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Boulding*

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Begetting Silvio Gesell in the Modern Economy: A Marriage of Frederick Soddy and Kenneth Boulding

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Abstract

In the *Natural Economic Order*, first published in 1916, Silvio Gesell warned against a fiat monetary system that in place of controlling the circulation of money with demurrage, sought to manage the system by accommodating demand for liquidity. We have been in such a system since 1971 and it has survived these 55 years without collapsing in the way that Gesell predicted. We will explore how Gesell's concerns apply to the modern system of monetary management and will argue that he has been right about the process but that we have not yet reached his inevitable end. We will also expand on Gesell with a marriage of Soddy (1925) and Boulding (1944) to help understand wider implications of monetary management in the modern economy.

1 Introduction

In the section "Reform of the Note-Issue" of the Natural Economic Order¹, Gesell considers a proposal to remedy Economic crises by moving to a fiat system that is managed to prevent either deficient demand for goods by always accommodating increased demand for liquidity through note issue or excessive demand for goods when demand for liquidity falls by reducing the money supply. Gesell has a different proposal for a fiat system to replace the gold backed system where unfettered economic progress requires that the supply of gold is increasing at a faster pace than the economy is expanding so that there is at least a 5% rate of inflation that prevents money from competing with capital as a medium of saving. Only then can capital continue to accumulate as its return comes down towards zero. The inevitability of a fall in gold production combined with the demand for gold for other uses make a deflationary cycle and periodic economic crises inevitable. Gesell is dismissive of the prevalent view that money has to have intrinsic value and saw that although the bits of paper that were being used as money were backed by gold or silver, it was something more akin to collective belief and a convention that gave money its value. Governments can force the convention to be a fiat currency that is managed by an issuing office. However, Gesell is also dismissive of such a currency if it does not from the outset have a stable circulation. The 5% inflation that allows for unfettered economic progress with a gold standard can be replicated with a 5% tax on holding money, also known as demurrage, in a fiat system that prevents periods of increased hoarding reducing the circulation or periods of hoards rapidly returning increasing the circulation. The key then to unfettered Economic progress is a stable velocity of circulation and in a fiat system this can be achieved with demurrage rather than inflation which compromises the crucial property of money as a standard. A fiat system without demurrage makes the circulation subject to the demand to hold money. This change in demand creates a contradiction between money as a medium of exchange and money as a medium

¹Gesell (1929), book 3, section 13.

of saving. If as a good medium of saving, its demand increases when the return on capital has come down then it is suddenly not being used as a medium of exchange. Gesell's proposal removes this competition for the use of money as a medium of exchange by fixing the demand for money as a medium of saving to zero. It is not possible to fix it at some positive amount as a medium of saving as its demand is subject to changing market sentiments.

However, the proposal under consideration allows wealth to be built up in money creating an instability. The idea is that as the return on capital comes down, the deflationary cycle can be prevented from taking hold by simply replacing additions to hoards with newly issued money. Gesell considers an issuing office that lends this directly to employers to make up for the reduced lending from banks because savers are hoarding money rather than lending it and at the same time banks also have an increased demand for liquidity. This will be effective in the short run as it prevents deficient demand in the economy by accommodating the increased demand for liquidity and this allows investment and capital accumulation to continue. As the return on capital continues to come down, the demand for money will only increase. More and more savers will prefer money in their possession than lending it at a low interest rate and commercial banks will not find it profitable to renew loans or discount bills of exchange at such low rates. The issuing office will also be the only lender for new mortgages and will gradually be replacing privately created credit/debt with newly issued money. However, with so much liquidity, the system has become sensitive to a change in sentiment. By preventing a deflationary cycle the system is now primed for an inflationary cycle where money suddenly becomes a terrible medium of saving and the demand for it collapses. The idea of the reform is that the issuing office simply reduces the money supply to prevent inflation from taking hold. The problem Gesell identifies is that the issuing office has nothing to sell that the money holders want to buy. They would rather hold money than low interest debt and the instability created by the creation of so much money makes it inevitable that an inflationary spiral will take hold eventually. Gesell is suggesting that this

experiment in fiat currency will end in hyperinflation and a reversion to a gold money institution. If a fiat system is to work, it must be protected from this kind of collapse from the outset.

In section 2 we set up a model of the liquidity trap that captures Gesell's instability of money as a medium of saving with an interest inelastic transactions demand for money at high interest rates and an additional elastic savings demand below some threshold. We use this to consider similarities and differences between Gesell and Keynes and define what we call the Gesellian and the Keynesian solution to the liquidity trap with the crucial difference that the Keynesian solution accommodates the elastic demand for money in a liquidity trap.

It will be helpful to have a framework that allows us to understand how value is created in the modern financial system. It is well understood that money can add to the wealth of a community without having intrinsic value of its own. The idea of intrinsic value is itself fraught with difficulties but a clear sense in which the previous sentence is understood is that money is not something that is consumed. It gets its value from a collective belief or convention that is linked to its function as a medium of exchange. In section 3, we build on this notion of wealth that is supported by a collective belief by expanding on Soddy's Virtual Wealth to include value in assets more generally and combine this with Boulding's generalization of liquidity preference to determine equilibrium values for all assets and the total value of the wealth of the community. With some help from Aristotle in section 4, we look to disentangle this total value which is some combination of real wealth and the expanded notion of Virtual Wealth. The key distinction will be wealth that is created from an *irrational* desire for wealth as an end rather than a means to an end and we will call this Chrema Wealth. Our marriage of Soddy and Boulding will allow us to see how accommodating the demand for money balances is transmitted to a larger increase in Chrema Wealth.

Section 5 gives an overview of the monetary system in the UK with a focus on policy from the 2008 financial crisis. In section 6 we use our model of the liquidity trap with the Soddy/Boulding framework and concept of Chrema Wealth to explore

possible problems with this policy and more generally with the Keynesian solution to the liquidity trap. We end with a discussion in section 7.

2 Modelling the Liquidity Trap

Having identified the same problem as Gesell, Keynes in the General Theory of Employment, Interest and Money proposes a solution that is subject to Gesell's critique of managing the system to prevent deficient demand by accommodating increased demand for liquidity. We will use Sidrauski's monetary growth model to help understand the similarities and differences between Keynes and Gesell. The famous result from Sidrauski (1967) is the *superneutrality* of money, that is the steady state real variables are not affected by the return on holding money (in contrast to the neutrality of money which relates to the quantity of money). Keynes and Gesell have essentially the same theory on money competing with capital to bring a halt to capital accumulation before the steady state can be reached. Rejecting myopic time preference as an explanation for a steady state with a positive rate, they both have a steady state net interest rate equal to zero. We will therefore use the Sidrauski model with no population growth and zero myopic time preference which gives the Gesell/Keynes steady state.

On the path to the steady state, as the return on capital comes down towards zero, there comes a point where money starts to compete with capital as a vehicle for savings. To model the liquidity trap we will assume a liquidity return function, $l(\frac{M}{P})$, that is downward sloping in real money balances, $\frac{M}{P}$, inelastic above some positive threshold level of liquidity return l^* and elastic below it. The inelastic portion represents transactions demand and the elastic portion additional savings demand. The real return on holding money is $r_l = l(\frac{M}{P}) + i_m - \pi$ where i_m is a monetary return on money balances and π is the inflation rate. Money can also be lent at a nominal rate, i , giving a real return, $r = i - \pi$. Arbitrage requires $r_l = r$ giving $l(\frac{M}{P}) = i - i_m$.

Gesell has a classical theory of the rate of interest when the additional monetary

return on lending money, $l = i - i_m$, is above l^* . As the transactions demand is inelastic, a small increase in demand for real balances that arises from reducing i is easily accommodated with a small decrease in prices and this will not start a deflationary spiral as the opportunity cost of holding money is too high and any substitution will be between consumption and capital. Without a leakage of money from the circular flow, we have a stable velocity of circulation and both Say's law and the quantity theory of money hold. The causal sequence then is, i is set in a real economy equilibrium with l adjusting to it. In terms of the Sidrauski model, we are simply following the equilibrium path to the steady state. The departure from Sidrauski arises when $l = i - i_m$ comes down to below l^* as now the increased demand for money cannot be easily accommodated by falling prices. The substitution will be from capital to money holdings and in place of the Sidrauski transition to the steady state, we have a deflationary cycle. Gesell sees the economic system periodically switching between deflationary and inflationary cycles on the gold standard and a fiat currency without demurrage as being doomed to collapse. His solution is to set $i_m = -l^*$. In his discussion, he has $l^* = 5\%$ and his solution is to simply have a tax of 5% on money holdings. Assuming $\pi = 0$, this allows the transition to the steady state $i = 0$, without ever having to negotiate the elastic part of the liquidity function. To maintain the property of money as a standard of value, the money supply is controlled to maintain $\pi = 0$. Other than that, there is no role for monetary management of the economy. The interest rate is set in decentralized markets along the transition path to the steady state.

Keynes in the General Theory argues that his theory of liquidity preference demonstrates a flaw in the classical system and that the interest rate is determined by equating the demand for money with the supply, $\frac{M^S}{P}$, to give the interest rate $l(\frac{M^S}{P})$. This rate then determines the return on lending money, i and the volume of investment that equates this to the marginal return on capital. The causal sequence is l is set by the stock demand and supply of money and i adjusts to it. We are now thinking in terms of a managed economy where the money supply can be adjusted to change

the interest rate. Above l^* , monetary policy is effective in managing investment as the interest rate will be responsive to small changes in the money supply. We can then imagine following the Sidrauski equilibrium path with the monetary authority successfully controlling the interest rate to give the full employment level of investment. Keynes has $i_m = 0$ and the departure from Sidrauski again arises when $l = i$ comes down below l^* . With the demand for money becoming elastic, the interest rate is not so responsive to increases in the money supply. In principle, this should just require a sufficiently large increase in the money supply to keep the economy at full employment. However, Keynes is also concerned, in the context of the great depression, that in a state of low confidence, firms are not wishing to invest even at low interest rates. In terms of economic theory, one thing that is revolutionary about the General Theory is its treatment of uncertainty. The investment and liquidity preference schedules are not fixed by some notion of real factors such as technology and preferences but are shifting in response to psychological factors and if in a state of pessimism, the liquidity schedule shifts up and the investment schedule (the marginal efficiency of capital, *MEC*) shifts down then it may not be possible to manage the economy with monetary policy alone. Keynes sees a failure of the market system to coordinate economic activity due to the volatile nature of investment expectations and liquidity preference. He proposes the socialization of investment to fill any gap in aggregate demand. What this amounts to is complimenting monetary policy with public investment to ensure full employment and continue capital accumulation and growth. Then with a combination of monetary and fiscal policy, the economy can be guided on the equilibrium transition path to the steady state.

Following the General Theory there was a neoclassical synthesis with Keynes's liquidity preference theory (*LM* curve) added to the classical real investment/saving theory (*IS* curve) and the interest rate determined simultaneously rather than in a causal sequence. This has the advantage of giving a picture of the combined system but misses the insights on exactly where the constraints are in the system and how that is affecting the equilibrating forces. In our presentation above, when $i - i_m$ is above

l^* , it is difficult to defend the liquidity preference determination of the rate of interest but when it is below l^* it can be a constraining force where Keynes's psychological factors and uncertainty take centre stage. In debates on what exactly the General Theory changes in the classical system, Robertson captured this constraining aspect of liquidity preference as the crucial departure. It was Robertson who first coined the term *liquidity trap*, which occurs if the liquidity schedule is downward sloping rather than vertical. Hicks, who popularized the term, considered the departure to be a positive lower bound where the liquidity schedule becomes perfectly elastic and Modigliani pointed at price inflexibility.² We will define a liquidity trap to be at $l = i - i_m < l^*$ where liquidity on money is affecting the economic system. This includes elements from Hicks, Robertson and Modigliani with a downward sloping but elastic liquidity schedule that makes the economic system sensitive to price inflexibility. We will call setting $i_m = -l^*$ the Gesellian solution which prevents the system from entering the liquidity trap and having to face the Keynesian uncertainties. We will call the careful monetary management (with possible fiscal support) of the system to accommodate the demand for money and navigate the system in a liquidity trap to the steady state the Keynesian solution.

3 Virtual Wealth and Liquidity Preference

Soddy (1925) uses the term Virtual Wealth to reflect the fact that money is wealth in the conventional sense that it has positive exchange value but also different from wealth that has value because it will serve us in our physical existence. As a nobel prize winning chemist who had become interested in social reform and in particular the monetary system, he arrived at this distinction by observing that economists use a system of value that does not satisfy the laws of thermodynamics. In the physical realm we consume and combine our labour with capital to produce. Over time we can build up capital that allows us to increase our consumption and we can consider

²Hicks (1937), Robertson (1966), XIII and Modigliani (1944).

this as increasing physical wealth. This apparent reduction in entropy in our local system is only possible because of the sun and taking the sun and the earth together, entropy is increasing and all is well with the second law of thermodynamics. Also energy is never created or destroyed (the first law of thermodynamics) although the sun's energy is being dissipated as it is converted from a form that allows it to be used to do work to a state of increased entropy. Restricting attention to the physical domain allows us to think of growth as a physical expansion of capital through physical investment, increasing a physical notion of income that is divided between physical consumption and physical investment. This growth is constrained by physical laws of growth and decay. A fiat currency however, created by a convention to facilitate exchange, is a creation of the *human will*. Soddy refers to Henry Dunning MacLeod, who gave a clear expression of subjective value with the human mind representing our preferences and the human will a collective value representing debt/credit that we will refer to more generally as a *collective will*. It is not constrained by physical laws and can grow beyond physical growth and also disappear, ruled as it is by the laws of the collective will. Soddy recognizes that there is a reality to its value in that it is a form in which wealth can and will be stored. How much will be stored will be determined by the preferences of the community and he considers this value to be a debt that the community is choosing to have to itself as the holders of money are choosing to hold their wealth in claims on physical wealth rather than the physical wealth itself.

To show that this distinction does not get us through the minefield of intrinsic value, consider the *value* of a work of art. It has a physical existence but gives a kind of intrinsic value without being physically consumed. This also makes it a great store of value. There is a real sense in which the satisfaction from beholding it gives a value and collective belief in its value gives it an additional value as a store of value and these values bear no relation to the physical process of creating it. It is because of this subjective nature of preferences that Soddy wants to separate out a physical notion of wealth which in the case of a work of art, reduces it to the physical

process of making it. To illustrate the problem of departing from physical laws, Soddy uses the example of a 9 inch ball of gold that grows at 5% compound interest which after 1070 years will be the size of the earth, to highlight the impossibility of compound physical growth. He identifies two reasons why value that is subjective can grow beyond limits set by physical reality. The first is simply changing preferences which makes them an unsuitable foundation for a measure of value. The second is an increase in the ratio of Virtual Wealth to real wealth. The focus of his attention is on the second as a stronger force that explains economic booms and busts. During a boom, the ratio grows allowing wealth to grow at a rate beyond physical growth and then periodically collapses. He sees the credit system of banking as the vehicle for the excessive expansion of Virtual Wealth and proposes a 100% reserve fiat system that is controlled to keep a stable ratio as the economy grows with banks acting only as intermediaries.

We see from the work of art example that it also serves the purpose of storing value that is created by the *collective will* of an art market community. Just as money can have a value that arises from collective belief, artwork can have an additional value from collective belief. It is also a convention amongst a group of people which gives rise to a conventional value that bears little correspondence to any measure of the satisfaction that will be derived from owning it. There are fundamentalist who will suggest that the value of art is derived from an expected present discounted value of satisfaction but such fundamentalism is struggling in the face of cryptocurrencies. As a measure of just how remarkable a collective will can be, there are communities that have given value to NFTs. To really understand value in the economic system, we need to have a way to think more generally about value created by a collective will. Our preferences and beliefs determine how much of our wealth we wish to hold in various forms based on expectations of future values, liquidity, attitudes towards risk etc. Extending Keynes' notion of liquidity preference, Boulding (1945), presents a simple but powerful framework for determining values of the stock of all assets; goods, capital, artwork, cryptocurrencies etc. He assumes that at any point in time,

every individual has a fixed proportion of their wealth that they wish to hold in each asset, the asset's preference ratio. We can think of a clearing market with assets trading at market clearing prices.³ In aggregate assume there are M units of money, A units of asset a with *average* preference ratios, R_m and R_a and an equilibrium price for asset a , p_a . The total value of wealth is

$$W = \frac{M}{R_m} = \frac{Ap_a}{R_a}$$

and rearranging to give the equilibrium price of asset a ,

$$p_a = \frac{MR_a}{AR_m}.$$

The total monetary value of all wealth is determined by M and R_m . If we fix these values then the price of asset a depends only on its total quantity and preference ratio. It goes up if the community wishes to hold a greater proportion of wealth in it and down if the community acquires more units of it. In monetary terms, the total value of an asset does not increase with a physical increase in its quantity (from capital accumulation) but only from an increase in its preference ratio. With M and R_m fixed, it is possible for say the total value of cryptocurrencies to go up but it must be at the expense of another asset, say that of artwork, going down through changes in preference ratios. Assets can be independent so that a change in A does not affect the preference ratio of any other asset or complements/substitutes creating a more complex model where preference ratios are functions of the quantities of other assets. Even then this is a really simple model but it gives us a framework for thinking about the total value of assets. We can elaborate in many ways by thinking in terms of fundamentals as determining the preference ratios or value created by

³Boulding highlights the stock nature of this exercise as opposed to the flow of income, consumption and investment. Rather than supply and demand determining price and quantity in equilibrium, he observes that with stocks where everyone with existing stock of an asset is potentially a buyer or seller, it is what he calls null prices that determine price and quantity. An individual's null price for an asset is the price at which they are neither a buyer nor seller. The price of an asset will be some average of all the null prices and the quantity traded will depend on variation in null prices.

the collective will. If for example the fundamentals of an asset improve, leading to expectations of increasing value then we would have an increased preference ratio based on *real* factors. If however the community forms expectations that the price of cryptocurrencies is going to go up and artwork is going to go down then we have self-fulfilling expectations that have nothing to do with fundamentals and will simply leave us with a new set of preference ratios created by the collective will.

Boulding ends with an aggregate version of his equation with a general price level and quantity of all assets, P_A and W_A , giving

$$P_A = \frac{M(1 - R_m)}{W_A R_m}.$$

This is a stock or wealth version of Fisher's equation of exchange with the demand to hold money equal to a fixed fraction of the total value of wealth. We see from this that there can be a rise or fall in the general price level with a fall or rise in R_m from self-fulfilling expectations. This general price index is very different from something like the consumer price index or GDP deflator and it is possible with M increasing to have P_A rising faster than the GDP deflator. One way to think of this is that the increases in money are being siphoned off into an asset circuit raising asset prices more than the price of goods and services. The link between the two comes from a wealth effect with increased asset values feeding back into increased demand for consumption.

4 Oiko Wealth and Chrema Wealth

We now have a framework for seeing how an increase in money balances can be transmitted to the value of assets and an expanded notion of Soddy's Virtual Wealth to explain how this value can include value created by the collective will. To disentangle this expanded notion of Virtual Wealth from real wealth, we will relate it to a desire for wealth as an end rather than a means to an end. Imagine a world where everyone has an increased desire to hold £1000 and at the same time are given £1000

each. The change in preferences is now supporting a greater total wealth without any increase in real capital. Just to drive home the point, we can simply have the same path of consumption as before but with greater money holdings. We already have a way of modelling such preferences with money in the utility function. However, we like to think of the money as providing some kind of real liquidity service as there is something irrational about desiring money itself. We can trace this idea back to Aristotle with his distinction between oikonomia and chrematistics. Oikonomia is the study of household management and the word chrematistics is derived from chrema which relates to money and wealth. In a natural system, chrematistics aids oikonomia which by ensuring our material needs are met provides a foundation for eudaimonia, the good life, which is our ultimate goal. However, chrematistics can also be used in pursuit of money and wealth as objects of desire that become the end rather than a means to an end. Although the discipline of Economics does not hold to Aristotle's eudaimonia ultimate goal, money and wealth are assumed to be a means to consumption ends with preferences determining the ends. When we put money in the utility function, there is an implicit assumption that we are holding the right amount of money to provide services so that it is affecting consumption in some hidden way and this is consistent with chrematistics serving oikonomia. We take this middle ground that avoids strong normative objectives such as eudaimonia, but we do make implicit rationality assumptions that are normative such as having an objective function based on consumption. The preferences approach is versatile and it is straightforward to include wealth in the utility function if we wish to rest this particular rationality assumption. We will introduce a decomposition of wealth that allows us to consider the consequences of resting this assumption. We will call the wealth in a rational system where it is instrumental in maximizing intertemporal consumption utility, Oiko Wealth and any additional wealth that is created when we allow wealth to enter the utility function as an end, Chrema Wealth. In our rational models Oiko Wealth is mainly capital that has a value based on fundamentals and in so far as money facilitates the exchange process, we will have some wealth created by

the collective will. Chrema Wealth is inspired by Soddy's notion of Virtual Wealth. It is more general in that it expands the notion to non productive wealth in general, including money as a medium of saving but also excludes the money that is part of Oiko Wealth (money as a medium of exchange). We could of course draw these lines differently and if for example we wish to be consistent with Aristotle's eudaimonia, we would define our Oiko system with preferences that meet his notion of our needs and preferences for consumption in excess of this as a departure from rationality which would be defined in terms of eudaimonia. We are keeping to our normative middle ground to assess the consequences of including wealth in the utility function with a focus on the ratio of wealth to output.

We can now elaborate on the significance of expanding Soddy's notion of Virtual Wealth. Returning to our £1000 thought experiment, holding R_m constant, we have an increase in wealth equal to $\Delta M/R_m$, where ΔM is the additional money, and a desire to hold £1000 more in wealth. The only difference now is that we only need to increase M by $\text{£}1000R_m$ giving the desired increase in total wealth $\text{£}1000R_m + \text{£}1000(1 - R_m)$ where the second term is the increased value of wealth in other assets. The assumption is that this is a desire for wealth and therefore Chrema Wealth. The Boulding equation allows us to see in one stroke how the Chrema Wealth will be distributed between money and other assets. What Boulding is demonstrating is that preference ratios determine a general equilibrium set of asset prices with a pivotal role for R_m in determining the total value of wealth. We can also view the equation as an accounting identity as at any point in time there will be a total value for every asset and a corresponding preference ratio. We can then see what the causal processes are leading to equilibrium values by considering particular models.

In our abstraction, we assume that prices of productive assets are determined by fundamentals and an increase in Chrema Wealth cannot be manifested through them. This allows us to keep a clear distinction between Oiko Wealth and Chrema Wealth but in general there is no reason to rule out Chrema Wealth also being manifested

in productive assets.⁴ Assuming R_m is constant, the $\mathcal{L}1000(1 - R_m)$ part must come through non productive assets such as artwork, cryptocurrencies, gold etc. This will *cause* a reduction in the preference ratios for productive assets. We are essentially introducing non productive substitutes for money as a medium of saving. We can use the Sidrauski model by assuming that these substitutes are also in the utility function with diminishing marginal utility that doesn't have a positive lower bound. We are not affecting any part of the real system and we simply have superneutrality with a more exotic portfolio of assets in the utility function. In our example, all that has happened is that $\mathcal{L}1000R_m$ has been added to everyone's money balance and through other stores of value, another $\mathcal{L}1000(1 - R_m)$ has been added to wealth.

How it will be divided between the non productive assets requires understanding something about the laws of the collective will which creates this value out of nothing in response to a desire for wealth. There is a limit to how much of this value can be created for a particular asset and the aggregate Chrema Wealth as the loss of correspondence between wealth and physical reality in an asset bubble eats away at the system of beliefs that is supporting it. The laws governing the collective will are mostly a mystery to us but the desire for wealth has to be matched somehow to a system of beliefs that can support it.

5 The Modern Economy

We have been in an international fiat monetary system since 1971 with the US dollar at its heart, acting as the world reserve currency. Our discussion will focus on the

⁴Productive assets such as property in a particular city could be vehicles for Chrema Wealth simply because there is a system of beliefs in their inflated values. Just as the collective will, supported by a system of beliefs, can give value to cryptocurrencies above zero, it can give value to productive assets above some notion of fundamental value. The way Boulding is thinking about this is that it is preferences to hold assets that determine prices and then the return on a productive asset is given by the stream of income. Differences in returns are then explained by factors other than the stream of income that form part of preferences.

UK but we see a similar story across the world. The Bank of England's liabilities are made up of reserves held by the commercial banking system and notes in circulation. The commercial banks create deposit money by making loans and these deposits make up the majority of the money supply with notes in circulation making up only a small proportion. The Bank of England sets the bank rate which under the current regime is paid on reserves. This sets the standard for other rates and is the monetary policy instrument that is used to manage the monetary system with a 2% target rate of inflation as the main policy goal. Quantitative easing (QE) was added as a policy instrument following the 2008 financial crisis. The problem is that below target inflation, a zero lower bound on the bank rate removes it as an instrument once it has come down to zero as notes in circulation that have a zero nominal return compete with deposits. Following Krugman (1998) the term liquidity trap has been used to describe this situation and Gesell's solution has been invoked as a way to overcome the constraint.⁵ This is different from Hick's positive lower bound and Robertson's downward sloping liquidity schedule discussed at the end of section 2. We have defined the liquidity trap to be at $l = i - i_m < l^*$ where an elastic demand for money competes with capital as a medium of saving. Going by this definition which accords with Gesell's theory, the monetary management, bringing l down from l^* to zero, takes place in a liquidity trap that accommodates an increasing demand for money. The QE solution is a way to continue monetary expansion to prevent deficient demand and the suggestions to use a Gesellian tax at this point to reduce demand for money balances is far from what Gesell was proposing as the system now has the destabilizing excess liquidity. Gesell's solution is to have the tax from the outset to prevent money becoming a medium of saving which is inherently unstable. By accommodating this demand, the system is now at risk from both deflationary and inflationary forces and a tax to prevent deflationary forces can immediately create inflationary forces. Gesell's solution restricts the money supply to the transactions

⁵See Ilgmann and Menner (2011) for a review of the literature on negative interest rates and the link to Gesell.

demand which is interest inelastic and therefore stable.

The QE policy resulted in a substantial expansion of reserves which made the switch to paying interest on all reserves necessary in 2009. We can see here a correspondence with Gesell's description of the process of navigating through a liquidity trap with privately held debt being transferred to public balance sheets. In terms of using the Sidrauski model, the various central bank regimes are versions of the Keynesian solution to the liquidity trap with the central bank targeting the equilibrium interest rate on the transition path and allowing the banking system to provide the accommodating money supply. The process that Gesell describes has the government lending money directly to accommodate the additional demand which we can consider an instrument that is stronger than QE. However, with QE we have seen an expansion of public balance sheets and there were also stronger versions of QE with for example the Fed taking on mortgage-backed securities. What Gesell was right about was in navigating through a liquidity trap, with returns on capital coming down, there will be a passing of risk from the private to public balance sheets.

QE was used for three years following the financial crisis, used again in 2016 following the Brexit referendum and then the largest programme of all was used in 2020 during the Covid crisis. It was complimented with large budget deficits resulting in a large increase in government debt. In the modern system, government debt plays a crucial role in enabling an expanding money supply. When it is sold to private individuals, it makes no difference to the money supply if the money is spent back into the economy. When it is sold to banks, there is a corresponding increase in the money supply and when banks sell government debt to the central bank there is an increase in reserves. When the central bank buys from the private sector, there is an increase in both the money supply and reserves. The net result of this combined monetary and fiscal policy has been a substantial increase in the amount of both government debt and private debt on the one hand and wealth held in the form of government bonds and monetary balances on the other. In 2021, with inflation taking off, the Bank of England aggressively raised the bank rate and has managed to

successfully bring inflation back close to the 2% target. Let's consider Gesell's critique of monetary management in this situation. An unexpected increase in inflation will make money a terrible medium of saving feeding into an inflationary cycle that with such a large amount of wealth held as money will end in hyperinflation and currency collapse. We will consider some reasons why Gesell has been wrong about this. The institutions that support the fiat system are strong. In the case of the UK, there is strong faith in the Bank of England's ability to manage the system and in the government's ability to service its debt. We can imagine placing another country in the same objective circumstances, where let's say it is conventional wisdom that the cause of the inflation is a shock to energy prices, but that does not have monetary and fiscal institutions that are trusted. It is not difficult to see how an inflation rate of 10% very quickly becomes hyperinflation when a significant amount of money is held as a medium of saving. Collective trust is the foundation of fiat money and it is strong institutions that have allowed for a collective will to create the large amount of wealth that we have in the form of money and government debt and also the Chrema Wealth in other assets that is derived from this. What Gesell saw was that the process of increasing the amount of this wealth eats away at the foundations supporting it. It is not unreasonable to say that our institutions are not as strong as they were prior to the 2008 financial crises with the substantial increase in the Bank of England's balance sheet and to the government debt to GDP ratio and will not have the same resilience to deal with, for example, another financial crises. With the experience of countries like Argentina and Zimbabwe, we see just how valuable this trust in institutions is and Gesell's insight is that the institution supporting money as a medium of exchange should not be used to manage money as a medium of saving. He considers this an abuse of the monetary system that will eventually undermine the trust supporting it. Gesell's solution avoids having to navigate the economic system through a liquidity trap when the return on capital has come down to some threshold. There is no need for expanding public balance sheets that we can at the very least agree create an increased risk to the currency itself.

6 Begetting Gesell in the Modern Economy

In the context of the modern economy, we will now expand on Gesell's critique of the Keynesian solution and also look at ways in which Gesell's solution can be implemented. We have two equations for the nominal units of money,

$$M = \frac{P_Y Y}{V}.$$
$$M = \frac{P_A W_A R_m}{(1 - R_m)}.$$

The first is Fisher's equation of exchange that relates the stock of money to the flow of income and the second is Boulding's equation that relates the stock of money to the stock of wealth. We can take P_Y as the GDP deflator and P_A is an index of asset prices. Consistent with a policy to accommodate the demand for money at low interest rates, we have seen the money supply grow faster than income and consequently a declining velocity. We have also seen wealth grow faster than income with the wealth to output ratio, $(M + P_A W_A) : P_Y Y$ doubling from 3.5 to 7 since 1991 and a consequent increase in absolute wealth inequality.⁶ We will use our model of the liquidity trap, our marriage of Soddy and Boulding and our concept of Chrema Wealth to explore possible mechanisms by which the Keynesian solution to the liquidity trap can explain this increase in the ratio and wealth inequality. The equations above will allow us to take a big picture view of the economy with what is essentially an accounting exercise to trace through consequences of the monetary policy bearing in mind that when dealing with aggregates and indices in this kind of accounting we are taking some liberties.

With $i_m = 0$ and the nominal interest rate, i , below l^* there is deficient demand which essentially arises because not all savings are directed to real investment. There is a competing demand to save in money and other forms of non productive wealth. Our concept of Chrema Wealth allows us to think generally of an increase in wealth that is the creation of the collective will in response to a desire for wealth beyond

⁶Bourquin et al (2024)

the real capital Oiko Wealth of our rational models. The problem at low interest rates is that real capital becomes relatively less attractive. Let's consider the policy of monetary expansion by lowering the bank rate. At lower interest rates, there is an increase in borrowing from firms for real investment with the resulting increase in the money supply accommodating an increased demand to hold money. The desire for wealth decouples V from R_m and P_Y from P_W and we will focus on non productive wealth asset bubbles. If we assume R_m remains the same then we have an increase in wealth $\Delta W = \Delta M/R_m$ but with rising asset prices, money will become less attractive relative to these assets and R_m will fall increasing wealth further.

The Sidrauski model is a representative agent model that doesn't allow us to address distributional questions and also has newly created money given directly to households but we will use it along side our actual system so that we can think about a transition path to the Gesell/Keynes steady state $r = 0$. As we discussed in section 4, if we assume that Chrema Wealth is only manifested in non productive assets that we include in the utility function then the real side of the system has stayed the same with the same transition path and steady state. Assuming we are successfully following the transition path with the monetary policy, the wealth to income ratio can increase in a non productive wealth asset bubble.

To consider distributional questions, imagine starting with some unequal wealth distribution. The increase ΔW will simply stretch it out, increasing the wealth to income ratio and this gives a simple explanation for an increase in the absolute wealth inequality we have observed. We can also consider how redistributing income will affect this ratio. Assuming the wealthy have a lower marginal propensity to consume, this will increase aggregate demand and a smaller ΔM will be required through monetary policy and the wealth to income ratio will be lower with a smaller increase in Chrema Wealth.

Now suppose that in response to rising asset prices, the wealthy who can put up a large amount of collateral, are taking out loans to buy these assets. They will now be getting proportionally more of the increase ΔW which means we can now keep

the relative wealth inequality the same with an increase in absolute wealth inequality and consumption inequality. We can imagine for example that all the growth in the economy is being consumed by the wealthy who at the same time are getting wealthier. This all seems completely crazy, accustomed as we are to think in terms of real wealth but once we accept that wealth can be created out of nothing with the collective will then what we have just described follows from a simple model of Chrema Wealth in a liquidity trap and looking at identities. We have always understood that fiat money is a creature of the collective will and are simply extending this to value in other assets. Also, if the wealthy were buying and selling an asset to each other, let's say an art masterpiece, then it would not be possible to have this redistribution of consumption from the rise in its value. It is because savings are being held in a common system of wealth that such a redistribution is possible. It is as if we are printing money and giving it to the rich to make up the deficient demand but the redistribution is hidden in the ability of the rich to leverage their wealth and claim disproportionately more of the increase in wealth.

With rising asset prices we now have investment in real capital competing with speculative returns and it is possible that rather than inducing investment, the monetary policy is reducing it. By accommodating the demand for liquidity, the mechanism through which deflationary forces are being held in check is not increased real investment but a process that is expanding Chrema Wealth, until there is a sufficient wealth effect for the wealthy to fill the deficient demand. Not only do we have a regressive redistribution increasing wealth and consumption inequality, we have a smaller real growth in income to divide. Then at the zero lower bound of this monetary management, it is not that we have a negative natural rate of interest, it is that our system of valuations has been distorted by a combination of this monetary management and the growth in Chrema rather than Oiko Wealth. The QE at the zero lower bound simply allows the expansion in Chrema Wealth to continue. Distortions from centralized management of the interest rate have been a central concern of the Austrian School, particularly with the long period of near zero rates being below the natural

rate of the real economy. With our analysis, we can see that setting a rate that meets the policy target of inflation does not imply that this is the natural rate. If through the same period there is an asset bubble then a wealth effect can prevent the inflation rate from falling below target and the relevant return to look at, that capital is having to compete with, is the much higher speculative return and the natural rate can therefore be significantly higher. This will also interfere with competitive markets, putting upward pressure on profits and downward pressure on wages to compete with the speculative returns.

In the modern economy, the Gesellian alternative can be implemented with a digital currency that has a continuous rate of tax with an annual tax of say 5% (Gesell's rate). It is not a system that can support the large amount of Chrema Wealth of the present system so we will imagine introducing it in response to Gesell's predicted collapse of the current regime. There will be very little trust in the government, central bank and the banking system in this scenario. Consider a new institution that following Gesell we call the issuing office, IO, a public bank that everyone has an account with, that is independent from government and is responsible for managing the money supply. We can also have accounts with commercial banks who have to hold 100% reserves of IO currency. This adds Soddy's reform to Gesell's in recognition of the failure of the credit money system. A simple way to see the accounting is that all transfers take place between IO accounts. To get the funds to lend, the commercial banks will compete by offering interest to depositors and then lend the money with some competitive margin, acting as intermediaries between borrowers and lenders and playing the important role of allocating capital. The interest rate will be determined in the market for loans rather than through centralized monetary management. With the tax on money, only transactions balances are held, M_T , which are assumed to be interest inelastic. We no longer have the mechanism where increases in M create inflationary asset price forces that also possibly reduce R_m . An increase in the value of wealth can now only arise from R_m somehow autonomously decreasing.

Implementing a digital only currency raises individual liberty concerns. Using an

idea suggested by Eisler (1932), it is possible to have a cash and digital hybrid using a depreciating cash version of the currency. The IO simply stands ready to exchange currency from one form to the other with the cash currency depreciating against the digital unit by the tax rate. If both are made legal tender then there will be two prices at any point in time, the digital price which is the target for price stability and cash price that by arbitrage will be increasing at 5%. Finally, there is a literature starting with Phelps (1973) that suggests this tax would be an efficient way to raise money for public finances. However, if we are concerned about the temptation to misuse this tax that might also threaten the independence of the IO, the tax can be shared equally amongst every citizen with a lump sum transfer. This would also make the new system a more attractive proposition. Then anyone who holds less than the average quantity in their IO account will actually find their balance increases over time and those who value liquidity more than average will pay a net tax that has an upper limit of 5%. The 5% tax is a small charge compared to financial transaction charges in the modern system, especially when considered over a period of a month or week. Then linking this to the cash system, every citizen from birth will have a share of the lump sum transfer and will be free to exchange their digital currency for cash.

7 Discussion

This has been a theoretical investigation into possible consequences of the Keynesian solution to the liquidity trap. In the modern context, to prevent inflation falling below target, the increased demand for money is accommodated. If this is elastic at low interest rates then there will be a large increase in money balances and fall in the velocity of circulation which is something we have observed over the last 20 to 30 years. In the previous section we explored mechanisms through which this regressively redistributes wealth and consumption and slows growth adding to Gesell's inevitable collapse of the currency critique. We should perhaps reflect on how given

the assumptions we are making on the desire for wealth, the Gesell tax avoids these problems.

With a tax on money, there will be a substitution to the other forms of non productive wealth but Gesell does not believe that this will compete with real capital as a medium of saving. Similar to Soddy, he sees that the values held in non productive stores of wealth are essentially multiple claims on goods and even with his reform and the circulation regulated, there can be an illusion of wealth that is broken as soon as there is some shortage of commodities and everyone tries to sell their assets at once (increasing R_m).

It may here be objected that gold and precious stones may be kept indefinitely without deterioration, but what would happen if this form of saving became general ? How high would the price of these things soar in good years, when everybody saves; how low would it drop when, after bad harvests or in war-time, the savings (that is, the gold and precious stones) were brought to the market in large quantities ? Precious stones are the things that people buy last and sell first. The experiment would not be repeated; this form of saving would be a deplorable failure.⁷

Gesell recognizes that there can still be an increased desire for wealth which can manifest in rising asset prices and bubbles. Using the Boulding equation, with a fixed M_T , this would mean a falling R_m . Crucially, a collapse of a bubble will now be felt only in the asset market. So the exchange system will be protected from occasional experiments in irrational bubbles and Gesell is suggesting that people will learn to avoid them, holding wealth instead in real capital. There is therefore no need to control assets other than the medium of exchange to induce investment in real capital.

He also sees a stabilizing effect on asset prices from his reform. With the tax on money, there are no idle balances to get a bubble going (which now requires a

⁷Gesell (1929) Part IV section 5M The Theorist on Interest

falling R_m) and money being an unattractive medium of saving prevents a move to liquidity (increasing R_m).⁸ The process described before had M increasing first causing asset prices to rise and it was only in response to this economic signal that R_m was possibly falling. It is theoretically possible for R_m to autonomously fall but if the expectations are being formed in response to economic signals then R_m will be stable. By stabilizing money balances at the transactions demand, M_T , and assuming a stable R_m , we also have a stable wealth to output ratio. The essential problem is that this liquidity solution to deficient demand in the goods market creates a liquidity instability in the asset market.

Another question is how we can have a difference in preferences for wealth with an apparent decrease with the Gesellian solution. First, we are in an equilibrium with no deficient demand and R_m taking a value that is determined by how costly it is to hold as a medium of saving. In the Sidrauski model, this makes no difference to the real system but a tax on money does lower the real value of money balances held in the steady state reducing the wealth to output ratio where wealth is money and real capital. With other non productive assets included in the utility function it is possible that R_m falls and taking this into account, the wealth to output ratio is undetermined. Under suitable assumptions the ratio can be the same as without the tax which would be an even stronger result than Sidrauski's superneutrality with wealth redistributed from money to other non productive assets when there is an inflation tax. This serves as a benchmark from which to consider reasons for a difference in the wealth to output ratio.

Under the Keynesian solution, following an increase in M and assuming R_m remains constant, the rise in asset prices will increase the ratio. Our neutrality story has a wealth effect that increases demand for consumption and a proportional increase in P_Y returning us to the same ratio as before the increase. However, if in response to asset prices going up, expectations are formed of further rises then R_m

⁸Gesell (1929) Part IV section 5F The Speculator

will fall and the expected growth in wealth will support a higher ratio. The wealth effect does not take us back because there is now greater value in holding wealth relative to consumption. There is a limit to how much Chrema Wealth the system can support and without the expectation of price rises the forces will be towards going back to the original ratio which requires a collapse in asset prices. In the process described, it is not possible to end the asset bubble with a new higher stable value of assets as the high wealth to output ratio is only being supported by expectations that the bubble will continue. Another important consideration here is that it is not just desire for wealth that determines the ratio, with Chrema Wealth there has to be something to support belief in this wealth that gives rise to the collective will. With strong institutions such as central banks and government treasuries, a large amount of central bank reserves and government debt can support a much larger system of Chrema Wealth that allows an otherwise latent desire for wealth to be realized.

The disproportionate growth in wealth with leveraged collateral in section 6 is also driven by asset bubbles and here again it is the instability created with too much liquidity that is at the root of the problem. We can also consider endogenizing preferences to explain how Chrema Wealth can be greater with the Keynesian solution. If preferences have been changing in response to asset bubbles then increases in Chrema Wealth could be driven by a wealthy elite that is hooked on wealth where the desire for wealth has been cultivated in a system that can accommodate the increasing desire. This is a significant departure from our rational models. Returning to Aristotle, we have a society where chrematistics has become dysfunctional, no longer playing its natural subordinate role to oikonomia. This is terrible for the wealthy and powerful elite who have been led astray from eudaimonia and for everyone else who don't have the resources to lay the oikonomia foundations for eudaimonia.

Gesell has an alternative solution that theoretically addresses the problem of the liquidity trap and also a theoretical critique of the Keynesian solution. Proponents of the modern system have a firm belief that due to market frictions and imperfections, monetary control is needed to deal with economic cycles and shocks. A response

based on Gesell's theory is that much of the uncertainty that is giving rise to the present need to have careful management has arisen because we have chosen to have monetary management in a liquidity trap. The key to Gesell's proposal is that with an inelastic transactions demand for money, the market determined interest rate takes the burden of adjustment away from prices and with the monetary constraint removed, the interest rate is free to coordinate economic activity. This is ultimately an empirical question and while we have not tried the Gesellian solution, with the current state of government and central bank balance sheets, we can see that Gesell was right about the Keynesian solution eating into the foundations of our fiat system. Although his predicted collapse has not yet materialized, we have explored how the Keynesian solution may be creating the conditions for asset bubbles that increase wealth and consumption inequality and distort the real system to reduce growth in real capital. Like Aristotle, Gesell has an idea of a natural economic order where economic freedom forms the foundation for a just society. He sees that it is through the monetary system that power is being exercised and with his demurrage solution to the liquidity trap, he sees a stable monetary system that serves all equally.

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