate exerts on money supply and total debt we can now analyze the need for constant growth in the real economy. It is not (only) greed that makes us produce more. We are obliged to do so. There are four reasons that contribute to this growth imperative.

1. A steady increase of the total debt means that we (households, governments, companies) are ever more indebted, and this is the reason why we must continually do more just to maintain the *status quo* (for a similar argumentation see: Binswanger, 1996; 2006; Costanza, et al., 2012; Löhr, 2012; Lietaer, et al., 2012). Looking at corporate balance sheet from 20 years ago and comparing them with those of today confirms this view. On average, corporations have much more borrowed capital than they did 20 years ago.

2. Even businesses with no debt are not immune from the growth imperative. This is because governments are forced to pass on increased debt burdens to citizens and companies in the form of higher taxes. In fact, in most countries the government is the biggest customer of the banking sector, and the volume of money loaned to the State is significantly higher than the amount loaned to private borrowers.

3. Workers require salary increases to compensate for inflation, which ultimately results from the growing money supply (see already Fuders & Max-Neef, 2014a; 2014b; Fuders, 2017; 2021). Inflation also affects the national budget which is why governments are prone to increase taxes even in the absence of public debt.

4. Even those fortunate companies who have no debt, who do not suffer from growing taxes and whose workers do not ask for pay increases to keep up with inflation are still not immune to the pressure to expand. This is because interest is the **opportunity cost** of any productive investment. The interest rate that banks pay is the benchmark against which the success of any productive investment is measured (e.g., Copeland, et al., 2008; Common & Stagl, 2008). Any business that does not generate a return at least as high as what the business owner could receive by depositing money in a bank account is economically unviable (for a similar argumentation see Suhr, 1988; 1989). Hence, **interest is the rhythm to which the real (productive) economy has to dance**, and not just a "fetish" as some believe (Hamilton, 2003)[2].

Some might object that instead of pursuing growth, businesses could try to cut costs as a way to maintain the *status quo* without needing to increase income. This is true and this helps to explain why we tend to see rising unemployment in economies which do not grow at least at the rhythm of interest rate, which in economics is known as Okun's law (according to Okun, 1962). Since government of States fear unemployment, everything is done to promote economic growth. Even the exploitation of natural resources must increase; anything in nature that does not reproduce itself at the rhythm of interest rate is in danger of extinction as Daly & Cobb (1989) once put it. Economic growth (the increase of productive output) in the long run must lead to an overuse of natural resources, since –as the laws of thermodynamics tell us– we cannot produce something out of nothing. Hence, the current system forces to choose between increasing unsustainability or increasing unemployment and misery (Costanza, et al. 2012).

5. The effect of the money interest rate on money supply, demand and growth

According to conventional monetary theory lowering interest rates would foster economic growth (and *vice versa*). Some of the described maldevelopments, especially those associated with economic growth could then even be accelerated during a phase of falling interest rates. However, only in the very first moment in the phase of falling) lowering interest rates will foster economic growth while increasing interest rates would slow it down. Powerful arguments exist that in the long run the effect that the interest rate has on money supply goes the other way around; we can even see a synchronicity (positive correlation) between interest rate, inflation and GDP growth rate as clearly depicts fig. 2 for the case of the US economy (for other economies see Lee & Werner, 2018). This chapter provides an in-depth discussion of the short- and long-term effects that the money interest rate has on money supply, demand and growth.

[2] This is true if the sole purpose of the business is to make money. However, entrepreneurs could, of course, also start their business because they wished to make use of their talents in order to produce products that contribute to the common good, i.e., to the quality of life of people, and not only for financial gains. In that case, entrepreneurs would care less about interest as an opportunity cost, and it might be sufficient for them to earn enough to live off it. On this topic see: Fuders & Nowak, 2019.

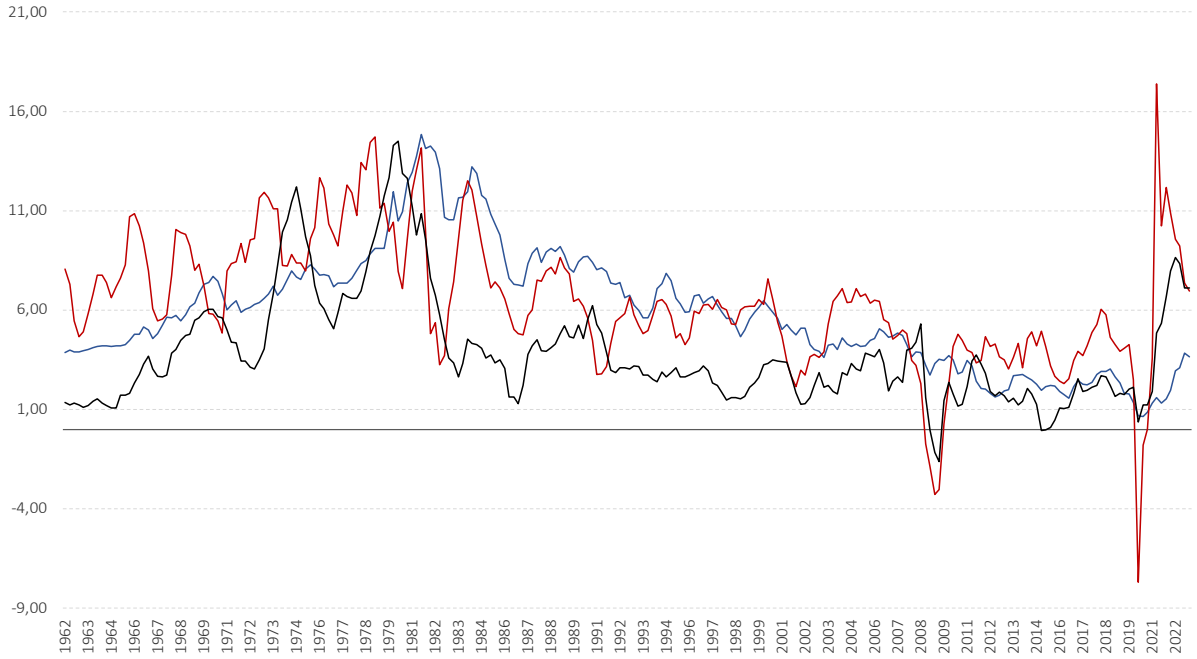

Fig. 2. Interest rate, inflation and GDP growth rate (US). Blue: market yield on 10-Year Treasury Constant Maturity Rate; black: Consumer Price Index (% change from year ago); red: GDP growth (% change from year ago). Source: own work. Data provided by Board of Governors of the Federal Reserve System, US Bureau of Economic Analysis and OECD (2024). Retrieved from Federal Reserve Bank of St. Louis.

That is to say, while chapter 4 discusses the growth imperative form a microeconomic (*supply side*) point of view this chapter 5 explains the growth imperative from a macroeconomic (*demand side*) point of view. Both viewpoints look at the problem from different perspectives and combine to create a **completely new understanding** of the growth imperative. Later in the book, chap. 10 and 11 expand on this idea and explain why the growth imperative applies to privately owned resources as well as resources in open access regimes. The chapter contains a thorough discussion of papers that argue that there was no growth imperative inherent in our monetary system, and clusters the counter arguments in five groups to later discard each of them. Such an in-depth discussion and classification of arguments does not yet exist in the literature. These five groups of arguments **against** the existence of a growth imperative inherent in our monetary system are:

5.1 The circular-flow argument

The most current argument against the notion of a growth imperative inherent in our monetary system is what could be termed the 'circular-flow' argument. We find it in papers published by Freydorf, et al. (2012); Wenzlaff, et al. (2014); Berg, et al. (2015); Jackson & Victor (2015); Richters & Siemoneit (2017; 2019); Larue (2020). Regarding the argument in support of the idea that ever-growing debt requires us to constantly work harder in order to keep up with the interest burden, thus creating a permanent necessity to grow Freydorf, et al. (2012), Wenzlaff, et al. (2014) and Berg, et al. (2015) argue that, if interest income is fully consumed, a stationary redistributive economy would be possible. To cite Wenzlaff, et al. (2014: 50):

> *"The need for growth can only be justified by the incomplete consumption of interest income (…). Only then must the economy grow (at least) to the extent of the unconsumed portion, (...) The growth constraint is thus not a consequence of money creation, but a consequence of income-dependent saving combined with an interest rate determined by liquidity preference".* (Original in German, author's translation).

In a similar way Jackson & Victor (2015: 45) conclude:

> *"The fact that the charging of interest on its own does not lead to a growth imperative could perhaps have been inferred from the realisation that the only interest payments which contribute directly to the GDP are the net interest payments of firms. All other interest payments turn out to be transfers between sectors and neither restrict nor enhance aggregate demand in themselves".*

Larue (2020) makes an akin argument. He draws on an example used by Lietaer, et al. (2012) to illustrate the growth imperative inherent in our interest based monetary system. This example goes like this: A foreigner proposes to lend money to villagers but asks them to repay it with interest at the end of the year. Accepting that offer allows the villagers to produce more but also generates an obligation to grow in order to repay the debt. Larue goes on to argue that if we modified this example only slightly then the growth imperative would not result. Specifically, Larue asks the reader to assume that the money lender is not a foreigner as in the original example but a member of the community. If that person consumes all his revenue, for instance by buying the villagers' goods, money will flow back to them, so they could repay their loans without being required to produce more (Larue, 2020).

The key argument in all examples above is that interest earnings are spent and thus represent income for someone else in the economy: the money keeps circulating. The authors conclude that even though the individual who borrows money has to pay back principal plus interest and therefore is indeed obliged to grow, for the economy as a whole this is not the case, as long as money keeps circulating. Some authors such as Wenzlaff, et al. (2014) and Berg, et al. (2015) admit that saving could be a problem which would result in a growth imperative, but the true cause of the growth imperative would then be the "liquidity-preference" as Keynes (1936: 165 ff., 194 ff.) termed it, not interest.

Here we encounter the common misunderstanding that money saved on bank accounts is withheld from circulation, which is not the case. Money saved in banks is, as long as the financial system has not yet plunged into crisis, kept in circulation via loans or other investments since the bank must pay interest on deposits. With the exception of money saved physically at home, money keeps circulating in any case.

The problem arises not from saving but from interest paid on loans (or bank deposits, which can be thought of as loans granted to banks). Any interest paid (or demanded) creates new money units in bank accounts or loan contracts **that did not previously exist**. We could refer to this as "interest money creation" (Fuders, et al., 2013; Fuders & Max-Neef, 2014a; 2014b). This means, if somewhere in the economy (or the village in the example brought forth by Larue, 2020) interest is paid and the central bank has not increased the money base, then the interest payment requires necessarily a new and again interest-bearing loan somewhere else in the economy. We might explain this fact with a simple metaphor:

Let us imagine an economy consisting of only two people: "Happy Doña" owns all 100 monetary units in the economy and "Unlucky Fellow" who has no money at all. Mr. Unlucky Fellow would also like to know how it feels to hold some money and borrows 10 money units from Happy Doña. He does not spend the money and at the end of the term pays it back to Happy Doña. But where does the interest come from that he now has to pay? The answer is, Mr. Unlucky must, in order to be able to pay the interest, take out a new loan from Happy Doña, that requires the payment of even more interest. After some time, Unlucky Fellow will be so indebted that, in order to be able to repay, he will have to sell off his belongings to Happy Doña so that he can, with the money

receive, pay his debts. Happy Doña will thus end up with all money and some (or all) of Unlucky Fellow's belongings.

A circular flow of all monetary units **is not possible** without constant increase of debt. It is not easy to see this in an economy consisting of millions of people rather than just two. If interest causes bank accounts to grow, total debt must also grow. Another way to think of this is to keep in mind that money is the counterpart of debt, as one person's money is another person's debt. If deposits grow via interest, the money supply (cash plus deposits) also grows. But where does this extra money come from if the central bank does not increase the monetary base? Some of the above cited papers use sophisticated mathematic models. This gives the impression of rigorousness. However, any model is only as good as its assumptions. Depending on how we define the assumptions, we can justify the use of any mathematical model. The models used in the cited papers neglect the effect of "interest money creation".

5.2 The inverted-causality argument

Another current argument against a growth imperative inherent in our monetary system is what could be termed the 'inverted-causality' argument. We find it in papers published by Jackson & Victor (2015); Cahen-Fourot & Lavoie (2016); Lee & Werner (2018); Larue (2020). For example, Jackson & Victor (2015) construct a mathematical model in which they try to demonstrate that changes in the money supply are driven by what is happening in the real economy, rather than the other way around an increase in money supply pushes growth as in argued in the book. Increased output results in increased loans demanded by firms, creating a higher level of deposits from households. They conclude (p. 40) that

> *"(…) with a suitable choice of initial values, a stationary state economy is possible. More interesting for our purposes in this paper is that this result is obtained from an economic model with interest-bearing debt".*

According to Larue (2020), following the reasoning of the post-Keynesians, an important argument against the existence of a growth imperative would be that money creation is in their eyes an endogenous process. Citing Cahen-Fourot & Lavoie (2016), Larue (2020: 7) argues "Money is created through bank credit when economic agents have a credit-worthy demand for it". In other words, this would mean that "the rise in production takes shape in the mind of producers before money is created and is effectively realized when credit is granted, and money is created to finance it". Similar reasoning is advanced in a paper by Lee & Werner (2018). According to this reasoning, growth in production drives growth of the money supply, therefore "the money supply can in no way be held responsible for the growth of output, which entails that there cannot be a money-led growth imperative" (Larue, 2020: 7).

In order to respond to this viewpoint, I would first point out that banks cannot create money endogenously (out of nothing), as discussed earlier (chap 2 of the book). The wrong idea that banks could create money out of nothing is based on a misinterpretation of a booking account that results from that fact that the credit granting institution is at the same time the bank where money is saved. Bank clients who are granted a loan that is then deposited at a bank account at the same bank are at the same time **borrowers and also creditors**, since their deposit represents a credit to the bank. This dual role of the bank's customer as both borrower and creditor, is what produces the confusion.

However, it is true that a growing economy can lead to more demand for credit, and this can induce an increase in money supply, but not because banks create money endogenously but through the so-called "money multiplier" effect (see, e.g., Stiglitz, 1998; Dornbusch, et al., 2009; Mankiw & Taylor, 2014). That is to say, the money multiplier effect can lead to an increase in money supply

via credit expansion within the banking sector (not via a single bank). The money multiplier effect can even be viewed positively since in an interest-free monetary system, this would cause the money supply to adjust automatically to economic cycles, resulting in no (or much less) inflation/deflation. In the current system, however, interest obliges to constantly increase the volume loaned out since interest on deposits too grows. This means, in the current system interest provokes a constant increase of money supply via the money multiplier effect.

To sum it up: what post-Keynesians overlook is the role of interest rates. Interest puts pressure on banks to **increase the volume of debt** since it causes deposits to grow. As long as interest is paid on deposits (even if the rate is very low), banks **must** continuously increase the loan volume or else they will go bankrupt. Seen from this perspective, demand for debt does not depend on productive output, but **the other way around**. Banks will employ ever more aggressive marketing practices in order to expand loan volume and will even lower credit standards and make loans to riskier borrowers if necessary. Or they can try to generate returns through other forms of investments such as the stock market or investment banking. When such behavior leads to inevitable losses, there will invariably be accusations of greediness or unlawful behavior.

5.3 Neglecting compound interest

Another current argument against a growth imperative inherent in our monetary system is the denial of the compound interest effect on money supply. Berg, et al. (2015) as well as Richters & Siemoneit (2017; 2019) argue that proponents of the monetary growth imperative model allegedly neglect the fact that creditors can consume or invest their interest income, so that money flows back into the economy and thus no growth of the money supply is caused. They assert that a growth imperative only results if creditors choose to keep their money in banks, since only then is compound interest paid, thus leading to exponential growth. However, interest income that is spent will most likely end up in another bank account somewhere else in the economy and thus generate interest there. Hence, all bank accounts taken together (and thus the total money supply and the debt) always grow exponentially due to interest.

5.4 The profit-maximization argument

Some authors argue that the aim of steadily increasing profits and in particular the pursuit of labor productivity growth is the primary cause of the growth imperative (Jackson & Victor, 2015). However, this perspective is backwards and conflates cause with effect. Why should we unceasingly attempt to increase output and productivity when we are already doing well, as is the case in developed countries? Conversely, interest-driven growth creates a constant pressure to improve efficiency and especially to improve labor productivity. This is because if businesses fail to keep pace with the growth imperative the second-best strategy is cutting costs, and labor is usually the most important cost position in any firm.

5.5 The ambiguous-role-of-interest argument

Diedrich (1994) studies the case of forests (as an example of renewable natural resource management) and argues that the interest rate has a dual role, one to act as "discount rate" and one to act as the "price of capital". In his view, both roles exert opposite effects on the exploitation of renewable natural resources, and "the overall outcome then depends on the relative powers of the two tendencies" (Diedrich, 1994). On the one side, interest as discount rate for future revenues artificially overvalues time, thus creating pressure to grow fast, i.e., to heavily exploit the natural resource (for an in-depth analysis of this argument see also Fuders, 2020). On the other side, money as the price of capital makes capital intensive production more expensive since the money market subjects producers to the interest rate as the price of capital ("capital" is defined in Diedrich's (1994) model as the value of physical capital stocks).

The author admits in agreement with (Ackermann, 1994) that the long-term use of forests is more intensive in high-interest rate environments than under low ones. But in the short term he argues that high interest rates lead to a shift from capital intensive to labor-intensive production models that result in less exploitation of timber. This is because "in its role as discount rate, the higher interest rate makes rising future production costs less relevant compared with current costs" (Diedrich, 1994: 13). Similar arguments have previously been made by (Farzin, 1984).

However, this is, as the author correctly states, only true in the short-term. And even in the short-term, it is not necessarily correct. The assumption made in Diedrich's (1994) model that high capital costs lead to more labor-intensive production is questionable. Business owners will not simply discard existing productive capital and replace it with labor as a result of rising capital costs. And even if they did, this would not necessarily result in reduced throughput of timber. Why would the owner of a wood chip processing company, for example, demand less timber? Diedrich argues that as labor-intensive production is relatively less dependent on a certain minimum level of timber utilization, reduced timber supplies would lead to dramatic increases in the uses of other factors of production. This argument is weak. It is not clear that a more labor-intensive production process necessarily changes the "timber sensitivity" as Diedrich (1994) argues.

Some contend that higher interest rates reduce overall production (e.g., Musu, 1994) and thereby counteract the effect of interest as a discount rate for future cash flows (or as opportunity cost of any productive investment). However, as discussed above (see also Fuders, et al., 2013; Fuders, 2020), there are powerful arguments that the effect of interest on the money supply is not correctly understood yet. Contrary to conventional wisdom, higher rates lead in the long run to increased GDP growth. Hence, interest not only incentivizes growth but also makes that growth possible. Irrespective of strong short-term fluctuations, empirically we can observe a clear long-term positive correlation between interest rates and GDP growth rates (while the GDP growth rate follows the interest rate, see fig. 3).

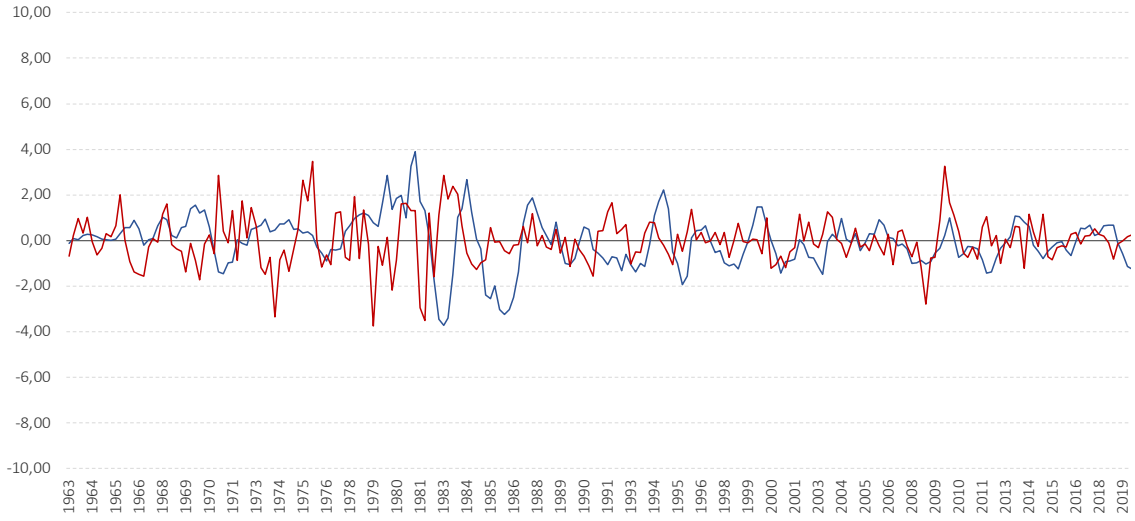

Fig. 3. Red line: real GDP growth rate (change from year ago, growth rate previous period); blue line: 10-Year Treasury Constant Maturity Rate (change from year ago in %). Source: own work. Data provided by Board of Governors of the Federal Reserve System and OECD (2024). Retrieved from Federal Reserve Bank of St. Louis.

Finally, regarding the case of natural resources, some might argue that higher interest rates make harvesting more costly, and this counteracts any pressure to grow (e.g., Farzin, 1984). This is true. But there is no reason to assume that higher harvesting costs can fully counteract the growth

imperative resulting from interest as the benchmark against which the returns of all productive investments are measured. Investors take harvesting costs into account. If they decide to invest, they do so because their calculations indicate that a profit can be made. And these profits must be at least as high as the interest rate that can be earned risk-free via a bank account or other financial assets. We could even argue the other way around that higher harvesting costs **create additional pressure** to increase productive output in order to counteract those higher costs.

6. Economic growth in the long run is unsustainable

Since economic growth (real GDP growth) means that this year we produce more than the year before, and since the **laws of thermodynamics** tell us that we cannot produce something out of nothing (Clausius, 1876; Radi & Rasmussen, 2013), a steady GDP growth rate in the long run **must** end up in an increased use of natural resources. Even if we managed to be ever more efficient and produce the same product or service with less input, it will never be possible to produce a product or service with no input at all. This is why steady economic growth in the long run must cause an increase of the use of natural resources and energy. Even renewable resources will end up overexploited, since if we keep on growing economically at some point the extraction rate will be higher than the reproduction rate of the resource (see e.g. Daly & Farley, 2011). However, what has just been said is not so clear in environmental economics and many argue, using sophisticated mathematic models, that economic growth, indeed, was possible without having negative effects on the environment. The chapter consist of **several sub sections** in which these arguments are analyzed and refused. Usually, it is about wrong or unrealistic assumptions made at the beginning, or the models use unrealistic production functions where natural resources and capital are described as substitutes or where natural resources do not even appear. This chapter concludes that steady real (physical) GDP growth on a physically finite planet must someday end up with the last resource. Sustainable economic growth cannot exist.

7. Economic growth or unemployment

If a company does not manage to grow, it will try to reduce costs to maintain the Return on Investment (ROI) at least as high as opportunity costs, i.e. the money interest rate. Human workforce is usually the most important cost position, which is why there is a constant pressure to either grow or to replace humans by machines, i.e. to improve productivity. This is the reason why the labor share of added value is constantly decreasing, and why we see this empirically proven (Okun, 1962) but nevertheless not well understood dichotomy everywhere that either the economy grows or unemployment increases. This dichotomy is also the reason why SDG No. 8 even demands economic growth next to decent work. What this goal really tries to achieve is decent work, not economic growth. A "sustainable" economic growth does not exist and could truly be seen as "squaring of the circle" (Azkarraga, et al., 2011: 10). Nevertheless, maintaining our current financial system our economies, indeed, do have to grow if we do not want unemployment and precarious working conditions to increase. Here we understand that **degrowth strategies** –even though highly necessary to avoid further overexploitation of our natural environment– will cause unemployment and deep economic depression if the actual financial system is maintained. The current system forces a choice between unsustainable growth and unemployment and so misery as Costanza et al. (2012) correctly put it. Since economic growth is the reason for the unsustainability of our lifestyles, the demand for decent work requires necessarily to get rid of this dichotomy to either grow or otherwise increase unemployment. This is only possible if we change our financial system.

Part III. Money and inequality

8. Our current monetary system produces income inequality

Our current financial system is also a powerful driver behind income inequality. As said above, money supply and debt grow in a likewise manner. This means that while on the one side we find ever more monetary units on bank accounts, on the other side ever more people are ever more indebted. In other words: the income inequality, too, grows exponentially. We can visualize this drawing money supply and debt on the same graph. In fig. 4 using data from the US, we can see that monetary assets mirror total debt. This is no surprise, since as was outlined above, there is no interest paying without debt. The gap between the upper and the lower point in the graph is the (exponentially growing) inequality. The same gap can be observed in any other country if the observed time period is only long enough. Accordingly, the Gini-index that measures income and wealth inequality shows not only similarly high values for almost all OECD countries but also a significant incrementation of inequality over the las 30 years (OECD, 2015; Bárcena, et al. 2018).

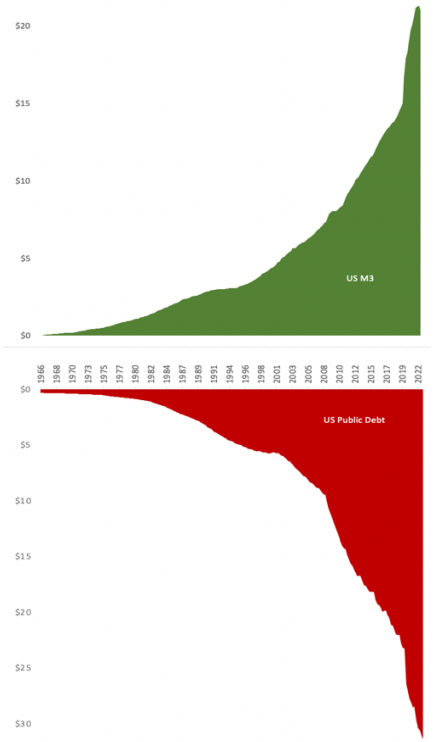

Fig. 4. US money supply M3 and total public debt (in trillions of USD). Source: own work. Data provided by OECD (2024) and US Department of Treasury. Retrieved from Federal Reserve Bank of St. Louis.

9. Moral-ethical aspects of interest-induced inequality

However, it is not just that inequality grows exponentially and according to a mathematical function, but it can be characterized as an **unjust inequality** because the one who receives interest does not get richer thanks to his own effort, but because of the effort of those who borrow money and pay the interest. This is because money does not work (even though banks might use this metaphor to incentive clients to invest with them), nor does it have offspring as already Aristotle [384 BC] (1995) sarcastically had pointed out. It might be that we have honestly gained our money with our own hard work. But if this money is deposited on a bank account and then starts to yield interest, this is only possible because someone else takes a loan and manages with his productive investment to pay the interest, since –as was mentioned above– there is no interest without debt.

Hence, interest can be seen as the "right to earn someone else's effort"[3] (Gesell, 1920: 210). This situation appears to be even more unfair if we bear in mind that money does not have any intrinsic value (chap. 3 of the book expands on this idea; see also Galbraith, 1983; Keynes, 1983). If there were no goods, any money would be worthless. The reason why we assign value to the money is because someone produced goods and services that can be interchanged for the money. Indeed, instead of asking for interest, one could argue that creditors should be thankful to the debtors since they produce goods and services that give value to the creditor's money[4]. This chapter contains an in-depth analysis of these moral-ethic aspects.

Part IV Natural money as solution

10. Gesell's solution

This chapters introduces the reader to a possible solution. Economic schools should study and analyze the conventional economic theories in order to formulate a new model of a market economy not perverted by the need to grow and by a constantly increasing income inequality, that is a market economy with a different kind of money. We could probably learn a lot from the proposal offered by the German-Argentine economist Silvio Gesell in his work, **"The natural economic order"**. Gesell (1949, first edition 1916) designed a currency that being equipped with some sort of "carrying cost" (Keynes 1936: 357) cannot be hoarded eternally, and thus circulates without interest as reward for parting with liquidity being necessary. Money then loses its special position compared to real goods, and the money holder cannot "press" interest anymore (Gesell 1949: 205, 344). This interest free currency would serve solely as a means to facilitate the interchange of goods and services and not to store wealth. Consequently, it would truly comply with the concept that conventional economic theory usually calls "monetary neutrality" (Stiglitz 1998: 187; Mankiw & Taylor, 2014: 587), but which does not hold under today's financial system (Suhr, 1989; Humphrey, 1991).

The proposed monetary reform should be accompanied by land reform as proposed by Silvio Gesell and, before him, Henry George and John Stuart Mill (Gesell, 1949; George, 1881; Mill, 1885). Land is not subject to decay and has a similar superiority over other real goods as money does in our present economic system (Suhr, 1988; similar Keynes, 1936). A monetary reform as suggested by Gesell without corresponding land reform would lead to people investing in land as a store of value. After some time, most of the land would end up in the hands of a few, just as today the largest share of financial assets is held by a relatively small percentage of the population[5].

In addition, land is not a product but a gift from nature which is a powerful argument that from a moral-ethical point of view land should belong to everybody. But it is not only about land. The reform should also include the regulation of the exploitation of other natural resources. These are actually to be regarded as the property of all mankind (Gesell, 1949), or at least as the property of the people in whose territory they are located. In most countries natural resources are considered public property (e.g., in Chile according to the current constitution).

The chapter argues that regarding property rights we should distinguish between man-made products and (pure nature-made) natural resources (see also already Fuders & Pastén, 2020). In conventional economics, however, private property rights are considered indispensable to

[3] Author's translation. In the German original: „Das Recht auf den fremden Arbeitsertrag".

[4] On the moral-ethic aspect of interest see also already Fuders (2010b; 2017).

[5] for an exhaustive analysis of the possibility of gaining economic rents from land ownership see the publications of Löhr (2012; 2013; 2018).

allocative efficiency, basically **regardless** of the nature of the goods. Also, according to conventional economics, one way to avoid the overexploitation of freely accessible resources (*open access regimes*) is by privatization. This argument is based on the idea that only market goods (excludable and subject to competition) can be efficiently allocated by the market. The sale of significant parts of Chilean forests to private companies in the 1980's was based on this economic rationale. However, powerful arguments exist that allocative efficiency can be achieved if private property rights exist for man-made products, but not necessarily for natural resources, which ideally should remain freely accessible. The chapter explains why this is NOT a Marxist idea but, on the contrary, a way to avoid monopoly rents and **approach to the ideal of perfect competition**.

11. Gesell's Solution to achieve the SDGs

Since all but one goals are either linked to the unsustainability in *stricto sensu* resulting from the growth imperative (goals 9, 11-15) or to the inequality (goals 1-8, 10, 16), and both are symptoms of our unnatural financial system, this chapter analyses how the achievement of each goal can be substantially improved by a reform of our monetary system. The following is a resume of these sub-sections.

SDG 1 and 2 (No poverty and Zero hunger). The main reason for poverty and hunger is the unequal distribution of wealth. Our planet offers enough resources for all people to live in dignity and without hunger. Even amid those countries where people are dying of hunger, we find at the same time very rich people who live in an exorbitant abundancy. Notwithstanding that there are other reasons that generate income inequality such as market concentration, this chapter stresses that the main factor behind the growing unequal distribution of wealth is the gap between the exponential growing financial assets and debts, as fig. 4 clearly depicts. While an ever-smaller number of persons gains ever more interest, ever more people are indebted. The only way to sustainably guarantee a fair distribution of wealth is to eliminate the root of inequality, that is to change the unnatural design of money into a more natural one. We can observe this wealth gap not only in between countries, but also between countries, since some countries are creditors of the sovereign debt of other countries (Creutz, 2018). This way our financial system also (exponentially) increases inequality between ever richer countries on the one side and ever poorer countries on the other.

SDGs 3, 4 and 6 (Good health and wellbeing, Quality education and Clean water and sanitation). Many ideas exist to improve the provision of healthcare, to make cities heathier and increase wellbeing, for example using a 'systems approach' (Gatzweiler, et al., 2019). However, sanitary and healthcare installations are expensive. Wellbeing, even though we would not define it as access to luxury goods but as a decent satisfaction of fundamental human needs (Max-Neef, et al., 1991; Fuders, et al., 2016) requires the access to basic goods, a clean environment, good infrastructure and intelligent development planning (see, e.g., Dick et al. 2016), all of which costs money. The same is true for guaranteeing a high-quality education as well as clean water and a high-quality sanitary infrastructure (Bárcena et al., 2018). Hence, good health, wellbeing and education are strongly connected to the fair distribution of wealth.

SDG 5 and 10 (Gender equality and Reduced inequalities). The underlying cause of most types of inequalities is the inequality of wealth distribution. The main reason for the unequal wealth distribution is our unnatural financial system. Any income inequalities that might exist because of other reasons will be further pronounced by the current financial system as savings grow by interest. The more and the earlier someone is able to invest in financial assets the faster this investment starts growing by interest.

SDG 7 (Affordable and clean energy). Technologies for clean and free energy exist, and today they are much cheaper than years ago, in some countries –especially developing countries– not seldom even cheaper than getting connected to the conventional energy network (Debus, et al., 2016) and here some speak of a new form of „energy democracy" (Stephens, 2019). Even though these technologies are less expensive now they might be too expensive for the poor. Again, the fair distribution of wealth can be considered crucial for a broad use of clean energy.

SDG 8 (Decent work and economic growth). As outlined above, what this goal is trying to tackle is unemployment and precarious working conditions that are usually associated with high unemployment rates (see e.g. Fernández, et al., 2011). Steady economic growth is contrary to the idea of sustainability since in the long run it **must** end up in an increased use of natural resources, a fact that already Aristotle [384 BC] (1995) 2,300 years ago had pointed out. Constant economic growth is the main reason for the unsustainability in *stricto sensu*. The idea that economic growth was necessary to decrease unemployment is based on the empirical observation that unemployment and GDP growth rate are negatively correlated (Okun's law). However, this dichotomy that we either increase the productive output of our economies or otherwise unemployment prevails finds its roots in the obligation to grow inherent in our financial system. As explained above, if a company does not manage to grow, it will try to reduce costs, and since human workforce is usually the most important cost position, there is a constant pressure to either grow or to replace humans by machines.

SDG 9 (Industry, innovation and infrastructure). Innovations, digitalization and improving infrastructure (industry 4.0) could substantially increase efficiency and therefore decrease the input and throughput of physical material and energy required to produce a certain product or service. Nevertheless, as outlined above, the laws of thermodynamics tell us, that if we keep on growing economically (increasing real GDP) we will in the long run use more resources, since we cannot produce something out of nothing. Renewable resources will end up overexploited, because if we keep on growing at some point the extraction rate will be higher than the reproduction rate of the resource. In addition, any produce will end up as waste (2^{nd} law of thermodynamics). Even if we managed to perfectly recycle everything (perfect circular economy), which most probably will never be possible, we would still destroy and overuse our environment due to the steady increase of throughput, if we keep on expanding production. However, while maintaining our current financial system any degrowth strategies will cause unemployment and misery.

SDG 11 (Sustainable cities and communities). Even though we may improve sustainability in cities and communities by a clever development planning (see e.g. Dick, et al., 2016), in the long run steady economic growth cannot be sustainable and will interfere with this goal. If we really want sustainable cities and communities, we will first need get rid of the obligation to grow (see already Fuders, 2016).

SDG 12 (Responsible consumption and production). It is a widespread and modern belief that responsible consumption is the key to achieving greater sustainability (see, e.g., Latouche, 2003; 2009; Becker, 2020; Higgs, 2021). We should recycle more and consume less. However, if we reduce consumption while leaving the current monetary system in place unemployment would increase. As explained in chapter 4.5, the interest rate for investments in financial assets is the benchmark for the assessment of the profitability of any productive investment (e.g., Copeland, et al., 2008), even in ecological economics texts (Common & Stagl, 2008). For most people gaining money is the main (or only) reason for investing[6]. Any business that does not yield a return at least as high as the interest rate

[6] However, entrepreneurs could, of course, also start their business because they wished to make use of their talents in order to produce products that contribute to the common good, i.e., to the quality of life of people, and not only for financial gains. If all entrepreneurs understood this, we could come close to what might be called an "economy of

will fail (see Suhr, 1988; 1989). Therefore, as discussed in chapter 4 businesses will always try to achieve a return on investment that is at least as high as what they could earn by investing in financial assets. This is why businesses engage in intelligent and tricky marketing strategies to steadily increase consumption. As long as they can grow at least as fast as the interest rate, unemployment will not rise *ceteris paribus*. The chapter concludes that if we want a more responsible consumption without unemployment to rise, we need to change our financial system first.

SDG 13, 14 and 15 (Climate action, Life below water and Life on land). In order to protect the life below water and on land it is crucial is to keep our natural environment clean and not to overuse renewable resources, such as oceans and forests. To achieve this, we necessarily need to degrow economically or, at least, not keep on expanding production from now on. Nevertheless, while maintaining the current financial system this will cause unemployment and misery, counteracting the achievement of several other SDGs.

SDG 16 (Peace and justice, strong institutions). Taking a look in any history textbook we can see that wars and financial crisis have often been timely correlated; and this might not be coincidence (Gesell, 1949; Creutz, 1998). The interest burden of the sovereign debt could be paid with captured capital and resources (Creutz, 1998). On the other hand, war is a most effective method to destroy physical values, making new economic growth and paying of interest possible (Creutz, 1998), all the while increasing the demand for loans. Not only households need to rebuild destroyed homes and replace destroyed goods, but it also leads the governments of nations at war to increase their level of national debt. This is why wars have the power to delay the collapse of the financial system by enabling further economic growth on the one hand and providing an incentive to borrow on the other. What applies to the destruction of real capital by war also applies to the destruction that natural disasters wreak. Indeed, this is precisely what could be observed after the second strongest ever recorded earthquake that took place on February 27th, 2010, in Chile. Contrary to the predictions of Chilean Central Bank GDP (BCCh, 2010a; 2010b) GDP growth in 2010 was higher than it had been the last 16 years before, the demand for all types of loans increased sharply and so did the interest rate as "price" for loans (see also Fuders & Belloy, 2013).

That an exponential growing inequality goes contrary to the notion of justice as it is felt by many can be understood intuitively, even if one is not an enthusiast of a strict egalitarianism and even considering that inequality is not unjust *per se*, since people who work harder (employ more production factors in microeconomic terms) should also gain more, at least in the perception of many. But taking into account that money does not work, it is not only that inequality grows exponentially, but, as outlined above, it can be characterized as an unjust inequality, because the one who receives interest does not get richer thanks to his own effort, but because of the effort – and usually also at risk– of those who borrow money, invest it productively and pay the interest thereof (for an in-depth analysis of this aspect see chap. 9 of the book).

SDG 17 (Partnerships for the goals). This is the only goal not directly connected to our unnatural financial system. In fact, SDG 17 is not a 'goal' in itself but can be seen as a 'transversal goal' that, when being achieved, helps to achieve all other goals. However, even here a reform of our monetary system could help to promote such partnerships. Since money in the Gesellian system is not easily storable and does not yield interest, it makes less sense to work more than can outrightly be consumed. A monetary system where money cannot be hoarded easily has the power to reduce greediness, excessive individualism and selfish behaviors in the quest of getting rich at the expenses of others. The many vices today awarded by the system (Suhr, 1988) will exist in a less pronounced form, and this might substantially enhance the possibility of cooperation.

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neighborly love" (Fuders, 2017; Fuders & Nowak, 2019). In that case, entrepreneurs would care less about interest as an opportunity cost, and it might be sufficient for them to earn enough to live off it.

12. How to implement Gesell's solution in today's world

This chapter proposes and discusses different ways how to practically implement Gesell's solution in today's word. Gesell had proposed to put physical stamp scrips on money bills that have to be renewed every certain time. Today we can think of modern forms to attach "carrying costs", as Keynes (1936: 357) had called the Gesellian hoarding fee, to money.

One way to practically employ Gesell's proposal could be through an effective **negative central bank interest rates** policy (Fuders, 2010a; 2015; Fuders & Max-Neef, 2014b), i.e. a monetary policy where negative interest rates are not only charged for deposits of commercial banks at the central bank, but that also apply to cash. Different ways have been discussed to achieve this (Buiter & Panigirtzoglou, 1999; 2003; Goodfriend, 2000; Buiter, 2005; 2009; Agarwal & Kimball, 2015; Assenmacher & Krogstrup, 2018, 2021). This chapter analyses and discusses this idea thoroughly since it has been taken up also by central banks and the International Monetary Fund. However, the chapter will conclude that the way the negative interest rate policy had been implemented by the ECB between 2014 and 2022 is not comparable with Gesell's proposal. The policy of so-called *quantitate easing* can even be seen as contrary to what Gesell proposed. Gesell proposed money that circulates easily and not the printing of ever more money that will later be stored under the "mattress".

13. Alternatives to Gesell's solution

This chapter discusses ideas or proposals that in the literature have been brought up as alternatives to the current monetary system such as Irving Fisher's (1945) "100% Money" proposal, time banks, indexed money, gold standard, crypto-currencies, Tobin taxes, Modern Money Theory, or Islamic banking among others. The book concludes that even though some ideas, as e.g. the 100%-Money proposal, could be an improvement compared to today's situation, none of these proposals can avoid that money supply and debt grow by an "invisible hand" (to use Adam Smith's ([1776] 1952) metaphor) and eventually start decoupling from the real economy, and are therefore no solution to the problems discussed. The table in fig. 5 provides an overview.

Proposal	Chapter	No solution at all + extra problems	No solution at all	No true solution but improvement	True solution
Governmentally imposed hoarding tax	12.1				X
Effective central bank negative interest rate policy	12.2				X
"100% Money" and "sovereign money"	13.1			X	
Modern Monetary Theory (MMT)	13.2		X		
Marxism, communism and socialism	13.3	X			
Gold standard or other "backed money"	13.4		X		
Inflation adjusted accounting units like the Chilean UF	13.5		X		
Time Banks & time vouchers	13.6			X	X (if subject to hoarding fee)
Social or local money	13.7			X	X (if subject to hoarding fee)
Credit cooperatives and trustee savings banks	13.8			X	
Cryptocurrencies	13.9		X		X (if subject to hoarding fee)
Prohibition of interest / Islamic Banking	13.10			X	
Ethical banking and microcredits	13.11			X	
Bailouts, "Bad Banks" & Co.	13.12	X			
Tobin Tax and austerity	13.13		X		
Degrowth, decarbonize and circular economy	13.14			X	
Doughnut Economy, Gemeinwohl-Ökonomie & Buen vivir	13.15			X	

Fig. 5. Overview. Source: own work.

14. Experiences with Gesell's solution

Gesell's natural money is not just a theoretical idea. In the 1930s it was actually implemented alongside the respective national currencies in cities in Germany, Austria, Liechtenstein, Switzerland, France, Spain, the Czech Republic and in a couple of cities in the U.S.A. In some cases, with extraordinary success. In several U.S. States there were even bills proposed to officially introduce a natural money as legal tender, and later, Irving Fisher even advocated for nationwide introduction of such a non-hoardable dollar, but finally these bills were not adopted (Fisher & Cohrssen, 1933; Ottacher, 2007). The most successful implementation probably took place in Wörgl (Austria) and Schwanenkirchen (Germany) in the 1930s. In both villages unemployment rapidly fell to its pre-crisis level, the municipality recorded tax revenues again, and many citizens were able to get rid of their debt. The success especially of the Wörgl experiment was of such magnitude that newspapers around the world reported about the "miracle of Wörgl" (Fisher & Cohrssen, 1933; Onken, 1997). Unfortunately, this success story was brought to an end when the central bank prohibited the new bank notes, arguing that it had the exclusive authority to issue bank notes, but not the municipality of Wörgl (Fisher & Cohrssen 1933; Unger, 2007; Blanc, 1998). Other positive experiences of real implementations of Gesell's proposal including those that did not refer to Gesell, but which in essence follow the same idea, such as the Bracteates in the High Middle Ages or the "Panacotas" in Argentine 2001 are presented.

Part V Outlook and final considerations

15. Towards a Development at Human Scale

This chapter connects the proposed reform with classical microeconomics and development planning. The proposed financial system would abolish the growth impetrative, but on the other hand it would not avert economic growth either if this was necessary for people to 'develop', here understanding 'development' in the sense of the *Human-Scale-Development*-approach (Max-Neef et al., 1991). According to this concept fundamental human needs can be characterized as few, finite, classifiable and do not vary through all human cultures and across historical time periods. What do change over time and between cultures are the strategies and satisfiers by which these needs are satisfied. The better people manage to satisfy their fundamental human needs, the more developed is this country or region[7].

While today the biggest share of economic growth translates into increasing inequality, only a relatively small share (if any) of economic growth promotes development in the sense of improving the satisfaction of fundamental human needs. It is argued that with a Gesellian natural (and neutral) money near **100 % of any economic growth could translate into development**, i.e. into the improvement of the satisfaction of fundamental human needs, given that the government successfully enforces competition law so that also classic market imperfections and **monopolistic rents** that could derive hereof can be avoided. The driver of economic growth would then solely be the satisfaction of human needs. If by further growth we were not able not improve the satisfaction of human needs, then we would simply not grow anymore, but without that this economic stagnation would increase –as is the case today– unemployment. Since neutral money

[7] Max-Neef et al. (1991) defined a matrix of four existential and nine axiological fundamental human needs. The existential needs are: "being", "having", "doing" and "interacting". The axiological needs are: "subsistence", "protection", "affection", "understanding", "participation", "leisure", "creation", "identity" and freedom. An index that measures the subjective perception of the satisfaction of fundamental human needs is the "Human Scale Development Index" (Fuders et al., 2016; Fuders & Mora Motta, 2021).

cannot be hoarded for a prolonged period of time and since any investment bears risks, Gesell's solution provides a powerful incentive to not produce more than is actually needed. From a microeconomic point of view, we would get more 'relaxed'. It is quite conceivable that without the obligation to grow, an equilibrium could be achieved that comes close to the "*steady-state-economy*" described by Herman Daly (1991; 1993), maybe even without the need for the government to regulate input and throughput of production processes.

16. Economic resilience in presence of externals shocks

Our financial system is not only forcing us to pursue steady economic growth and, thus, resource consumption and environmental destruction, but it is **unsustainable in itself**. In particular, the system generates financial crisis every certain time. In fact, the so-called Kondratieff waves –long economic cycles named after Nicolai Kondratieff (1926)– could be interpreted as cycles of our financial system. The collapse of the financial system and the consequent economic crisis usually will come about when banks can no longer find sufficient solvent borrowers to service the deposits that are constantly growing through interest and compound interest. In their distress, banks therefore begin to grant loans to borrowers with dubious (*subprime*) creditworthiness. Later, they will be accused of not having checked the credit risks properly.

Any external shock, such as pandemics, could trigger this financial crisis. In the aftermath many will then erroneously blame the virus and again not see that the regular occurrence of crises is inherent in our financial system. However, with a money as proposed by Silvio Gesell the decoupling of the growth of the money supply (and debt) from the real economy can be avoided, and the financial system will be less susceptible for crisis. Indeed, the financial system would be more resilient and less vulnerable when it comes to external shocks.

On the other hand, money equipped with a demurrage fee circulates easier, and less economic stimulus packages would be needed in order to prevent the economy from plunging into a deep depression. Already John Maynard Keynes (1936) as well as Irving Fisher (1932) found that Gesell's proposal was suitable for pulling an economy out of the 1930's Great Depression. Yet, despite the positive evaluation by Keynes and Fisher, Gesell's proposal has not found its way into conventional economic teaching.

Right now, we are standing at the edge of new Great Depression that might come even worse than the last one, since value chains today are more globalized and interdependent. To avoid this, ever more debt-based economic stimulus is needed. For example, during the Covid 19 pandemic 193 from 195 States in the world had adopted debt-based economic stimulus packages of magnitudes never seen before (IMF, 2020) to counteract the negative effects of the Covid 19 pandemic. This can be understood not only as help for people and businesses but especially as help for banks that urgently needed to sell loans and which could finally grant these loans to the public sector who acted here once again as a sort of 'borrower of last resort'. However, we do not need more liquidity in the markets but a more equally distributed liquidity and, above all, a liquidity that circulates and serves the economy, instead of ever more of the same 'easy-to-hoard' liquidity. In the long run, this will again end up under the 'mattresses' or as excess liquidity at the central bank, both of which have already been increasing exponentially before these measures have been taken (Cœuré, 2019). The chapter concludes that it is not advisable to try to solve the problems repeating the same mistake over and over again. We now have the historic chance to do something different, so as not to repeat what has driven us to the current situation.

17. Final considerations

The book ends with some philosophical thoughts which conclude that a 'healthy' economy requires money that circulates easily as proposed by Silvio Gesell. This, of course, does not mean that a financial system with characteristics like those proposed by Gesell would automatically stop any destruction of ecosystems or the production of goods and services with negative ecological balances. We can envision, however, that without the obligation to grow and without the possibility of accumulating large amounts of '*virtual wealth'* (Soddy, 1933) in bank accounts that reproduce 'on their own', the abuse of nature could decrease to an extent that nature's ability to assimilate negative effects might no longer be overwhelmed. In any event, what can be affirmed with complete assurance is that **with the current financial system, a sustainable future is not possible**.

Summary of the article

The article connects to chapter 15 of the book. It provides empirical evidence to support the hypothesis that in order to get as close as possible to "development at human scale", as proposed by Max-Neef et al. (1991), we need to get as close as possible to the microeconomic ideal of so-called perfect competition, a situation in which many small and medium-sized enterprises compete with each other, while the GDP growth rate does not seem to be directly related to development. The ideal of "perfect competition" is part of the repertoire of classical economic theory. Few adherents of classical economic theory manage to build a bridge between economic theory and wellbeing when wellbeing is defined in terms of fundamental human needs, as Max-Neef & colleagues have done in their *human scale development* approach. On the other hand, the adherents of Max Neef's theory would, at first sight, usually not agree with the assumption, proven in our paper, that competitive markets are a way to get closer to human scale development, i.e. development where people can best satisfy fundamental human needs. Our paper tries to help bring both positions together.

Methodology

Perfect competition is a situation in which many small and medium-sized companies compete with one another. There is no way to directly measure a degree of how close markets are to the ideal of perfect competition. But we can measure market concentration (Herfindahl-Hirschman Index), which can be seen as the contrary of perfect competition. To measure development, we ideally would have used the "Human Scale Development Index" (Fuders et al. 2016; Fuders & Mora Motta, 2021) which builds on the Neefian human scale development approach and measures the subjectively perceived satisfaction of the fulfilment of fundamental human needs. Since this index has not yet been widely applied, we used as an alternative the UN Human Development Index. Cross referencing data of market concentration, GDP growth rate and the Human Development Index in 100 countries via time series analysis, autocorrelation, partial autocorrelation, cross-correlation function, and augmented Dickey-Fuller test, we found that there is i) no clear positive correlation between GDP growth rate and development, and ii) on average developed countries have significantly lower degrees of market concentration than developing countries, i.e., they have more competitive markets.

Discussion

The paper discusses next to some limitation of the findings the idea that, in order to really be able to reach a situation coming close to perfect competition and thus to a development where everyone can best satisfy fundamental human needs, we need a money reform as proposed by Silvio Gesell. Here the paper again connects to the book, especially to chapter 15.

Conclusions & Policy implications

The cumulative dissertation consists of a 350-p. book and one article, both of which complement each other. It is argued that the current economic system, driven by an unnatural design of money, is incompatible with the goals of sustainability and social justice. To fulfill the UN SDGs, a radical rethinking of money's role in the economy is necessary. That is to say, we do not need more money for sustainability but a **different kind of money**. By adopting a system based on "natural" money as first proposed by Silvio Gesell, the world can move towards a future where economic activity serves people and the planet, rather than the other way around. Both publications end with a hopeful vision of a world where money is no longer a source of inequality and exploitation but a tool for achieving true prosperity and sustainability for all.

The book is a comprehensive treatise on the role and the concept of money and at the same time critical appraisal of Silvio Gesell's reform proposals. It concludes, after discussing 17 other alternatives, that Gesell's proposals represent a solution to virtually all the big challenges we face today, especially ever-increasing income inequality, inflation (or deflation if the system crashes) and the ever-increasing unsustainability of our activities. This, of course, does not mean that a financial system with characteristics like those proposed by Gesell would automatically stop any destruction of ecosystems or the production of goods and services with negative ecological balances. But in any event, what can be affirmed with complete assurance is that with the current, unsustainable financial system, a sustainable future is not possible.

Regarding the management and use of natural resources, it could be shown that the reason for why natural resources are being ever more overexploited is not (only) related to open access regimes, as is regularly argued, but originates in the real economy's obligation to grow, an obligation that in turn emanates from the interest rate as the opportunity cost of any productive investment, applying this pressure to private goods as well as to those that are freely accessible. Consequently, a policy of privatization of resources, which have originally been freely accessible, does not eradicate the underlying problem, nor does it necessarily increase allocative efficiency. In some cases, it can even decrease allocative efficiency. It was also explained that the assignment of property rights to natural resources, originally freely accessible, does not automatically prevent their unsustainable management, and does not even ensure that they will not be exploited until their total extinction.

As an overall conclusion it can be stated that if we aspire an economy that promotes the satisfaction of fundamental human needs, that is a "Development at Human Scale" (Max-Neef et al., 1991); if we want an economy that serves people and not *vice versa*, and in which gaining money is not an end in itself; if we want a true social-ecological transformation that **attacks the illness from its root** and doesn't just address the symptoms, then we have to reform our money first. This would then provide the basis to establish a truly free market economy, let us call it a market economy without capitalism. Chap. 15 of the book concluded that this is probably the *oikonomia* Aristotle used to refer to.

Limitations & further research needs

Gesell's hoarding fee (demurrage fee) influences the speed at which money circulates. However, until today there are no records that permit to describe mathematical dependencies. For example, how does inflation change if the hoarding fee is increased from 1% to 2% or *vice versa*? Is there an exact relationship between money supply, purchasing power and price level?

These are highly interesting questions. We can assume that, in general, the relationship between money supply, purchasing power and price level is the same for Gesell's natural money as it is for conventional money. Irving Fisher's quantity equation also applies here. The higher the money supply, the higher the inflation (the lower the purchasing power) if the output of the economy does not grow at the same rate. However, the effect of the velocity of circulation in Fisher's quantity equation may not have been described correctly so far. In the short term, it may be true that, as the quantity equation states, a higher velocity of circulation leads to higher inflation if the output of the economy remains the same. However, in the long run a higher velocity of circulation (e.g. through a Gesellian hoarding fee) leads to lower interest rates; after all, interest is a "reward for parting with liquidity" (Keynes' 1936: 167) which is not possible to charge if liquidity is not easy to hoard. But as explained and discussed in this dissertation (especially chap. 5 of the book) the effect of the interest rate is, in the long run, exactly the opposite of how it has been understood in monetary theory to date. Empirically it can be shown that interest rates and the money supply are positively correlated in the long term, contrary to conventional understanding, i.e. a higher interest rates lead to a higher money supply and thus inflation potential (and *vice versa*). Therefore, a faster circulation of money induced by a Gesellian hoarding fee, which causes the interest rate to fall (or at best disappear), leads in the long run to a lower money supply and thus lower inflation potential. Nevertheless, if we set the Gesellian hoarding fee too high, the interest rate will disappear and with it the main cause of the constant growth of the money supply and thus of inflation (and the growth imperative), but inflation could then arise as a result of money circulating too quickly, this time caused by the hoarding fee itself.

Regarding the growth imperative inherent in the monetary system, in chapter 5 of the book (p. 69), I tried to describe mathematically why the money supply always grows slightly faster than economic output. The money supply M expands via the natural demand for Money M_{nd} (we could also say natural demand for credit) **plus** interest r. That means, the money supply M will increase as much as the natural demand for money M_{nd} increases plus the additional credit that banks have to grant in order to be able to pay interest, while the interest rate *r* depends on the natural demand for money: $r = f(M_{nd})$. Banks therefore find themselves under constant pressure to grant more credit than would naturally be demanded and can only remain solvent as long as they are able to do so. Banks must therefore constantly increase their loan volume, and in doing so increase the money multiplier, since deposits are also constantly growing due to interest. However, also here precise dependencies based on real data have not yet been described. To answer these questions, it would be necessary to implement a Gesellian monetary system first to be able to conduct a study with real data.

The so-called "rebound effect" (on this see also DBK, 2018) describes the paradoxical situation that efficiency gains eventually lead to an increase instead of a decrease of overall demand for resources if they translate into lower prices and thus spur consume. This situation might also apply here. Through the Gesellian hoarding fee we may manage to bring long-term interest rates down to zero and thus get rid of the underlying reason for the growth imperative as explained throughout the book. However, lower interest rates also mean lower costs which can lead to lower prices, that in turn could lead to an increase of consumption. Whether or not the positive effects regarding natural recourse exploitation of finally having abolished the growth imperative could be

counteracted by consumers that will now want to consume more, needs behavioral studies. To conduct such studies, requires the implementation of natural money that generates a long-term zero interest environment.

Regarding the long-term positive correlation between interest rates and GDP growth rates (fig. 3) in future research the causality could be tested and proven with descriptive statistical methods.

How to effectively implement Gesell's reform proposals in praxis needs to be discussed in more detail as it has been done in the book. In fact, a book on its own could be written on this issue. For example, the Gesellian hoarding fee, which can be interpreted as a negative interest rate on cash and demand deposits, could be associated with legal problems, next to a resistance of large part of the population and politicians.

Finally, I would like to emphasize that this dissertation is not a critique of economic growth, but a critique of our monetary system. If we maintain the current monetary system we must grow, otherwise unemployment will increase as explained in chap. 7 of the book. That this dichotomy – that we either grow economically or otherwise unemployment and so misery increases– is a secondary effect of the current monetary system is not yet well understood in economics. This dissertation tries to contribute towards this understanding.

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