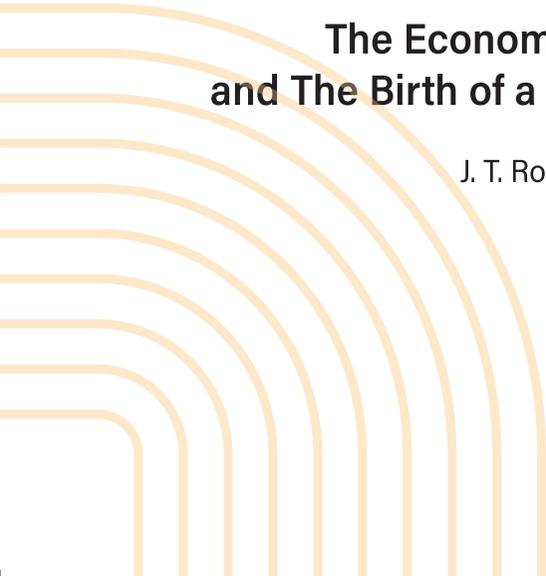




**The
Bad
News: &
The
Good
News**



**The Economics of Collapse
and The Birth of a Regenerative Society**

J. T. Ross Jackson

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Stavnsholt Gydevej 52
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Website: www.jtrossjackson.com
info@jtrossjackson.com

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Also by J. T. Ross Jackson

When No Means Yes; Danish Visions of a Different Europe (co-editor), (1992)

Kali Yuga Odyssey: A Spiritual Journey, (2000)

And We ARE Doing It; Building an Ecovillage Future, (2000)

Shaker of the Speare; the Francis Bacon Story, (2005)

The Companion to Shaker of the Speare, (2005)

Gaian Economics; Living Well within Planetary Limits, (co-editor), (2010)

*Occupy World Street: A global roadmap for radical economic and
political reform* (2012)

**For more details, visit the author's website at
www.jtrossjackson.com.**

Reviews

“Ross Jackson has done it again, this time with another splendid book-length thought-provocation on the future that can await us, where we live, on the other side of the current failing civilisation.”

— **Ruper Read**, Emeritus Professor, author of *This Civilisation is Finished*.

“Ross Jackson reminds us that the collapse of the growth-for-growth’s-sake global industrial economy is not the collapse of the world as such. Indeed, as this book shows, it is an opening onto a renewed ecological economics of place, one the world and our hearts are desperately crying out for.”

—**Helena Norberg-Hodge**, author of *Ancient Futures*.

“With masterful simplicity, Ross Jackson penetrates the complexities of our unsustainable economic system and offers a deeply insightful exploration of a pathway toward a livable and compassionate world. This wise and helpful book balances understanding of the destructive aspects of economic growth with mature realism for the world that we have the capacity to create.”

— **Duane Elgin**, author of *Voluntary Simplicity*, *Choosing Earth*, *The Living Universe*, and other books

Ross Jackson’s book describes a world that is getting worse and worse better and better faster and faster. We are simultaneously experiencing global economic and political collapse while new forms of regenerative economies and democratic institutions are being envisioned and implemented. This is a must read for anyone wanting to skillfully navigate a world made turbulent by both the demise of the old and the rising of the new.

— **Jim Garrison**, President, Ubiquity University

Ross offers an illumined path through chaos placing nature, and our true human nature, at the forefront. He clearly outlines where we are now, and how to create a harmonious future.

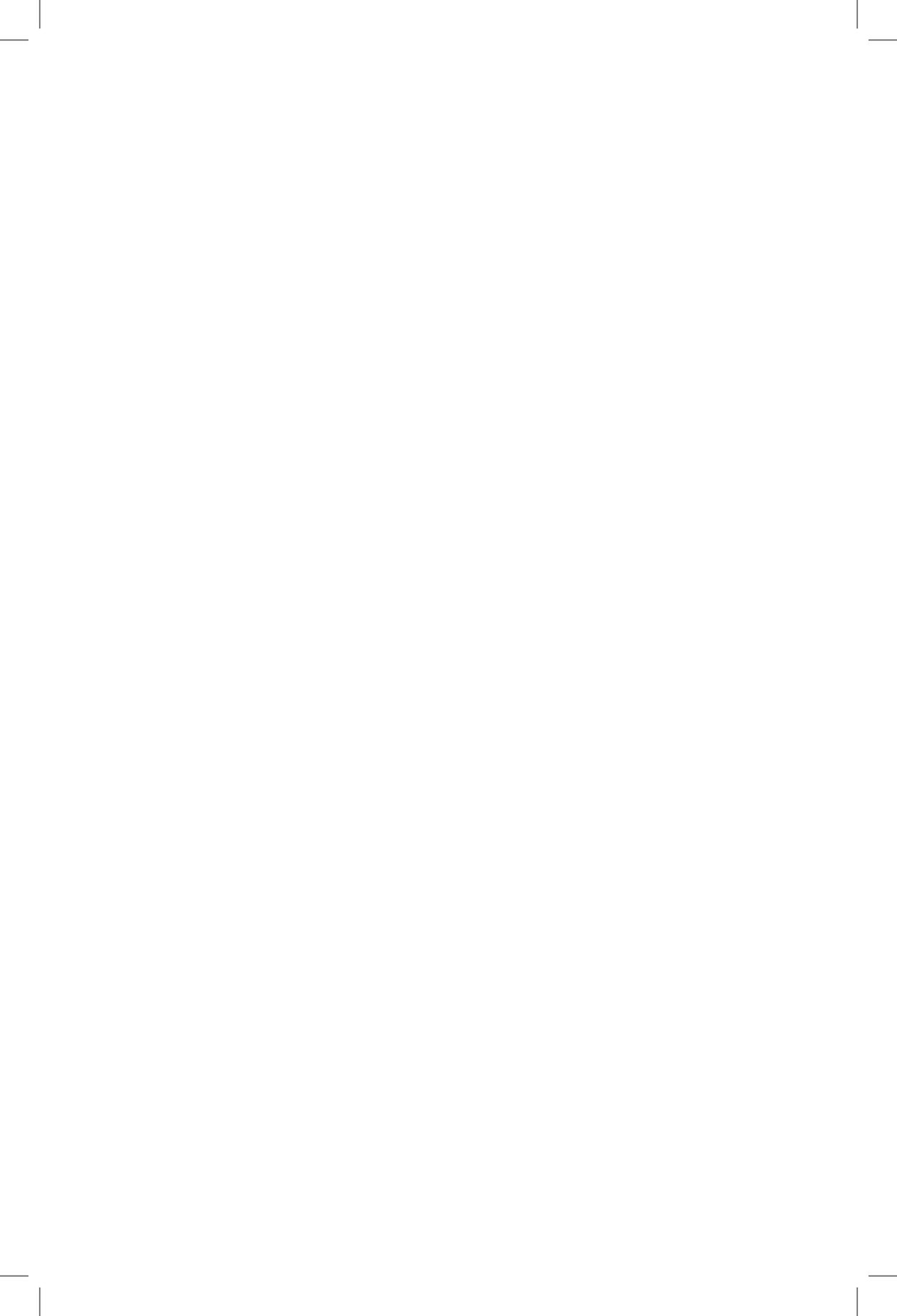
— **Llyn Roberts**, award-winning author and founder of the *Olympic Mountain EarthWisdom Circle*

Ross Jackson's new book is a precious treasure map to a brighter future for humanity. If any national politician fails to read *THE BAD NEWS & THE GOOD NEWS*, or fails to comprehend the regenerative economics that Ross Jackson provides in these pages, then they will continue to implement archaic thoughtware, and the catastrophic collapse of western civilization.

— **Clinton Callahan**, originator of *Possibility Management* and author of *Conscious Feelings*

"Italian political philosopher, Antonio Gramsci, famously remarked that 'the old world is dying, and the new world struggles to be born'. In this period of transition, the myths and metaphors that underpin the dying world come under irresistible strain as more congruent stories emerge. Ross Jackson in his latest book, *The Bad News & The Good News: The Economics of Collapse and The Birth of a Regenerative Society*, succeeds admirably in both nailing many of the foundational myths that provide the intellectual scaffolding of the dying paradigm that is neoliberal capitalism and in mapping out a new vision for the world that is already in the process of being born."

— **Jonathan Dawson**, Head of Economics, Schumacher College.



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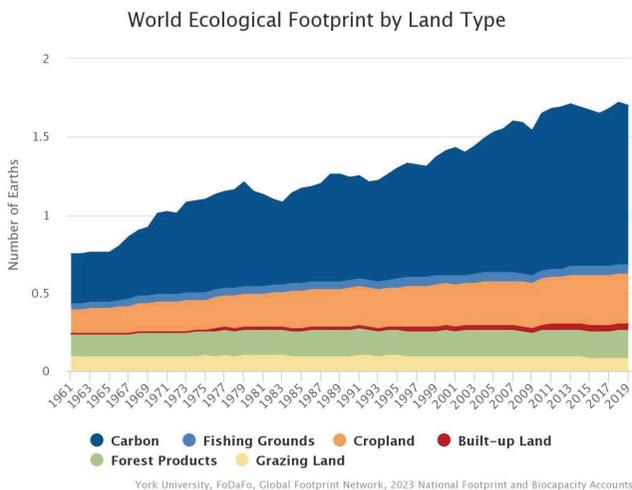
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Preface

Sometimes a structure can be in such bad shape that it is not worth trying to repair it. The more we are emotionally attached to such a structure, the more difficult it is to accept the reality that things have gone beyond the point of no return. I believe the structure of our current civilization is a case in point. It is especially frustrating for those trying heroically to bring about change when those who have the power to make radical change are intent on continuing the same exploitative policies that created the problems in the first place.

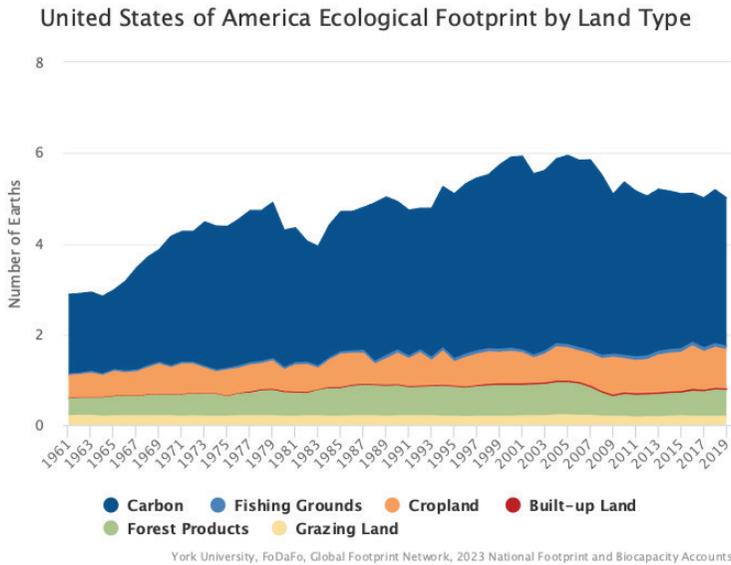
While mention of the word “collapse” can be spine-chilling at first, once a sober reality check confirms the truth of the matter, coming out on the other side can be a tremendous source of catharsis — relief from frustration, disappointment and hopelessness. Suddenly, the heavy load on one’s shoulders is replaced by new energy based on a positive vision of working with like-minded souls to actually create a different world without regard for the dying society.



So, let it go and move on. Stop trying to tweak it. Understand why it failed and don't make the same mistakes. Think seven generations ahead. Join others who have already made the mental switch and are now laying the foundation

for something new, something better, something more likely to last, something that will succeed in the long run. That is what this book is about: understanding how we got into this mess and visualizing what a different, more humane society will look like so we can have something concrete to try next.

The reality is that our generation is currently experiencing, in slow motion, the first global collapse of human civilization. Humanity's impact on the environment now amounts to 170% of the planet's capacity to support the current civilization and is increasing inexorably year after year. (Global Footprint Network, 2023). This means that we need 1.7 Earths to meet the biocapacity demands of our global consumption. The chart above shows that over 50% of the total footprint is due to excess carbon waste deposits in the oceans and the atmosphere. The capacity to absorb carbon dioxide waste from burning fossil fuels is our most critical planetary resource right now and has surpassed its maximum capacity, resulting in global warming and disastrous climate change.



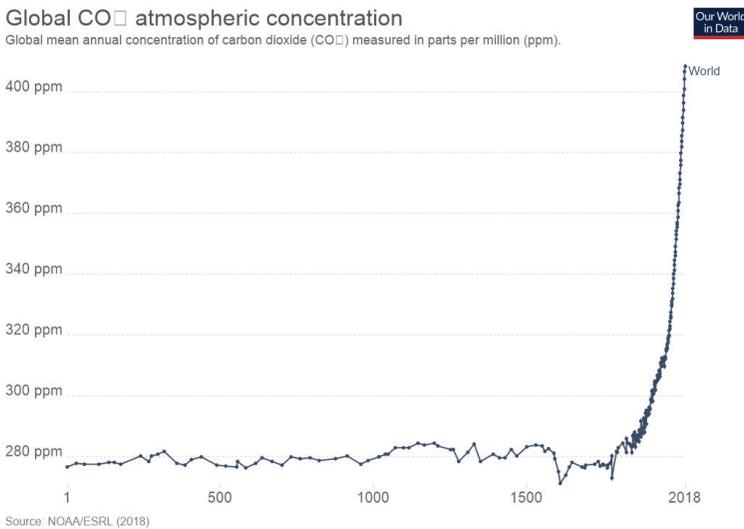
We passed the 100% mark in 1970, which means that since 1970 we have been living off our limited natural capital and not just the yearly yield from nature. We can see this directly in the increasing extinction of species all around us as humans encroach more and more upon their habitats. We see it in the way we cut down our few remaining forests, the way we destroy marine life through pollution, acidification, ocean warming and overfishing, and the way we destroy life-giving topsoil through destructive farming methods. When you are living off your capital, it is only a question of time before your capital runs out and you collapse.

The footprint of individual countries can be larger or smaller than the global average. For example, for the United States, the chart above shows that, if all nations had the same consumption per capita as the U.S., then we would need

5.0 planet Earths in 2019. U.S. levels of consumption needed 4.2 Earths already in 1970, the last year that the planet was in ecological balance overall with a global average ecological footprint of 1.0 Earths. Since then, the U.S. footprint has increased to 5.0 Earths, a substantial increase, but nevertheless, at 19%, a much smaller increase than the global average increase of 70% since 1970.

This critical state of affairs is made even worse by the psychological state of both political leaders and citizens, characterized by an unwillingness across the board to even try to seriously reduce their consumption. Unending growth is not possible on a planet with finite resources.

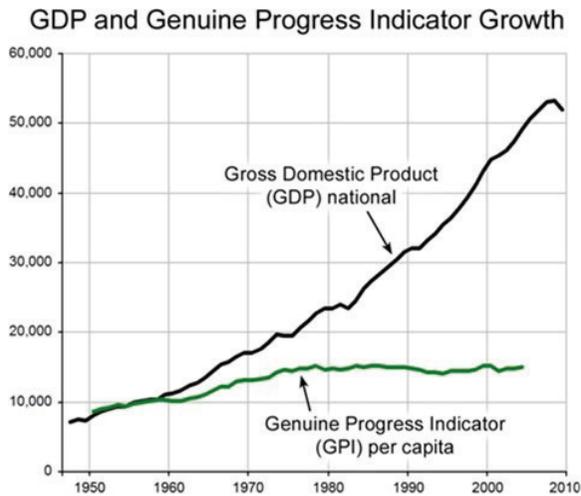
We are experiencing no ordinary crisis. This is a major disruption of planet Earth in geological time, as shown dramatically in the chart below of carbon dioxide concentration (parts per million) due to humanity's burning of fossil fuels.⁴ The big increase coincides with the period of global ecological footprint overshoot from 1970 to the present time, just 50 years out of the last 2000 years of relative stability. This is truly mind-boggling.



Societal collapse has happened many times before on a regional scale. Anthropologist/historian Joseph Tainter has studied dozens of previous collapses of regional human civilizations and has developed a general theory (Tainter, 1988). According to Tainter, the overriding reason for societal collapse is *economic*. More specifically, the collapse is attributable to declining benefits to the population. Collapse is imminent when marginal costs begin to exceed marginal benefits. A comparison below of per capita Gross Domestic Product (GDP), representing the total cost of all output, and an index of the net benefits to citizens, the Genuine Progress Indicator (GPI) for the U.S. suggests that the point of marginal costs exceeding marginal benefits (the slopes of the curves) was reached in

4 Source: Our World in Data: See www.ourworldindata.org

the early 1960s, and the gap between the two has been getting larger ever since (Guild, 2012), very much in line with the ecological footprint analysis.⁵



GDP measures the amount of activity in an economy, whether beneficial or not, while GPI measures the net benefits to society after deducting the portion of the total activity that is not providing useful products and services—i.e. the negative byproducts of progress, such as industrial pollution, crime and family breakdown, commuting, deteriorating health, resource depletion, car accidents, increasing inequality, etc. Thus, while GDP was increasing at a rate of about 3.5% per annum from 1975 on, the net benefits to citizens have hardly changed. This is Tainter's signal of the beginning of a collapse. Similar results have been measured for several other countries. The phenomenon is global.

We tend to think of collapse as something happening suddenly, as with a house of cards. But the collapse of civilizations is different. While it may be considered instantaneous on a geological scale of billions of years, on a human scale it will typically take several decades. We are apparently in the 7th decade of our collapse at this time (2020s).

If we take an overview of the status of our planetary civilization at this time, we can directly observe two environmental crises that characterize the collapse and that threaten our very survival as a species—the climate crisis and the 6th mass extinction crisis. To this we can add a third *social* crisis that, while not threatening our survival, is causing widespread dysfunctionality, health issues and anger among the great majority of world citizens, while hindering international cooperation—increasing wealth and income inequality.

This book has two related themes. The first theme is that all three crises have

5 Developed by ecological economist Herman Daly and theologian John Cobb, Jr. (Daly and Cobb), The GPI concept is a subject of continuing research and improvement and must be taken with some reservations as regards exact timing and magnitude (Talberth and Weisdorf, 2017).

a common cause, consistent with Tainter's theory of collapse—namely the *economic system*. The second theme is that the collapse of the current civilization is not the end of the world, but will rather open the possibility to birth something new and better.

What does a collapse look like in practice? Just look around. Follow the evening news. It is much clearer now than it ever was. If anyone was still in doubt, 2023 was a wake-up call, with record-breaking extreme weather everywhere, enormous forest fires, flooding, drought, heat deaths, mass migration, widespread crop failures, dysfunctional societies, species extinction, yellow vest protests, starvation, increasing authoritarianism, and a dozen or so billionaires with more wealth than half the world population. And it will go on and on and get worse and worse until fundamental infrastructure and production totally break down.

It is my premise that it is now too late to prevent a global collapse. I believe I am simply being realistic, based on the scientific reports of the Intergovernmental Panel on Climate Change (IPCC) and the observation that neither the political/economic elite nor ordinary citizens will change their ways.

What is it in the current society that prevents us from avoiding a global collapse? The short answer is the dominant worldview, which is closely related to the economic system. A worldview is the taken-for-granted way that we see the world, and is very deeply entrenched. It is, in a sense, unconscious and automatic unless we happen to be fortunate enough early in life to observe alternative worldviews, in which case we may begin to ask ourselves some fundamental questions. But this is rare. Normally, we unquestionably accept the worldview we are born into.

So, what are the general characteristics of our global society's dominant worldview? The most significant characteristic, and the one that separates us clearly from the worldview of a very small minority—the indigenous peoples—is the concept that Man is separate from Nature. Nature is seen as separate from us, a static background for our human activities, a source of renewable biomass, including plants and other living creatures, and of limited non-renewable resources—fossil fuels and minerals, all there for our sole benefit. A second characteristic is the relatively short time-frame that we normally consider in making decisions, varying from a few months to a few years—rarely longer.

A third characteristic is the concept—both individually and for an extended family—of “mine” as opposed to “yours”. The “extended family” can be anything from a small tribe to a great nation state. A follow-on concept is that of competition for resources among “extended families”, encompassing the moral right to keep, own and control anything acquired, by force or otherwise. Sharing is not a concept found in this worldview. Thus, there is no limit to how unequal the distribution of wealth may be, either individually or among “extended families”.

These three characteristics define pretty much the way the great majority of contemporary humans think and act. In the dominant “West”, both the political/economic elite and the majority of ordinary citizens have too much invested in their current life styles to contemplate any truly radical change. The rest of the world's countries are relatively poor and have limited means and little incentive to act on their own when the rich countries, which have been the major beneficiaries of uneconomic growth, refuse to help.

Some minority organizations, like Extinction Rebellion, 350.org and Fridays for Future, could see that the time had come to abandon a worldview that was no longer working and to come together to take radical action and avoid collapse. Why did they not receive support from a single political leader, who must have realized deep down the truth of their appeal for support? I suspect the political elite reasons that things have gone so far that any truly radical action, such as an immediate end to deforestation, cutting meat production by 50%, cutting all subsidies to fossil fuels, putting an immediate stop to extracting more fossil fuels, or implementing a global carbon tax, would create a global disruption every bit as serious as a collapse and would probably provoke one. So, they placed their hopes instead on a miraculous technological solution to the problem of CO₂ emissions while pacifying the public and continuing business as usual.

This reasoning was understandable but naïve. Reducing CO₂ emissions and limiting further rises in temperature are not sufficient to prevent a collapse. Even in the unlikely event of a miraculous technological reduction in emissions, the same dysfunctional worldview with the same mass extinction event, the same overconsumption, and the same untenable dream of increasing economic growth without limit on an already devastated planet would remain. At best, the technological miracle would have postponed the collapse for a few years.

The fact is that the dominant Western civilization consciously chose colonialism over partnership, competition over cooperation, exploitation over sharing, brute force over peaceful negotiation, short-term over long-term, and most important of all, unlimited consumption over the preservation of natural capital. It is, perhaps, not surprising, when we realize that this is the same worldview that made *homo sapiens* an evolutionary success—the dominant life form on the planet. Habits persist, especially when ensconced in DNA.

These are the reasons that I consider a collapse inevitable. But all is not lost. I prefer to look beyond the collapse to what might come next. In this connection, according to Tainter, collapse of a society is not necessarily *negative*. It can also be the beginning of something better, something simpler, something less complex. Historically, there are cases where it was even welcomed by the majority of citizens as the lesser of two evils.

I maintain a long-term optimism based on the fact that we humans have one very important characteristic—the ability to learn from our mistakes. I hope and expect that the post-collapse successor civilization will correctly recognize the causes of the collapse, reject the old worldview and its perverse pricing system, and consciously decide to not repeat the mistakes of their ancestors.

I call this coming post-collapse civilization a “regenerative society” — one that lives within the limits set by nature — one that can last as long as the planet is habitable, literally millions of years. And one that is more in keeping with our true nature. In THE GOOD NEWS part of this book, I will describe in more detail the nature of this society and the new institutions and policies that it will require.

This book is a follow-up to my previous book, *Occupy World Street: A global roadmap for radical economic and political reform*.⁶ (Jackson, 2012) but it is

6 “OWS” for short

written from a *national* perspective. OWS looked at the *global* perspective, including the causes of the collapse and the emerging new worldview that sees humans as an integral part of nature and not separate from it. OWS includes a comprehensive background for the coming collapse, including much more detail on Tainter's work, and includes a proposed framework for the organization of cooperating member nation states — including eight new international institutions, which I will summarize in a chapter in the second half of this book.

Thus, *this* book deals with the *national* perspective that was not covered in OWS. In the next chapter, I will explain in greater detail why I consider the *economic system* as the most important factor in the success or failure of a civilization.

It may be helpful for the reader to understand where I am coming from. My career has been split into two seemingly incompatible directions, much like this book. On the one hand, I operated for many years within the dominant growth paradigm as a businessman, entrepreneur and consultant. On the other hand, for the last forty years, I have also been an environmental activist.

I am not a specialist in macroeconomics, but am not without some knowledge of the subject through my education and research. My PhD (Case Western Reserve University) is in a related field of economics — Operations Research (OR), which is an analytical method of problem-solving and decision-making focused more on microeconomics — the individual firm. Prior to that, my formal education was in Engineering Physics (Queen's University, Canada) and Industrial Management (Purdue University). Operations Research is not as well-known today as it once was, but is basically the science of problem solving, in the broadest sense, using quantitative methods. I decided against an academic career—aside from a short period lecturing at Denmark's Technical University—because I preferred dealing with real problems in business and industry rather than teaching. I love the challenge of tackling new problems that have not been tackled before. Most of my professional career has been doing just that, as an independent management consultant, developing original computer-based models for clients in many branches of business and finance.

My environmental activism was premised upon the conviction that we were heading for collapse, the political/economic elite was not going to change its ways, and it was far too powerful to confront directly. Therefore, my focus was on what might be strategically most useful to enable the emergence of an alternative society based on a more appropriate political/economic worldview. Thus, I founded a charitable entity, Gaia Trust, in 1987, financed by the modest earnings from my business initiatives. Subsequently, in the early 1990s, I co-founded the *Global Ecovillage Network*, and later, its sister organization, *Gaia Education*, as the two major strategic entities in my vision. I envisaged that a global ecovillage movement could provide the foundation on which to build a regenerative society based on a new worldview more in line with our true nature. I saw education in the principles of regenerative living as a critical component in the establishment of this alternative approach to life.

In this new worldview that I envisaged, economics would be a tool for a servant leadership to fulfill a social contract with the citizens of a country, operating within the limits imposed by nature. Servant leadership means serving

first and foremost all citizens, not those who paid for your election campaign and not for self-aggrandizement. It is about executing policies that enhance happiness and well-being for the great majority. It should enable protection of citizens against destruction of their environment as well as against exploitation by commercial interests.

I have organized this book into four distinct parts. The main text is for everyone, including those with no background in economics, but who have a lively curiosity and an open mind. It consists of two parts.

THE BAD NEWS: The Economics of Collapse, examines a number of false premises and misunderstandings concerning the current economic system, which together have led to the current dysfunctional and terminally threatened civilization.

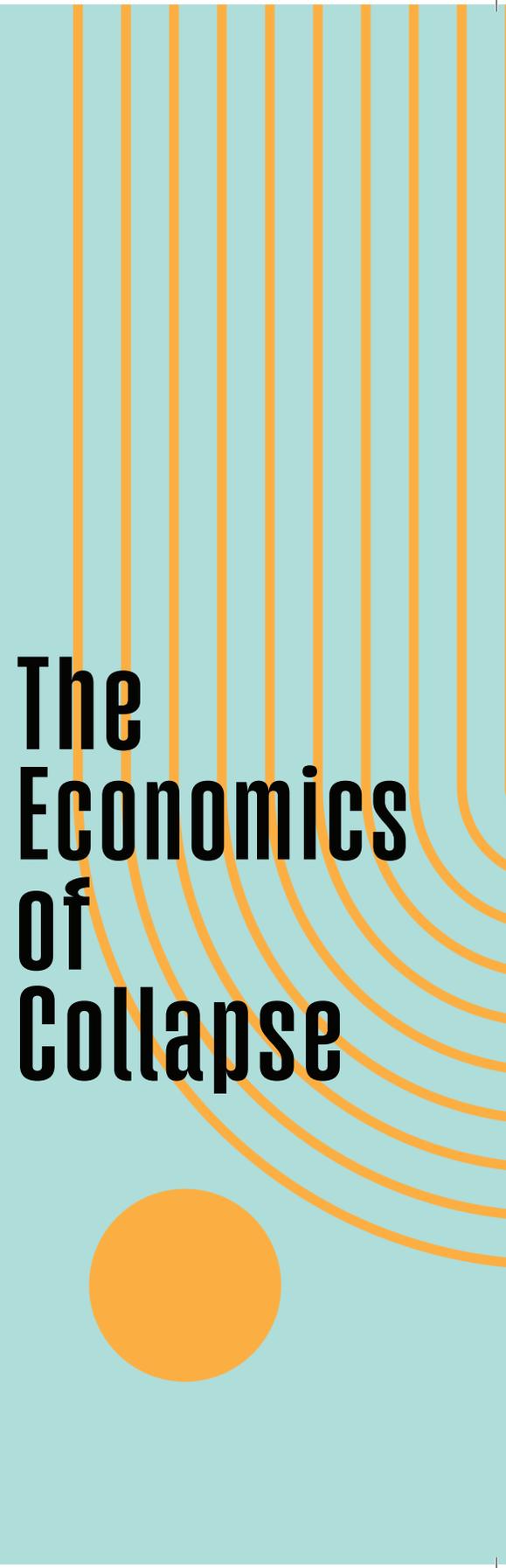
THE GOOD NEWS: The Birth of a Regenerative Society, includes concrete proposals for the political and economic structure of the successor society that will emerge after the inevitable collapse of the current civilization, based on the analyses in THE BAD NEWS.

Appendix I: The Model, is for those who may wish to delve one layer deeper into the original macroeconomic model that I have developed, including the assumptions and the math. The macroeconomic model that evolved in the course of my research builds upon assumptions that I think most economists will accept. Its primary use in this book is to offer a simple but complex top-down description of the economy, and thus provide explanations for why my statistical tests of some widespread economic beliefs yielded results that were the opposite of mainstream expectations.

Appendix II: Data Sources, is a description of the various time series, which I extracted from the Federal Reserve Bank of St. Louis data bank for my statistical tests; this will enable others to go into even further detail or try to replicate my results if they wish.



**The
Bad
News:**



**The
Economics
of
Collapse**



Chapter 1

Introduction

There is an insider joke circulating among professional economists that usually gets a chuckle, and it goes like this. An economist visits his old professor at his alma mater twenty years later. As they chat in the professor's office, the visitor looks over the exam prepared for the graduating students, and remarks, "This is the same exam you gave us twenty years ago". The professor replies with an ironic smile, "You are absolutely right. The questions are the same, but the answers are different."

Welcome to the world of economics.

I claimed in the Preface that our society's *economic system* was the primary cause of the existential crisis facing humanity at this time. So, what do we understand by an "economic system"? For starters, it is far more than the theorems and equations that economists work with. That is the least important aspect—really just minor ripples on the surface. What really counts and tells us pretty much all we need to know about the priorities, worldview and likely fate of a given society are two things (1) the major premises of the dominant economic theory and (2) the spending and taxing policies of the government.

For example, the currently dominant economic system is based on three fundamentally flawed premises which together are a recipe for the collapse of a civilization.

Optimal Allocation of Resources

A fundamental theorem of economics—going as far back as 100 years ago (Pigou, 1920)—is that to obtain optimal resource allocation, production costs must include *all* costs, including off-balance-sheet items, or "externalities", for example, the costs of any negative environmental and social effects of production and the intrinsic value of non-regenerative resources extracted. All economists agree with this in principle. But they have never found a way to do it in practice. Nor have they tried very hard. Instead, their premise is that it doesn't matter that much, so they ignore the intrinsic value of natural resources as well as the environmental and social damage of extraction and production. In effect, they are assuming in their models that the price of externalities is zero, which leads to enormously distorted non-optimal resource allocations.

The economists' abuse of their own theory, and the political leadership's complicity, has been especially disastrous for our entire civilization in the case of oil, which has been far too cheap for far too long and has led to perverse pricing and totally wrong resource allocations. This single glaring error in fundamental economics is arguably the most important cause of global warming, the 6th mass extinction event, the catastrophic degrading and erosion of life-giving topsoil, the coming collapse, and ultimately, the possible demise of our civilization.

Homo Economicus

The dominant economic system is based on the assumption that humans are solely motivated by self-interest and the pursuit of wealth. We all know this is not true. Even economists admit as much. For example, economist Paul Krugman writes that *homo economicus* is admittedly "an idealized representation of what we really think is going on." (Krugman, 2007). The logic here is similar to the treatment of externalities, as if to say: we know the assumption is not true, but we will assume it anyway because it makes things so much easier.

The political system thus delegates major decisions critical to our survival to a narrow view of human aspirations that is basically psychopathic, characterized by a lack of empathy and antisocial behavior. Would an individual human ever delegate major decisions about his or her life to an antisocial psychopath? Hardly. But we are doing just that on a much larger scale as a society. How can we have any confidence in an analysis based on such a false premise?

Economic Growth

Just as destructive as *homo economicus* is the related objective of maximizing economic growth as measured by GDP. We saw in the Preface that GDP does not measure real benefits but simply the level of activity in a society. For the last fifty years GDP has been increasing regularly while the benefits as measured by GPI have been virtually unchanged while the environment has been degraded. How can we justify continuing to use such an inadequate measure? Furthermore, the very concept of unending growth on a finite planet is an obviously absurd concept. Pointing this out in the days of Adam Smith would have caused belly laughs, just as it would have been unwelcomed at the time to suggest not dumping wastes into rivers and oceans. The difference from then and now, of course, is a matter of scale. The problem we now face is that, as the scale has increased inexorably to the point of being a significant global problem, there is no institutional mechanism in place to put on the brakes, and no political willingness to acknowledge that the concept of prioritizing GNP growth is not only outdated and wasteful, but downright life-threatening. Yet our worldview has not changed. Large corporations are thus still allowed to follow a strategy of profit-making based on unsustainable growth that is destroying species at an unprecedented rate, exacerbating the global climate crisis and increasing inequality to unacceptable levels.

Government Spending and Taxation

This is the second thing you have to note to understand the economic system. Just ask yourself: Who benefits? The treatment of the poorest segment of society tells us a great deal about the values of a society. Most modern nation states leave the poor to fend for themselves with a minimum of public support. Even in the richest society, the United States, 60% of the working population have no wealth to speak of and live from paycheck to paycheck, often with two jobs to make ends meet. They have no safety net if unemployed and minimal access to affordable health care.

Regarding taxation, it is especially telling to note what is *not* taxed in most modern societies, (1) The income and wealth of the rich, which grows and grows, (2) The social and environmental costs of industrial production.

Economics and Politics

Economists like to present economics as objective and scientific, but a closer look strongly suggests that it is neither. American heterodox economist Hazel Henderson makes the provocative statement that “Economics has always been nothing more than politics in disguise” (Henderson, 1981). She has a valid point. Economics is not independent of politics. The three flawed premises of modern economics mentioned above are subjective, not objective or scientific. They simply reflect the worldview and priorities of the dominant political class.

I am not alone with my scathing criticism. The theoretical background of mainstream economics has been under attack from within the profession in recent years. Resistance to the narrowness of how economics is taught has arisen recently both among economics students and from a few within the profession. Economics students from 19 countries have joined forces in an organization called the International Student Initiative for Pluralist Economics. Their open letter criticizing the teaching of economics has attracted wide attention. (ISIPE, 2014). They are advocating an overhaul of the way their subject is taught, saying the dominance of narrow “free-market” theories harms the world’s ability to confront challenges such as climate change, financial stability, growing inequality and resource depletion. French economist Thomas Piketty agrees as regards inequality: “For too long economists have neglected the distribution of wealth..... partly because of the profession’s undue enthusiasm for simplistic mathematical models based on so-called representative agents,” he writes (Piketty, 2014).

As regards the question of being a true science, economist Richard A. Werner puts his finger on the fundamental flaw in the approach of mainstream economists in a devastating critique (Werner, 2005). The primary criticism is that their approach is *deductive*, contrary to the scientific method, which is *inductive*, requiring experimental verification of hypotheses. He writes, “Unhindered by economic reality, deductive economists can start with their preferred axioms, which do not need to be supported by facts—such as the axiom that individuals only care about the maximization of their own material benefit. Additional unrealistic assumptions produce the theories that are so removed from reality. While this is certainly allowed, and may be useful as an exercise in logic, the

theories, which are specific to the hypothetical environment created by the assumptions, are then used to advance policy recommendations.” Werner then goes on to describe the danger in this approach to economics, namely that “these theories are prone to be usurped by interested parties and thus may simply become excuses for advocating undocumented concepts preferred by the initiators for their own benefit.”

Economic Myths

My ultimate goal is to describe a new kind of economics that is consistent with a worldview that respects the limits imposed by Nature and the basic needs of humankind. To do that requires a revision of the flawed premises of the current economic system, but much more. It requires going down to the next level and understand how the economy actually works. This includes such things as the role of money, investment, inflation, taxation and the national debt. In the course of my research, I have been surprised to discover how many misconceptions abound about all of the above.

One popular misconception is that capitalism requires constant growth in order to survive. This is not so. Zero growth or even negative growth is every bit as possible. In fact, most of the examples in this book using my model are based on zero growth—which is normally understood as zero growth in labor productivity. The idea of ever-increasing growth makes it easier to sell the current system to the poorer countries, which can maintain their vision of an increasing standard of living and remain pacified. In the absence of growth, the existing differences in income and wealth would be far more visible and would likely cause a major uprising from those who have been held down by the affluent minority.

How the economic system works is a mystery to most, and that is quite understandable. After all, the economic system is complex, like nature, with non-linear feedback mechanisms and many components, and is probably even less predictable than the weather because of the human element. We know from experience with complex systems like nature that a small change, (e.g. introduction of an invasive species) can have quite unexpected and counter-intuitive consequences. So too with economics.

Which raises the question: how do the politicians that are making vital economic decisions on our behalf navigate in such a complex world? Well, in practice, they do the same thing that we all do—adopt and follow a few simple guidelines from our experience. We are all different, but your personal guidelines might include, for example: be prudent; don’t spend everything you earn; stay away from dangerous animals; be careful around open water, take care of your health, etc. etc.

In the case of politicians, their general economic guidelines will typically include the following; a balanced budget is responsible; budget deficits are inflationary; the national debt is a burden; savers lend their money to borrowers; personal savings are necessary to finance investment and growth; a government has to tax before it can spend; a government must finance a budget deficit by issuing Treasury bills; inflation is caused by too large a money supply with too much money chasing too few goods.

Most people would probably go along with that list of “beliefs”. So would most economists. Nevertheless, I claim *they are all wrong*. More precisely, they are wrong for a sovereign state with a floating exchange rate that issues its own currency, which is the most common case among nation states today. I am going to show you why in the following chapters, using very simple tools that do not require any knowledge of economics or math, just an open mind and common sense. A more correct understanding of how the economy really works will be necessary when we delve into the structure and institutions of the successor society in THE GOOD NEWS.

But how did these beliefs or “myths” arise in the first place? I think there may be two possible explanations. The first explanation is that many of them are actually quite sensible guidelines for running a household or a company, and that is precisely the background in economics that most politicians bring to the table upon being elected. And it is precisely how they usually look at the national accounts, as if the state were a company and they were the board of directors. The problem is that a sovereign nation is *nothing like* a household or private company because it can issue all the currency it wishes and has the unconstrained right to spend it. The government can purchase anything denominated in its own currency—anything! Without borrowing! This gives a totally different starting point for understanding how an economy works. Experience as head of a household or CEO of a private company is of limited help, and may even be a hindrance to a politician’s understanding of the economy.

The second explanation is that some of these myths were also quite sensible in the period prior to 1971, at which time most governments operated under a currency regime with fixed exchange rates linked to the price of gold, the so-called “gold standard”, since the 1870s. After the U.S. delinked the dollar from gold in 1971, all the major currencies “floated” against each other and continue to do so to this day. But many of the outdated guidelines and concepts from the gold standard days still linger on in economics text books, university courses, social media and the heads of many economists and politicians.

Going from a gold standard regime to a fiat currency regime (no physical backing) is like being released from living as a strapped-down inmate in a psychiatric ward to being a free unrestricted soul full of new energy. If it had been presented that way to the public in 1971 as a proposal by an economic genius, who understood and could communicate the advantages of the fiat regime, all citizens would have rejoiced over their new freedoms. But that is not what happened. Floating fiat currencies were forced upon the world because there was not enough gold to continue the gold standard. The shift was taken by politicians as an unwelcome disruption of their known world. The positive aspects were nowhere near being understood properly. How could they, when the new regime was so foreign to them?

For three years in the early 1970s, leading economists and politicians debated how some form of fixed-rate system could be invented to replace the gold standard, which was all they had known for 100 years. For centuries, currencies had been based on gold and silver. Lying strapped on a bed was the only life they knew. Finally, they had no other choice but to reluctantly accept floating rates and fiat currencies because no alternative could be agreed upon. But they continued to think like they were limited by the same restrictions, with no idea

of how different the new regime was from the old. The concepts of unconstrained spending, of having to spend before you could tax, of not having to borrow when you ran a deficit, of a national debt that was no burden, were so foreign to their experience, that just suggesting such things to a politician could create a state of cognitive dissonance. It still can.

I think we are finally entering a period where the answers are going to be substantially “different” from what they used to be, as the professor said. We are just beginning to understand how fortunate we were to be forced off the gold standard. The situation is changing slowly, with the “heterodox” group of economists of the MMT school, (Kelton, 2020), (Wray, 2012), (Mitchell et al., 2019), (Mosler, 2012) and (Hudson, 2014) in the lead. They, and their colleagues, are, not unexpectedly, meeting stiff resistance from the old guard. The shift that is occurring is enormously important because the current system, guided by false beliefs, has led to a dystopic society of billions of disenfranchised citizens, unacceptable wealth concentration and environmental destruction.

In this book, I will go beyond merely exposing these myths. I will describe my mathematical model, which is consistent with what I consider the correct understanding of the phenomena upon which these myths are based, inspired by the words of the American systems theorist, philosopher and futurist, Buckminster Fuller (1917-1983), who wrote, “To change something, build a new model that makes the existing model obsolete.” (Sieden, 2011). Finally, once a more correct understanding of the economy has been demonstrated, I will use the insights gained in THE BAD NEWS to show in THE GOOD NEWS how a revised economic system, more in line with the nature and needs of real people, can be used to provide the foundation of a long-living regenerative society after the current one collapses.

In the early days of my career. I was impressed with the work of Jay Forrester (1918-2016), an operations researcher from M.I.T., who, in his book *World Dynamics* (Forrester, 1971), used a non-linear “systems dynamics” model to simulate several scenarios of population growth, new technologies, resources, pollution and industrial production well into the 21st century with most scenarios ending in collapse. A modified and expanded version of his model, *The Limits to Growth*, (Meadows et al., 1972) became a best-seller the following year. This awakened my interest in the long-term evolution of our society. His approach appealed to me, so the model I developed for this book has many similarities to Forrester’s methodology.

Skip the Math if You Like

The main text has a little math and statistics, and a few paragraphs on balance sheets, but no more than adding and subtracting, really. Appendix I has quite a bit more. But don’t be discouraged if you are put off by math and statistics. Just skip those parts. And skip the model. You will get the message without going into the technical part. In fact, if you want a very brief overview of the book, you can go through the “takeaways” at the end of each chapter in a few minutes.

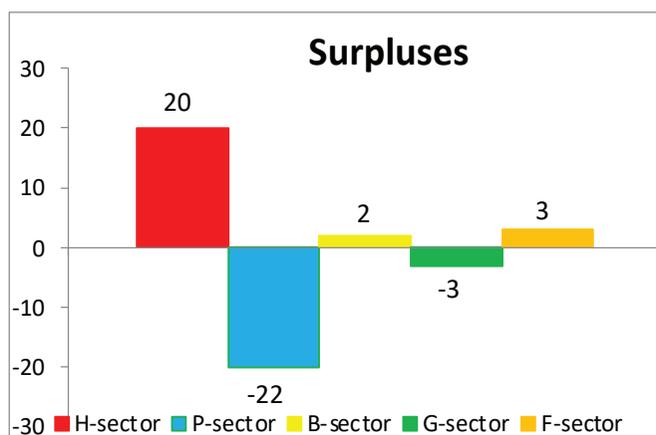
Takeaway

Three fundamental flaws in the practice of economics—with the complicity of the political elite—has “hard-wired” our civilization for collapse. They are (1) failure to incorporate environmental and social costs—as required by economic theory— in economic practice, (2) the assumption that humans are solely motivated by self-interest and the accumulation of wealth, (3) The goal of unending economic growth on a finite planet.

Chapter 2

Sector Balance

I call the analytical approach that I am taking “Sector Economics”, because it differs from other approaches to macroeconomics. Using economic sectors is rare in mainstream economics, but not unheard of within other schools of economics, such as MMT (Modern Monetary Theory), though in a far more limited way than I use it. It is easily understandable for anyone. A very useful way to look at any economy is to break down the national accounts into major sectors that make cash transfers among themselves, while together representing a closed system with no leakage. The sum of the cash surpluses—inflows less outflows for each sector—must mathematically equal zero. There are a number of ways one can define these sectors, and I will be using different representations in this work, depending on the purpose. A very useful breakdown is to define five sectors—Householders (H-sector), Production (P-sector), Bank (B-sector), Government (G-sector), and Foreign (F-sector). Each sector (except Government) is an aggregate of thousands of smaller entities, and can be treated as a single aggregate. For any given year, a sector balance chart can be constructed showing the cash surpluses/deficits for each sector, as shown below, which must add up to zero in a closed system. No money can disappear. It all has to go somewhere.



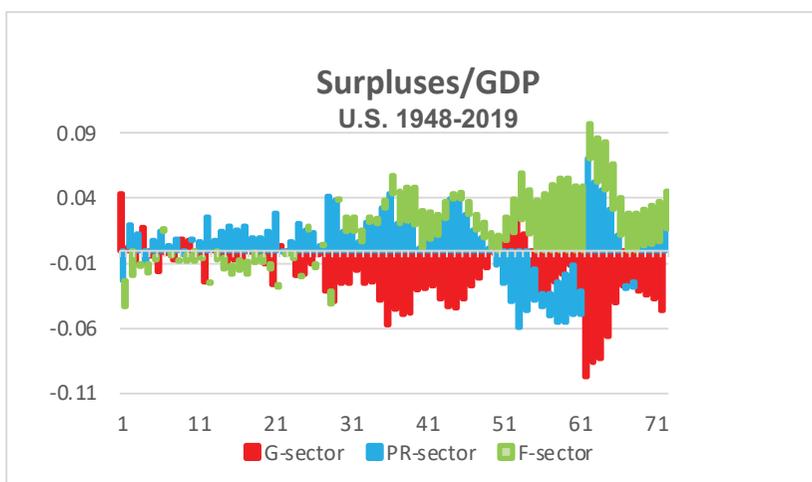
The cash surpluses for the sectors are quite intuitive:

- S_H : disposable income minus consumption (savings)
- S_P : cash profits minus investment outlay
- S_B : interest earned minus interest paid.
- S_G : tax income minus government spending
- S_F : domestic imports minus domestic exports (seen from a foreigner's viewpoint)

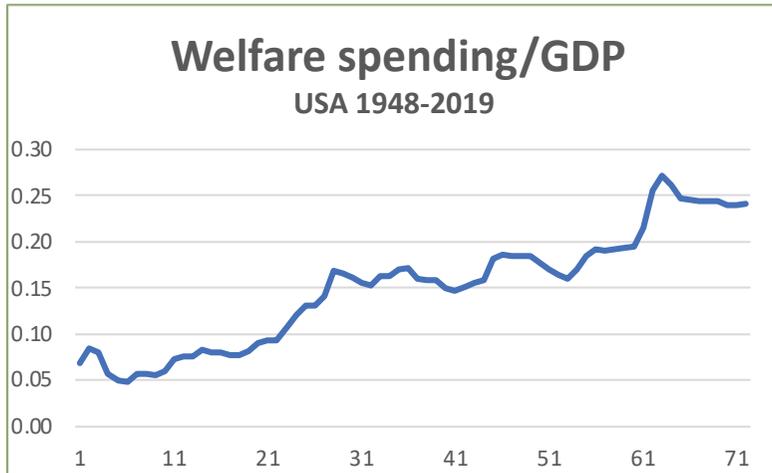
Sometimes the H, P and B sectors are combined into a single private sector PR.

The graphical presentation of sector balances as illustrated above is a very powerful tool to determine the overall effects of saving, spending and taxation decisions in the economy without the use of math or any deeper knowledge of economic theory. We will see several interesting examples in the coming chapters.

Money flowing between the Government sector and the Householder sector includes salaries for public sector employees, income taxes and transfer payments, such as social security and unemployment insurance. The Government sector purchases products and services from the P-sector, such as military hardware and infrastructure. The Foreign sector can be either a net buyer from or net seller to the P-sector, depending on the trade surplus/deficit. The P-sector pays wages to the H-sector and sells consumer goods to same plus to Foreigners and the Government, while paying corporate and payroll taxes to the G-sector. Investment costs and income are internal to the P-sector between a consumer goods sub-sector and a capital goods sub-sector. There are various interest flows among the sectors via the Bank-sector. The sector balance chart below is an example of how the surpluses of the three sectors G, F and PR (i.e. Private: householders, banks and production) evolved over the period 1948-2019 for the U.S. relative to the Gross Domestic Product (GDP).



A sector balance chart can be quite useful in giving an overview of what is happening in an economy over time. In this case, a growing government sector deficit was a major feature of the U.S. economy in this period. This was primarily due to a 400% increase in government transfers (welfare, social security, unemployment insurance, etc.), as shown below.



An exception to the trend was during the late 1990s when the government surplus was positive for a short time, as paying down the national debt became a priority, creating record losses in the corporate or P-sector for several years.

A second major feature was the effect of the “sub-prime loan” crisis of 2008 (year 61) and subsequent bailout of the financial sector, which created record profits in the financial sector and a corresponding record government deficit. Another feature was chronic trade deficits (exports minus imports was negative), which also tended to get larger relative to GDP. Note that the F-sector surplus is seen from the foreigners’ point of view—domestic imports minus domestic exports, which was positive here.

The American trade deficit has generally increased since the U.S. broke the link of the dollar to gold in 1971. The increasing F-sector surplus (trade deficit) is due primarily to the dollar’s reserve currency status. Foreigners accumulate dollars from their export surpluses, but rather than selling them and weakening the dollar, as they would with most any other currency, they hold a good portion of their dollars in their Central Bank reserves in the form of U.S. Treasury Bills, which provide foreign Central Banks with the liquidity necessary to finance their international trade. Providing liquidity is the primary role of the U.S. dollar in the current global economy. This lack of selling pressure props up the dollar, which becomes chronically overvalued, making exports less competitive than they would otherwise be. The U.S. has a vicious circle going here, as a stronger, less competitive dollar means an even bigger trade deficit (Foreign sector surplus), which means more dollars in foreign Central Bank reserves and an even bigger trade deficit, etc. etc.

A convenient way to present the sector balances is with a cash flow matrix designating the flows sector to sector and making sure all the rows sum to zero (no leakage). This is the basis of so-called “stock-flow consistent” models. “Flow” here is cash flow as in the sector balances, while “stock” is best understood as a sector’s balance sheet of assets and liabilities. Major credit for this approach goes to the late Wynne Godley, former professor of economics at Cambridge University (Godley and Lavoie, 2012). He was, for decades, noted for his uncanny ability to accurately predict—contrary to mainstream thinking—the consequences of British government policy decisions using the simple kinds of sector balance models described in this work. However, his approach never caught the attention of mainstream economists, who stuck to their abstract “agent” approach, aggregating behavioral assumptions at the micro level to the macro level, without always checking for sector balance or empirical verification.

It can be useful to show the flows in tabular form. For example, consider a simple three sector case with only a Householder sector and a Production sector with two subsets, one producing consumer goods, C; and one producing investment goods, I, in tons. Total output is thus $Y = C + I$ in tons. Let us assume that the B-sector is included in the P-sector for now, thus cancelling out any interest transfers between them. Consumption units (e.g. in tons) are sold by Producers and purchased by Householders at price, P (\$ per ton) for a “dollar” value of P.C. Note that I use “dollars” as a generic term for whatever currency we are working with. Incidentally, most mainstream models do not explicitly include monetary variables (prices and wages) in their models as I do. They usually consider money to be neutral and work with inflation-adjusted data, which I think disguises a lot of what is going on.

W is the average wage per employee per annum and L is the number employed in a given year, so W.L is the wage bill (disposable income) of Householders (there is no government to collect taxes). I is the gross investment (tons) in production facilities in a given year, and P.I is the corresponding dollar value. I assume the same price per ton for consumption and investment goods. Note that “investment” in economics refers exclusively to an increase in the production capacity of the Production Sector, but not to the purchase or sale of *existing assets* (stocks, bonds, real estate, etc.), which I define as “speculation” to make the difference crystal clear. This is a trap for the unwary to fall into as the macroeconomic effects of the two kinds of “investment” are as different as night and day.

Thus, we have the very simple cash flow matrix below, where Wc.Lc is the wage bill for the consumer sub-sector and Wi.Li is the wage bill for the investment sub-sector such that $Wc.Lc + Wi.Li = W.L$. Note that I use throughout the book a period as a multiplication sign.

Householder Sector	Production Sector Consumer Goods	Production Sector Investment Goods	Item
-P.C	+P.C		consumption
+W.L	-Wc.Lc	-Wi.Li	wages
	- P.I	+ P.I	investment

$$\text{SUM: } W.L - P.C + P.C - Wc.Lc - P.I + P.I - Wi.Li = 0$$

“Profits Equal Investment”

If we assume no Householder savings in the above matrix, i.e. $W.L - P.C = 0$, then the sector balance equation by inspection is:

$$P.C = Wc.Lc + Wi.Li \text{ or } P.C = W.L.$$

The profit in consumer goods, π_c , is sales minus wages, i.e. : $\pi_c = P.C - Wc.Lc$, which from the above sector balance yields: $\pi_c = Wi.Li$. This means that the profit of the consumer goods subsector is exactly equal to the wages paid in the capital goods subsector. This profit can be interpreted as the result of a markup of the cost price by an amount exactly equal to the wages of the capital goods workers.

For the investment goods sector, profit is

$$\pi_i = P.I - Wi.Li. \text{ Thus, for the combined P-sector, profit is:}$$

$$\pi = \pi_c + \pi_i = P.I$$

Thus, the sector balance equation can be written:

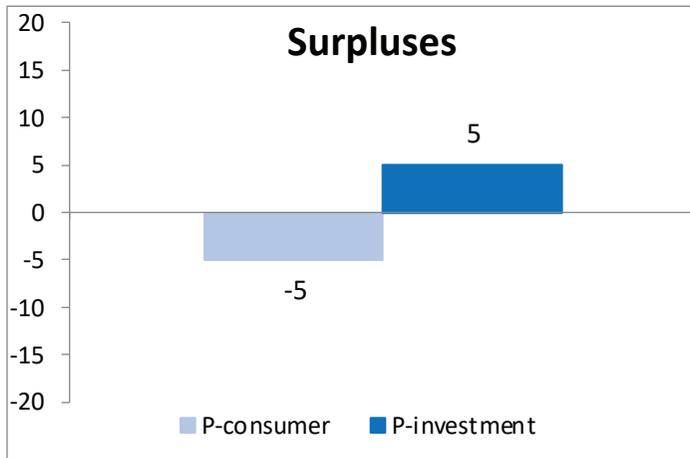
$$\pi - P.I = 0, \text{ or Profits equal investment.}$$

Economist Hyman Minsky derives the same relationship, which he calls the “strong proposition that profits equal investment...a powerful truth.” In his formulation, “the profit in consumer goods equals the wages in investment goods”, adding, “in an investing market economy, prices and income distribution are such that resources are made available for investment” (Minsky, 2008, p.163).

This simple three-sector balance equation when there are no Householder savings is simple but quite profound. It is an identity without an arrow of causality and means that anything that increases profits will increase investments (\$) and vice versa.

We can illustrate the relationship graphically with the sector balance chart below. To make things even clearer, I will introduce some fictive numbers. Let

us assume consumer sales in a period are, in \$ billions, $P.C = \$100$, while investment, $P.I$, is $\$20$. So total output is $Y = P.C + P.I = \$120$. It follows that income is $W.L = \$100$ ($W.L = P.C$) and $\pi = P.I = \$20$. Assuming $W_c.L_c = \$85$ and $W_i.L_i = \$15$ as an example, it follows that consumer goods profits are $\pi_c = \$15$ and the consumer goods cash surplus is $\$15 - P.I = -\5 , while the investment sub-sector surplus is $+\$5$. The H-sector has zero surplus as there is no saving. Similarly, the combined P-sector has zero surplus.



Takeaway

Simple sector balance charts can teach you much of what you need to know about economics without the use of economic theory or mathematics. Example: Investment will take place whether or not there are Householder savings. In the simplest case of no Householder savings, investment will be financed 100% by profits. Hence the expression "profits equal investment."

Chapter 3

Bank Credit

There is one major problem with the 3-sector model of the previous chapter. We saw that the investment costs in the investment goods subsector of the P-sector are financed precisely by the profits in the P-sector consumer goods sector. That is to say, that in the aggregate, corporations can pay for their investments out of their consumer goods mark-up, leaving them, however, without any cash. The analysis implicitly assumes that production and sales take place simultaneously. However, in the real world, there is a lag time between production and receiving sales revenues, typically 3-6 months.

Then who is going to finance the salaries of the workers needed for *goods in process* production for these 3-6 months? The answer is...banks. In fact, the *raison d'être* for banks is precisely to fill in this gap so the real economy can function. They do this by providing the *credit* demanded by the P-sector.

How much credit is required in this simple case? Let's say the annual wage bill in the P-sector is $W.L$, the average nominal wage rate times the number employed—\$100 in the example above. The credit required is the money (M_R) needed to finance worker wages in the period between production and sales. If we define "lagg" as the time in years that elapses between production and sales, then the required credit is simply: $M_R = \text{lagg} \cdot W.L$. Note that I will sometimes use for convenience names rather than symbols for parameters, typically the names I use in the computer code (there are not enough letters in the English and Greek alphabets). If we assume $\text{lagg} = 0.25$ (3 months), then bank credit is one fourth of the wage bill, or \$25. This bank credit I call "GDP money", M_R . It is represented on the Bank-sector's balance sheet as a new deposit liability representing the wages paid to Householders, while the corresponding loan to the P-sector is an equal and opposite bank asset. I use the term "GDP money" to emphasize that this money circulates in the real economy and *only* in the real economy, i.e. where the production and sales of real products and services takes place. The magnitude of "GDP money" in this simple case is simply the value of consumer and investment goods in process. On the P-sector balance sheet, the loan appears as a liability while the corresponding P-sector asset is "goods in process".

The credit that is required is provided in the following manner. To create a corporate loan, a bank creates a P-sector deposit on the liability side of its balance sheet and simultaneously creates an equal and opposite bank loan on

the asset side. This P-sector deposit is quickly used to pay wages by crediting workers' deposits, which I designate as "GDP Deposits".

Money out of Nothing

Note that banks create credit money out of nothing! No liquidity is required. No existing savings deposits are required. Banks will normally lend money in the above way provided that they expect to make a profit and provided that they are satisfied with the collateral. For example, they might be willing to lend up to 80% of the book value of a corporation's production facilities, but no more. Bank credit can be thought of as a credit line required to enable a company to meet its operational cash payments. This credit line is the "oil" that enables the real economy to function. I call it "the first kind of money" out of three, which I will define according to their function, in the course of this book. Bank credit illustrates what is meant by "endogenous" money, created from within the system by private banks—not coming from the government or foreigners. GDP deposits can be thought of as demand deposits where wages are received and consumer goods are purchased continually.

Many people have difficulty grasping this "money out of nothing" concept the first time. So, to cement my case, I will quote a few Central Bank authorities.

"When a bank makes a loan, for example to someone taking out a mortgage to buy a house, it does not typically do so by giving them thousands of pounds worth of banknotes. Instead, it credits their bank account with a bank deposit of the size of the mortgage. At that moment, new money is created. For this reason, some economists have referred to bank deposits as 'fountain pen money', created at the stroke of bankers' pens when they approve loans.

Another common misconception is that the central bank determines the quantity of loans and deposits in the economy by controlling the quantity of central bank money — the so-called 'money multiplier' approach. In that view, central banks implement monetary policy by choosing a quantity of reserves. While the money multiplier theory can be a useful way of introducing money and banking in economic textbooks, it is not an accurate description of how money is created in reality" (McLeay et al., 2014).

"The National Bank does not control the size of the money supply nor the level of bank loans via bank reserves" (Bang-Andersen et al., 2014).

"In fact, the level of reserves hardly figures in banks' lending decisions. The amount of credit outstanding is determined by banks' willingness to supply loans, based on perceived risk-return trade-offs, and by the demand for those loans" (Borio and Disyatat, 2009).

"...banks extend credit [i.e. make loans] by simply increasing the borrowing customer's current account...That is, banks extend credit [i.e. make loans] by creating money." (Tucker, 2007).

Today, we would say “computer stroke money” rather than “fountain pen money” but the effect is the same. I continue to be surprised at how few people outside the banking community understand the “money out of nothing” concept.

The “Bank as Intermediary” Myth

Curiously, mainstream economists do not accept the above description of how loans are created, in spite of the evidence and confirmation by Central Bankers. They insist on assuming that retail banks lend by taking money from existing customer deposits. This is the way banking is often described in introductory text books and popular explanations because it is easier for newcomers to grasp. The following quotes are examples of this misunderstanding:

Banks are a financial intermediary—that is, an institution that operates between a saver who deposits money in a bank and a borrower who receives a loan from that bank. All the funds deposited are mingled in one big pool, which is then loaned out.” From Principles of Economics 2e.

“Saving is the supply of loans – individuals lend their saving to investors or they deposit their saving in a bank that makes the loans for them.”
- economist Gregory Mankiw, (Mankiw, 2019, p.65).

There is a partial truth in the above statements in that bank customers do occasionally lend their deposited savings directly to non-bank institutions that then may lend them on to borrowers (e.g. pension funds, private equity firms, asset managers, investment banks). They can also lend directly to borrowers if they like. But the retail bank, which is the only type of bank that can legally accept deposits from the public, has nothing to do with this. *It is not an intermediary in these types of transactions.* In my model, I assume for the sake of clarity that this is precisely what these deposits are used for. They are lent to what I call the Non-Bank Financial (NBF) sector. This may seem like splitting hairs to some readers, but the difference is fundamental to understanding banking. If the banks did not create new loans “out of nothing” then their only function left would be to act as payment firms that provide their customers with a trivial accounting facility to track their monies received and spent.

In this connection, I would like to draw upon a personal experience. One of my first assignments after getting my PhD was to develop a cash management system for Denmark’s largest bank. I was fortunate to work on this project with one of the members of top management, who taught me a lot about banking. I had heard the usual story about savers and borrowers in an introductory economics course, and mentioned this to him at one point, but he corrected me. “No, Ross”, he said, “We don’t actually lend the depositor’s money to anyone. When we create a new loan, we credit either a new deposit or an existing deposit.” He added, with an insider’s knowing smile, “It is credit that drives the economy, not savings.”

That insight stayed with me for many years, long after I had left the banking world, but when it occasionally came up in friendly conversation, my friends

would become starry-eyed and unbelieving, “Creating money out of nothing?” they would laugh incredulously. But it is true. Banks are the only profit-making entities that can create their own resources out of nothing.

Support for My Approach

There are other economists who think along the same lines as I do regarding the creation of loans. One of them is Richard Werner, who writes the following.

“Without fully reflecting the implications of credit creation, macroeconomic theories were doomed to misunderstand also other concepts, such as the role of savings and the determination of growth. Most of modern economics assumes—and policy-makers cite regularly—the idea that there is a given amount of savings that poses a physical limit for the total amount of money that can be raised by firms and hence invested. In reality, savings are not limited at any point in time. They are not a constraint on loans or investment. Occasionally, economists worry about a ‘savings shortage’ or ‘capital shortage’, which they feel is holding back growth. There is no such thing” (Werner, 2005, p.192).

Some older mainstream economists were also on the same wavelength as Werner, but were apparently not getting through to their colleagues, for example Joseph Schumpeter, in 1954, warned his colleagues that they were on the wrong track:

“...it (is) highly inadvisable to construe bank credit on the model of existing funds being withdrawn from previous users by an entirely imaginary act of saving and then lent out by their owners. It is much more realistic to say that the banks ‘create credit’, that is, that they create deposits in their act of lending, than to say they lend the deposits that have been entrusted to them. And, the reason for insisting on this is that depositors should not be invested with the insignia of a role which they do not play. The theory to which economists clung so tenaciously makes them out to be savers when they neither save or intend to do so; it attributes to them an influence on the ‘supply of credit’ which they do not have. The theory of ‘credit creation’ not only recognizes patent facts without obscuring them by artificial constructions; it also brings out the peculiar mechanism of saving and investment that is characteristic of fully fledged capitalist society and the true role of banks in capitalist evolution” (Schumpeter, 1954).

The “Paradox of Profits”

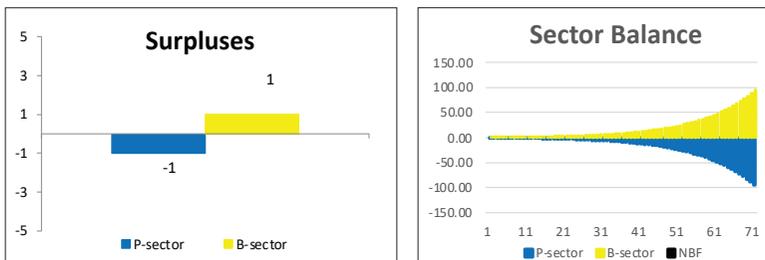
Let us have a look at an expanded sector model now that includes a Bank-sector in a no-growth economy. Incidentally, I use a no-growth economy for many of my examples because it is simpler than a growth economy from a pedagogical viewpoint. But do not be misled by the simplicity. The calculations are con-

ceptually correct representations of reality. Adding realistic detail only clutters the presentation and adds nothing of significance. For this next exercise, I will combine the two production sub-sectors (consumption and investment) into a single P-sector encompassing both. Consider once again a three-sector national economy without a Government Sector or Foreign sector, just Householders (H-sector), Production entities (P-sector) and Banking (B-sector). I will again assume for now that there are no Householder savings, i.e. all wages are spent on consumer goods ($P.C = W.L$), but include interest charges.

Householder Sector	Production Sector	Bank Sector	Item
-P.C	+P.C		consumption
+W.L	-W.L		wages
	+P.I - P.I		investment
	-Rp	+Rp	interest

SUM: 0 -Rp +Rp = 0

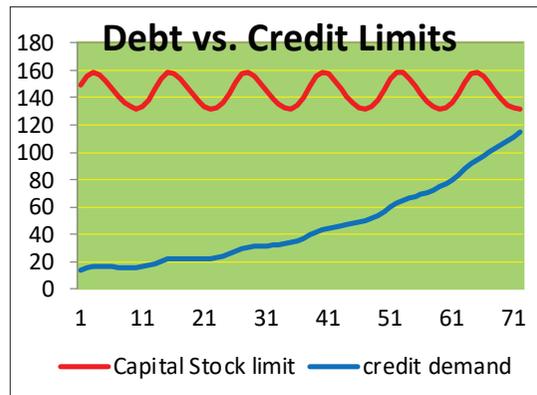
Using the same numerical values as in the previous chapter, let us assume an interest rate of 4%, so $R_p = 0.04 \cdot 25 = \$1$ in the first year payable by the P-sector to the B-sector. The numbers tell us that every single day, every single year the P-sector is increasing its loss by the interest charge (\$1 in the first year) on its bank loan – a loan that is a necessity for it to stay in business. And that interest is compounding. The P-sector's loss is the B-sector's gain, dollar for dollar, as it must be for sector balance. The sector balance chart is simple and looks like this in the first year and cumulatively.



The important thing to understand here is that there is no way that this growing debt can ever be repaid. Where would the money come from to repay? The entire amount of money circulating in this simple economy is the bank credit,

$$M_R = \text{lagg.W.L,}$$

lent to the P-sector, as pointed out above. Bank credit is the only kind of money in this particular economy of no Householder savings and no government. W.L is precisely the amount paid out in wages in a year and precisely the amount received in sales revenues when there are no Householder savings. Thus, there is nothing left to pay interest or repay borrowed capital. The real question is: how long can this go on before the whole economy collapses? The dilemma is illustrated in the diagram below, produced by my model.⁴ The assumption here is that the banks will continue to provide credit as long as they have collateral corresponding to at least their credit limit – 80% of the P-sector Stock Capital in my model.



It is clear from the diagram that it is only a matter of time before the P-sector debt approaches the limit of 80% of capital stock. How will the crisis unfold when bank credit dries up? Perhaps a foreign country will take over the economy. Perhaps the banks will write off a portion of their loans as non-performing. Perhaps half of the firms will go bankrupt. Perhaps some combination of the above will occur. There are any number of possible scenarios, so I will not even try to guess the way the crash will unfold. While some individual companies can do it, there is no way that the Production sector in aggregate can ever pay the interest on its loans nor repay the borrowed capital in a 3-sector Householder, Production and Bank economy.

German economist Karl Marx was one of the first to point out that the production sector could never receive more in revenues than workers received in wages in a closed economy. He asked, how can money invested create a profit greater than the investment – in other words, how could money through production and consumption lead to more money, which he expressed as “M-C-M+”? Marx is perhaps best remembered for his prediction that capitalism embodied the seeds of its own destruction and would eventually collapse. Marx did not use the argument of unsustainable corporate debt as the cause of collapse, but he argued rather from a social perspective. He foresaw an increasing concentration of wealth in fewer and fewer hands in a capitalist society – as

⁴ The chart was produced by my model, where prices and profits have a cyclical component, which causes the waves.

we are currently experiencing – and reasoned that this would eventually lead to a revolution led by the working class.

The implication is that the capitalist system is on an unavoidable trajectory towards collapse. But we can observe in the real world that economies grow, while many firms make profits. Furthermore, most loans plus interest are normally paid back to banks. These observations have given rise to the so-called “paradox of profits”. How is it possible? I will explain in the next chapter with a very simple sector chart.

Some readers may wonder if the same conclusion holds in a growth economy. The analysis is a little more complex and requires the model I will talk about in Appendix I. But the answer is the same. In the aggregate, the loans can never be paid back in a three-sector H-P-S economy. In actuality, there is no paradox if we look at the problem through the lens of sector analysis. But first, I would like to round off this discussion by introducing the “stock” part of the analysis.

The “stock-flow-consistent” approach I am using has two aspects. One is the cash flow matrix described above, the other is the balance sheets described below, which shows where the money ends up. Based on the numerical example above, I created the very simple balance sheets for this simple economy at the end of the first year. If you are not familiar with balance sheets, you can skip the following, but I would recommend that you try to understand it. In any case, you can be confident that these balance sheets assure that every dollar is accounted for. The investment, \$20, is required to replace the capital stock at its rate of depreciation, say, 5% per annum. So, capital stock is unchanged at \$400, while the P-sector equity is down from \$400 to \$399 due to interest charges. The size of the corporate loan and the GDP deposits in the B-sector are \$25 (one fourth of the wage bill), corresponding to goods in process. The B-sector is assumed to have begun the year with an equity of \$1, and gains \$1 in interest in the first year. At the end of the first year, the balance sheets look like this.

	Assets		Liabilities	
B-sector	P-sector Loans	26	GDP Deposits	25
	Cash	1	Spec. Deposits	0
	NBF Loans	0	Equity	2
H-sector	GDP Deposits	25		
	Loan NBF-sector	0		
			Net Worth	25

Continued on following page

Continued from previous page

	Assets		Liabilities	
P-sector	Capital Stock	400		
	Goods in Process	25	Corporate Loans	26
			Equity	399
NBF-sector	Spec. Deposits	0	Corporate Loans	0
	B-sector Equity	2	Householder Loans	0
	P-sector Equity	399	Net Worth	401

Takeaway

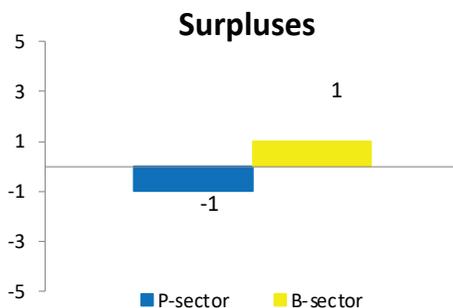
The primary function of banks is to finance workers in the period between production and sales. In a simple Production/Bank sector economy, there is no way interest or capital on bank loans can ever be repaid and the economy will eventually collapse.

Chapter 4

The Balanced Budget Myth

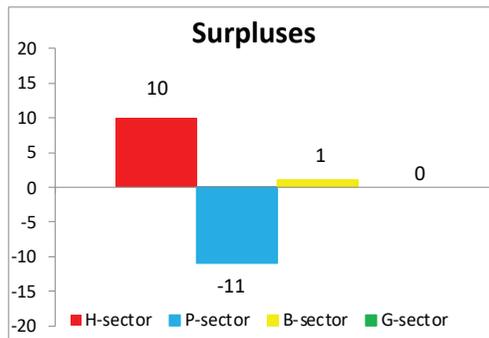
The concept of making ends meet, of limiting your expenses to your income, is as old as humankind. It would be considered a virtue in most any culture, an existential necessity both for individual families and merchants. The overwhelming number of politicians and legislators in our modern society would most likely claim that a balanced budget is the only responsible thing to do when planning next year's budget, barring exceptional circumstances, such as war or a pandemic. This time-honored principle certainly applied to the European monarchs of the late Middle Ages, who only had coins to work with. They were physically prevented from spending money they did not have. The same applied, in principle, during the gold standard. You had to have gold backing in order to spend. (In reality, they often cheated in this respect). However, a sovereign nation with its own digital currency has many special features that differentiate it from your normal Householder or company. So, does the old monarchical principle still apply in a modern "fiat" money economy ("fiat" means no physical backing such as gold or silver)? This time-honored principle of budget balance is what we will look at in this chapter.

I would like to continue with the example from the previous chapter, where I asked: "Who or what will prevent the whole economy from collapsing when the credit limit is reached?"



In the above chart, the P-sector is earning a profit of \$19; \$20 due to the investment of \$20 (“remember “profits equal investment”) less \$1 due to interest charges. But the cash outlay for investment (capital stock replacement due to depreciation) leaves a negative cash surplus of $19 - 20 = -\$1$.

Let us now allow for Household savings and introduce a primitive government at the end of the first year with only public employees and corresponding income taxes, such that the government surplus is zero, while the H-sector is assumed to have savings (surplus) of \$10. For sector balance the increase in H-sector surplus must be balanced by a decrease of the same amount in the P-sector, which is now at a deficit of \$11.



The P-sector profit, π , has been reduced from what it otherwise would have been by the reduced demand equal to the amount of H-sector savings, so $\pi = \$19 - \$10 = \$9$ and the yearly surplus is now $\$9 - \$20 = -\$11$. The chart shows that as long as the government runs a balanced budget (G-surplus = 0), then the Production sector must necessarily remain in deficit. Because the H-sector and B-sector will typically be in surplus, the P-sector must be in deficit and on the way to collapse if the government runs a balanced budget. Thus, *a balanced budget will lead to a recession and collapse eventually*. A government surplus is even worse and will collapse the economy even faster. It follows, as night follows day, that the government must run a deficit to prevent the Production sector from crashing. This is the solution to the “paradox of profits”, which is not a paradox at all when looked at through the lens of Sector Economics. Continuing with the numerical example, let us suppose the government decides to run a deficit of \$12, perhaps by establishing a National Health Service without any tax increase. This government deficit of \$12 must have the effect of increasing the combined surpluses of the other three sectors by the same amount in order to achieve sector balance. Because the H-sector and B-sector tend to be rather stable, the impact of the change will in practice be felt primarily by the P-sector, whose surplus increases by approximately \$12 to +\$1.⁵

The corporate sector has been saved from collapse by a government rescue operation and is now making more profits, though it is still low on cash. Note

5 I say approximate because in practice the change in P-sector surplus is slightly less than shown because prices and wages are changing dynamically and affecting the result a little as my model can demonstrate.

that the owners of corporate equity are the major beneficiaries of the introduction of a National Health Service! Citizens have the bonus of improved health care at no cost. The banks are happy. Everyone wins. In conclusion, there is no way around the “paradox of profits” unless we introduce a sector with a deficit that can push the production sector into surplus, or at least into break-even, so it doesn’t collapse. In practice, we need a government sector that can issue its own currency. This is a very profound statement, and fundamental to an understanding of the economic system. Note that a trade surplus of \$12 (foreign sector deficit) could accomplish the same result for a single country, but not globally, where there is no foreign sector.

But, a cynic might say, “By creating a government deficit, you have simply replaced unpayable private debt with unpayable public debt.” It is true that government liabilities will increase by \$12, but the cynic is wrong. There is a world of difference between private and public debt. Private debt is a burden on those in debt, while government debt is not a burden on anyone, as I will show in Chapter 6.

The Political Dimension

The balanced budget idea is one of the most misunderstood facets in economics, and is, unfortunately, very widespread, even at the highest levels of politics. Not so long ago, the far-right American Tea Party faction in the U.S. Republican party went so far as to advocate an amendment to the constitution to “bar federal government deficits” (Brown, 2011). Fortunately for the rest of the U.S., they did not succeed. They would have bombed the economy!

There are understandable reasons why so many people have a mistaken view of balanced budgets. Many people see a parallel to their household or company budget, which must be kept in balance. Many consider a deficit as a bad thing, a sign of irresponsible policy, extrapolating from personal experience. Many get frightened when they see the size of the national debt, and fear a coming loss of confidence in the currency and a possible collapse. However, a sovereign government that can issue its own currency *cannot be compared to households or corporations*, which must have money before they can spend. A sovereign government has an unconstrained ability to create and spend its currency into the economy. Not only does it have the right to spend, but if it does not spend more than it takes in on average, the economy will collapse eventually.

How much support should the government give the corporate sector? It could be argued that the government should keep the P-sector in a zero to small surplus situation with a fairly constant debt to GDP ratio. Too little government deficit means increasing corporate debt and the threat of eventual collapse, while too much government deficit — and hence excessive corporate profits — can add too much destabilizing speculative money to the economy with the threat of a financial crisis and unacceptable levels of inequality.

There are many historical examples of how the balanced budget myth has sent the American economy into recession simply because influential politicians thought that a government surplus would be good for the economy. But, contrary to their expectations, the government surplus in every case forced the

corporate sector into deeper losses, excessive corporate debt and recession. By simple mathematics, an increase in the government surplus means an increase in another sector's deficit, in practice, the corporate sector, as the other sectors are fairly stable year-to-year. Frederick C. Thayer, professor emeritus, Public and International Affairs, University of Washington, D.C., lists six historical occasions in the U.S. when well-meaning government budget surpluses led to subsequent depressions (Thayer, 1996).

Years of Surpluses	Size (as % of total debt)	Year Depression Began
1817-1821	29 %	1819
1823-1836	99.7 %	1837
1852-1857	59 %	1857
1867-1873	27 %	1873
1880-1893	57 %	1893
1920-1930	36 %	1929

This is very convincing evidence of the negative effects of balanced budgets, and even worse, government surpluses.

Takeaway

A global balanced budget will eventually lead to collapse of the global economy as there is no money to pay interest on loans, let alone capital. A government sector deficit is necessary to prevent the collapse.



Chapter 5

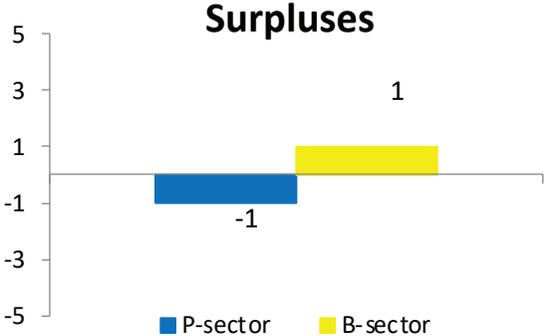
Savings and Investment Myths

The most common political argument heard for tax cuts for the wealthy is that their savings are necessary for investment and economic growth. I have never heard any objection to this logic. The argument that greater Householder savings leads to greater investment seems to be taken for granted by the whole political spectrum. In this chapter I am going to show that this understanding requires major modifications.

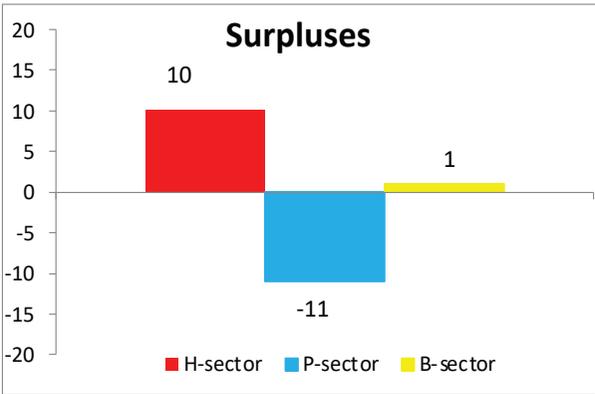
In Chapter 1, I showed that investment will occur even when there are no Householder savings provided only that bank credit is available. The amount is determined by the demand of the P-sector — in a no-growth economy, investment demand is simply the amount of depreciation of production facilities. So, it is certainly not true to say in general that savings are *necessary* in order to have investment. Of course, this may no longer be the case if profits are mostly distributed to shareholders as dividends and stock buybacks, as is the American custom, and the banks are reluctant to increase credit. Then there will be a deficiency in financing investment requiring liquidity insertion either from householders or from bank credit.

Does the amount of savings — either in the current period or in a pool of previous savings — affect the *magnitude* of investment? No. It follows logically from the above that the magnitude of investment is independent of the amount of Householder savings in a particular period. The aggregate investment relative to the capital stock, I/K —ignoring short-term cyclical movements about the mean — is independent of household savings both in my model and logically. In a no-growth economy, I/K will on average be equal to γ , the replacement rate for depreciation. In a growth economy, we must add additional factors to the replacement rate to reflect population growth (β) and the labor productivity growth rate (α) to get to the total of $\gamma + \beta + \alpha$. Householder savings do not enter the equation. But what about the *financing* of investment? Will an increase in Householder savings lead to additional financing available for investment, as many seem to think?

To answer this question, let us continue with the numerical example from previous chapters, where we had, in a simple 2-sector, no Householder savings, economy:



Let us now allow for Householder savings, in my example, say, 10% of the wage bill (\$10) and see what effect this has on the economy. As shown in the sector balance chart below, the H-sector surplus (savings) is now \$10. By sector balance, the P-sector surplus must decrease by the same amount from -\$1 to -\$11 (-\$10 for H-savings and -\$1 interest charges), as P-sector profits decline from \$19 to \$9. Investment is unchanged at \$20.



The reason P-sector profits must drop is that every dollar saved by Householders is a dollar *not spent* on consumer goods. In other words, Householder savings *reduce* corporate profits and create a need for additional financing equal to the amount of Householder savings. So, the idea that an *increase* in Householder savings can somehow finance additional investment is quite incorrect, indeed it is impossible. The most they can finance is part of the additional credit need that *they have created themselves*. This is not to say that the Householder savings do not sometimes finance investment. But it is a need that they have created themselves through the act of saving in the first place. In

the period 1948-2019, Householders saved on average an amount corresponding to 7.3% of total output (9.9% of disposable income).

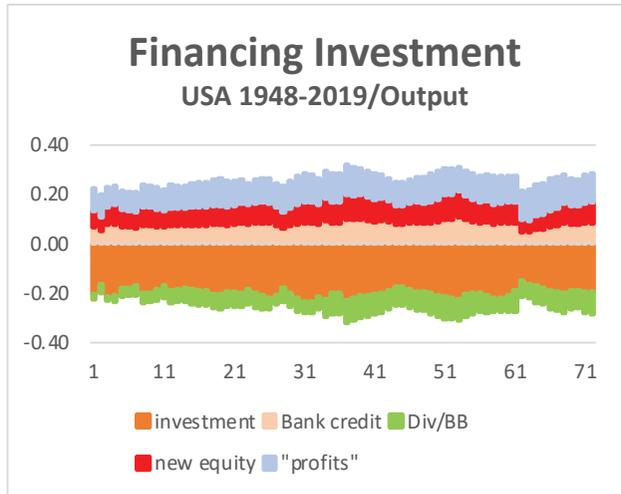
The Financing of Investment

The P-sector earns in the aggregate an after-tax profit, of which it can distribute to shareholders a portion in the form of dividends and stock buybacks. In the U.S., 61.7% of profits (5.7% of GDP) were distributed in this way on average in the period 1948-2019 for a total of 13.0% of GDP surplus transferred from the P-sector to the H-sector. The remaining undistributed profits (corresponding to roughly 3.5% of total output), were available to finance investment, which amounted to 17.3% of total output on average. So, the remaining 13.8% of total output had to be financed either through bank credit or new issues of equity or bonds. This amounted to a need for 3.0 trillion dollars (T\$) in 2019. We cannot see how this need was split between the three possible sources (bonds, equity, bank credit) from the U.S. data available. Bonds are basically equivalent to equity liquidity-wise, but give a different risk profile. In my model, I introduce a parameter RN for the fraction of the liquidity need by householders and assume for simplicity that it is provided as new equity. The rest is provided by bank credit. The assumption of a 50/50 split between bank credit and equity is not unreasonable (RN = 0.5). In practice, Americans tend to prefer equity financing, while Europeans tend to prefer bank credit.

Assuming a 50/50 split, then the net transfer of cash from production to householders was 6.1% ($13.0 - 13.8/2$). This will probably surprise many people, who assume that the net flow of funds goes the other way, from householders to investment in production. The investments made by householders will typically include higher risk start-ups as opposed to bank financing of residential construction and well-established companies.

The chart on the next page shows how investments were financed for the U.S. in the period 1948-2019 under this 50/50 assumption. Profits contributed very little to investment in practice as most of the profits were distributed to shareholders as dividends or stock buybacks.

The chart below shows total profits, and adds the dividends and stock buybacks to the amount that has to be financed. It shows that the amount financed from the savings pool as new equity was roughly equal to the amount distributed as dividends and stock buybacks ("Div/BB" in the chart). Thus, if there had been no such profit distributions, investment could have been financed entirely by profits and bank credit. In other words, the savings pool was not financing investment, but rather financing dividends and stock buybacks. This is one reason I say a major modification of the typical understanding is necessary.



In general, increasing the savings rate is not beneficial for the economy and not something the government should normally encourage. If savings should increase permanently by 1%, corporate profits would drop accordingly, the additional savings would be added to the pool of cash available for investment and would be immediately returned to fill the hole created by the self-same savings.

Are Household savings then a virtue or a plague, or simply indifferent? Certainly, from the personal viewpoint, increased savings are prudent in times of uncertainty, while they create a financing need in the aggregate.

Economist John Maynard Keynes was onto the double-edged character of householder savings with the concept known as “the paradox of thrift” (Vermann, 2012). His basic thinking was that increased savings by Householders may well be considered beneficial to individual families but are detrimental to the economy as a whole. While he was absolutely correct in seeing this, his reasoning was not convincing to other economists. The concept of sector balance had not been developed at that time. If it had been, Keynes could have made his point simply with the above charts, with enormous consequences for our attitudes about household savings today.

The Evidence

What does the empirical data show regarding the relationship between Householder savings and investment? After a cursory scan of the literature, I could not find a single article that attempted to test the empirical validity of the theory that increased Householder savings increases investment, which surprised me. Apparently, everyone just assumes that it is true. What I did find was that there are numerous articles about investment and “total savings” (broad definition in economists’ jargon, which includes not only Householder savings, but the profits of the P-sector plus the surpluses of the other sectors, which must, in fact add up to investment). For example, in my example:

$$\text{H-surplus } (\$10) + \text{P-sector profit } (\$9) + \text{B-sector surplus } (+1) = \$20$$

(“investment” P.I)

So, I did my own analysis using the U.S. data for 1948-2019. Thus, I regressed Investment/Output vs. savings rate (Householder savings)/(disposable income), or F_s , using detrended log differences for lags of 0, 1 and 2 years. If the general belief holds, then we should see a significant positive correlation. If my analysis holds, we should see zero correlation. This is because the “profits equal investment” rule suggests to me that these two quantities will tend to move together in the short run, which is what correlation measures. On the other hand, the amount of Householder savings in a period has nothing to do with the rate of change of investment in my universe.

I will be quoting such analyses several times in the following chapters. Therefore, a brief note is given here, for those unfamiliar with statistics, on the interpretation of the results from the regression analysis used. Generally, we are testing the null hypothesis that there is no significant linear relationship between the two data series. The most important statistic is the p-value, the probability that the observed data set could be observed under the null hypothesis. If $p < 0.01$, for example, then the likelihood that the null hypothesis is true is less than 1%. Alternatively, we could say in such case that we are 99% confident that there is a significant relationship. R is the correlation and measures the strength of the relationship, but not whether it is positive or negative, while R^2 measures the proportion of the variation explained by the linear relationship and “coefficient” measures the slope of the relationship line. The sign of the coefficient indicates whether the correlation is positive or negative. F is a measure of the strength of the relationship, the larger the better.

The results of this test were as follows:

	Lag0	Lag1	Lag2
F	0.1	6.2	0.2
R	0.04	0.29	0.06
R²	0.00	0.08	0.00
P	0.71	0.015	0.63
Coeff.	-0.03	-0.16	0.03

The p-values clearly reject any significant relationship between changes in Householder savings and changes in investment, confirming my expectation. The closest significance the statistical analysis showed was with a 1-year lag, but that was with a *negative* rather than positive coefficient.

Since “profits equal investment”, as mentioned above, my second test was investment vs. after-tax corporate profits. I did both a single regression of investment/Output versus profits and a two-factor regression with investment/Output versus both savings and profits. I would expect a positive correlation with profits and zero correlation with Household savings. F_s in the table is the average Household saving rate.

The results were as follows:

	I/Output vs. Profits	I/Output vs. savings rate (Fs) and profits
F	40.7	20.1
R	0.61	0.61
R ²	0.37	0.37
P	0.0000	0.73 (savings) and 0.0000 (profits)
Coeff.	0.42	0.02(savings) and 0.42 (profits)

The correlation with profits is very strong with over 99.99 % confidence while there is zero correlation with Householder savings. The 2-factor analysis confirms my expectation of a strong profits effect and zero Householder savings effect.

Takeaway

The argument that tax cuts for the wealthy stimulate investment has no empirical validity. In the U.S., householders receive more in the form of savings, dividends and stock buy-back than they invest in new equity and bond issues, resulting in increased inequality, speculation and financial risk.



Chapter 6

The National Debt Myth

The national debt is seen by many as a big problem for various reasons. Some worry because the increasing interest charges are an ever-increasing burden and “crowd out” more meaningful spending. Some worry about the enormous magnitude of the debt and wonder how it can ever be paid back. Others worry that the size of the debt will eventually lead to a lack of confidence and a collapse of their currency. There are also some who consider the increasing debt as a burden on future generations. In this chapter, I will argue that all of the above concerns are without merit and are based on some fundamental misunderstandings. The reality is that the national debt is not a burden and can be easily eliminated.

Many people have difficulty understanding that a sovereign government that issues its own currency is unconstrained in its ability to spend that currency. It can actually purchase anything denominated in its own currency. No outside force can hinder the government to do so if it so wishes. This is not to say that the government may not adopt self-imposed limits, such as a debt ceiling, if it so wishes. Nor does this say that such spending is always advisable.

In making this statement, I am defining “government” — my “G-sector” in the sector charts — as a proxy to include three public sector entities that determine and execute fiscal and monetary policies: the Finance Department (most countries) or Treasury (U.S.); the Central Bank (most countries) or Federal Reserve Bank (U.S.); and the legislative body, whatever it may be called, that adopts the budget. I assume a single decision-maker and a single consolidated balance sheet, so as not to get bogged down by country-specific differences regarding the relationships between these three entities. My model is thus generic. It does not represent any particular country. In my generic country, the “government” has an unlimited credit line at its Central Bank.

Furthermore, my “government” is from a sovereign country that can issue its own currency and has adopted a floating exchange rate regime, meaning it has an independent monetary policy (can determine its interest rate) and allows free capital movement (no capital controls). This definition covers most countries today, including the U.S., the U.K., Japan, Canada, Australia, Switzerland,

Sweden, Brazil, India and many others, but not the euro zone countries, which cannot issue euros, and not China, which I would describe as having a “managed float” currency regime with some capital controls.

Most people misunderstand the above description and claim that spending is constrained in some fashion. The explanation for their misunderstanding is that they have not understood the definition of “government” above properly, and are thinking of their particular country’s limitations on government spending. There are many such limitations in different countries, depending on the local rules of engagement among the three entities in the “government”. For example, in the U.S., the Treasury cannot draw down an infinite credit line at the Federal Reserve as my generic country can do. It has to go through a few hoops first, such as first issuing Treasury securities to the public. However, that does not change anything in my universe. But it does make it more difficult for Americans and others to extrapolate outside of their own self-imposed limitations.

Other observers tend to think of the government as being equivalent to a corporation or Household, where money has to be in hand before it can be spent. But sovereign governments are different in this respect because of their unique ability to issue the national currency. Some observers imagine that governments today are similar to governments in the Middle Ages, when coins were the currency and spending was dependent on having the coins in possession, or during the gold standard, where you needed gold in the vault before you could spend. That is no longer the case for modern fiat currency regimes with no physical backing of their currencies.

Regarding national debt, there are two kinds, which are very different — domestic and foreign. Debt denominated in a foreign currency has to be repaid at some point, either through a trade surplus or the sale of public assets. Domestic debt can always be repaid by issuing new currency. I am only concerned in this chapter with the domestic debt of a government that can issue its own sovereign currency.

I will begin by describing how public debt is created. It is actually very simple. Whenever the government pays out more than it takes in, e.g. welfare payments without a corresponding tax income, it creates a deficit. The deficit appears initially as an increased liability on the Government’s consolidated balance sheet called “Reserves” while net worth decreases by the same amount. The same amount appears simultaneously on the B-sector’s balance sheet as an asset. Reserves are the B-sector’s account with the Central Bank, corresponding to an ordinary bank deposit, except that its only use is to facilitate intrabank loans or clear a customer’s payments to the government, e.g. taxes. Reserves cannot be lent out to customers (Sheard, 2013). The balance sheets below illustrate the changes in the G-sector and B-sector accounts in the case of a \$12 National Health Service expense without any increased taxes.

Balance sheet changes after deficit spending:

	Assets		Liabilities	
G-sector			Reserves	+12
			Net Worth	-12
B-sector	Loans	-12		
	Reserves	+12		
			Equity	+0

The \$12 reduction in loans above is explained as follows. In the first instance, corporate profits increase by \$12 due to the increase in aggregate demand from government spending, and this profit accumulates in corporate deposits, which are used to reduce bank loans, as the sector is typically in aggregate debt.

A major misunderstanding of pretty much all politicians is to look at the deficit and think, "How are we going to finance this?" and quickly agree to issue Treasury securities to "finance the deficit". The problem is, the deficit does not have to be financed. Or more correctly, it has already *been* financed with the \$12 liability called "Reserves". The politicians are thinking like a CEO who has to finance his company's expenses. But a sovereign government is not a limited liability company. It does not have to borrow. Why should it borrow its own currency when it can issue unlimited amounts with a computer keyboard and an unlimited credit line? The very idea seems absurd. To make things a little clearer, let us see what would happen if, say, \$10 worth of Treasury securities were nonetheless issued to the B-sector at this time, as most politicians would do.

Balance sheet after issuing Treasury securities:

	Assets		Liabilities	
G-sector			Reserves	2
			Treasury Securities	10
			Net Worth	-12
B-sector	Loans	-12		
	Reserves	2		
	Treasury Securities	10	Equity	+0

What has changed? Virtually nothing. A simple asset swap in the B-sector—more Treasury securities, fewer Reserves. And in the G-sector, a corresponding liability swap, more Treasury securities fewer Reserves. *Same liability, same net worth, no big deal.* Incidentally, regarding the bank swap, the result is the same when non-banks purchase Treasury securities, as their payments from normal deposit accounts have to be cleared with the Central Bank by their commercial bank, whose Reserves fall by the same amount as when the bank swaps its own holdings. Similarly if there were foreigners. Then the liability swap includes Treasury securities and foreign Central Bank cash deposits. The most important consequence of the unnecessary issuing of Treasury securities is that it increases interest rates, by putting downward pressure on prices, which may not be opportune at the time.

I will try to clarify the misunderstanding by introducing two definitions for “national debt”. The first — the “narrow” definition, and the most common in daily discourse, is the total outstanding Treasury securities, or public borrowing. The second — the “broad” definition — is the sum of the narrow definition plus Bank Reserves and foreign Central Bank cash deposits. The second definition corresponds to the total debt *liabilities* on the government’s balance sheet, while the “narrow” definition includes only *some* of those liabilities. In the above example, when Treasury securities were issued, the national debt increased by \$10 according to the narrow definition (the one most people use) but was *unchanged* by the broad definition, which focuses on *total liabilities*.

Now someone might remark that the government’s Reserves liability is on the Central Bank’s balance sheet, while the Treasury security liability is on the Treasury’s balance sheet. This is absolutely true, and is the primary source of misunderstanding. But recall that I have defined my G-sector as a single entity with a *consolidated* balance sheet including the Central Bank, the Finance Department (Treasury) and the legislative entity that approves the budget.

Thus, I don’t have to be concerned with which entity has the liability. They are both debt liabilities of the public sector. Nor do I worry about items that cancel out between the Central Bank and the Treasury, such as the Central Bank’s holdings of Treasury securities, which may be booked as an asset in the Central Bank and a liability in the Treasury. Nor do I worry about Treasury securities held by other public entities as an asset to be used only for a particular purpose (e.g. Social Security in the U.S.) but which are booked as a liability of the Treasury. Nor do I worry about how many Treasury securities are owned by foreigners.

There is, in fact, no need at all for my generic country to borrow money by issuing debt securities just because the government runs a deficit. Why should it when the last thing it need is money? Then why do governments do it? There are a couple of reasons.

The least interesting is the simple misunderstanding, found frequently in some quarters, that it is necessary because the government needs the money to pay its bills just as a private company would. A second, more sophisticated version, is a fear of inflation if it were not done. The thinking here is that government deficits are inflationary, so, removing money from potential consumers by issuing Treasury bills should reduce the risk of increased aggregate demand and subsequent inflation. The problem with this logic is twofold. Firstly, government deficits are *not* inflationary — they have zero correlation with gov-

ernment deficits by statistical testing (I will show this in Chapter 10). Secondly, the people who buy Treasury bills are not the same people who might spend their cash on consumer goods otherwise. They are mostly foreigners, while the domestic holders are primarily large institutions, who want a portion of their funds to be liquid, and Treasury bills are an attractive alternative to cash or lower-paying bonds. The buyers are banks or large institutions in the speculative economy, not the real economy. So, the fear of inflation if Treasury bills are not issued is unfounded.

There is, however, a case for issuing Treasury securities independent of the budget situation and inflation worries. Let us assume, for the sake of argument, that in a particular country, there is no interest charge on Reserves and that Treasury securities do not yet exist, but the government wants to achieve price stability through controlling interest rates. How can it go about controlling interest rates when there is no interest rate charge on Reserves? The answer is for the Treasury to create a second type of bank asset and government liability—Treasury securities, both short-term bills and longer-term bonds, with interest rates. So, the Treasury makes an *offer* to the Bank Sector and to the general public, including foreigners, to purchase Treasury bills, which they can buy with their Reserves (banks) or cash (non-bank private and foreigners) and earn some risk-free interest at a rate determined by the government—a very attractive offer actually.

In order to fulfill their objective of controlling interest rates, the Treasury has to issue sufficient Treasury securities to create a liquid market. Once this is done, they can then use “open market operations” (buying and selling Treasury bills) to maintain the interest rate at a target level. This is the primary reason we have Treasury bills, to enable control over interest rates, *not because the government needs the money*.

Governments with a sovereign currency do not have to borrow, no matter what you hear or read from an army of politicians, mainstream economists, journalists, websites, social media and textbooks.

The national debt (narrow definition) in the U.S. in 2022 was roughly \$23 trillion. For a population of 322 million, this corresponds to a debt per American of about \$71,000. A lot of Americans look at this figure and are shocked at “how much they owe the government”. The same can be said about citizens of other countries.

To look into this concern more closely, I would like to introduce the concept of the National Net Worth, which represents the real wealth of the nation. A nation’s real wealth be calculated in two ways;

(1) The sum of sector net worth’s (H, G, P, B). (2) As a consolidated national wealth net worth. The two must be equal.

Below is shown the opening balance sheets for a fictive scenario. The numbers themselves are not important, but the intra-sector borrowings are. In this case, I assume, for pedagogical reasons, that my generic country does not issue Treasury securities, just to make the point that they are not necessary. All the national debt (broad definition) is in Reserves (assuming no foreign deposits for simplicity i.e. foreigners repatriate any trade surplus).

	Assets		Liabilities	
Householders	GDP Deposits	8.4		
	Spec. Deposits	3.8	12.2	Net Worth
Government	Capital Stock	65.2	5.3	Reserves
	Foreign Currency	0	0	Foreign Loans
			59.9	Net Worth
P-sector	Capital Stock	152.2	8.4	Loans
	Goods in Process	8.4		
	Deposits	0	152.2	Equity
B-sector	P-Loans	8.4	8.4	GDP Deposits
	Reserves	5.3	3.8	Spec. Deposits
			1.5	Equity

Sum of sector net worth's (assets minus liabilities): $12.2 + 59.9 + 152.2 + 1.5 = 225.8$

Now, for comparison, I compute the net worth of the consolidated national balance sheet after canceling all the intra-sector items. The net worth is the same, as it must be.

	Assets		Liabilities	
Consolidated	P-sector Capital Stock	152.2		
	Goods in Process	8.4		
	G-sector Capital Stock	65.2		
	Foreign Currency Assets	0	0	Foreign Currency Loans
			225.8	Net Worth

Note how the many intra-sector financial assets/liabilities cancel out in the consolidated balance sheet, leaving the consolidated National Wealth, which consists of only "hard physical assets", both private and public. Public capital

stock includes all public facilities and entities: infrastructure, public utilities, educational institutions, etc. Note that foreign currency obligations/assets are also “hard physical assets” that have to be received/paid eventually with real assets.

Note, in particular, that *the national debt disappears in the consolidated net worth*, no matter how we define it. It is just another financial asset that cancels out without relevance to real national wealth. In the special case of a reserve currency country like the U.S., the foreign part of the national debt would remain unless and until the creditor nation repatriated the funds, weakening the reserve currency's exchange rate. There is absolutely no burden on citizens from the “broad national debt” nor from the “narrow national debt”. This is also true for future generations. No burden. The government can always pay its debts, including social security obligations regardless of what Treasury securities may or may not be set aside for that purpose in the U.S. I cannot say too often: the government's ability to spend is unconstrained (except for possible self-imposed limits).

Therefore, the national debt is no burden.

Paying Back the Debt

One of the questions that worries many people is the sheer size of the debt, which is approaching \$33 trillion in the U.S. “How is it ever going to be paid back?”, they ask. It seems scary to some.

The answer is yes — the national debt can be paid off, as long as we are talking about the “narrow national debt” definition, which does not include cash. It can actually be eliminated very easily. Since the government can buy anything denominated in its own currency without limit, that includes Treasury securities. The government could simply announce that as of some particular date all outstanding Treasury securities will by law be exchanged for cash at the current price plus interest due. In effect the “narrow national debt” would be eliminated. The “broad national debt” would be unchanged, but would now consist 100% of Reserves and foreign cash deposits. What the government is doing is a simple swap on its liability side — Treasury securities for Reserves. The same is true for the sellers. They are simply swapping their Treasury bills (near cash) for cash and will probably put their money into the next best liquid alternative. No big deal. MMT economist Stephanie Kelton supports this view, writing, “The truth is, the entire national debt could be paid off tomorrow, and none of us would have to chip in a dime” (Kelton, 2020, p.90).

There is a possible downside, though. I mentioned earlier that Treasury bills need not be issued to finance spending, but rather to be able to control interest rates through buying and selling Treasury bills, so-called open market operations. Buying all the outstanding Treasury securities would mean giving up that possibility, unless interest rates could be controlled by other means. This might be done by paying interest on Reserves and trading them, or perhaps by the government engaging in direct lending to the corporate sector at whatever interest rate it wants.

A second possible negative effect for the U.S. of eliminating Treasury bills, of which many are held by foreigners, is that it might put some selling pressure on the dollar, as the interest rate on Treasury bills is one of the factors that

foreigners look at when placing funds internationally. However, more important than the interest rate is the liquidity to finance international trade, where the dollar reigns supreme, so I suspect the effect would be minor. Besides, the dollar is chronically overvalued anyway, as I pointed out earlier. Nevertheless, if the government were concerned, it could simply establish a special cash account for foreigners only, with an attractive interest rate.

Are Reserves Real Debt?

This possibility of a national debt that is 100% cash deposits puts the whole question of national debt in a new perspective. Should we really consider Reserves as debt, since there is no one to pay back? From a Federal Bank of St. Louis article recently, the following quote caught my attention:

“We might want to look at the national debt from a different perspective. In particular, it seems more accurate to view the national debt less as a form of debt and more as a form of money in circulation.” (Andalfatto, 2020).

This insight from FRED is especially interesting when we consider the “broad national debt” after the above-mentioned swap. Is there any justification for calling a 100 % Reserves liability a “debt” at all? I suggest no, there isn’t. There is no one to pay back. As we saw, it has no effect on real national wealth. In reality, it is simply an accounting entry, keeping track of the cumulative historical government deficit, and is without any practical importance. I agree with Andalfatto that it is totally justified to see it as a form of money, but a very limited form, basically “inert” or “inactive” money, in fact, my “third kind of money” seen from the perspective of the bank sector. This perspective is a little difficult to grasp at first, but we have to remember that the government’s consolidated balance sheet cannot be compared with the corporate balance sheets we are used to dealing with, where liabilities have to be paid off at some point. Having a negative net worth accounting-wise is of no significance when one has an infinite credit line.

To the extent that foreign Central Banks own dollar cash deposits, they are free to do what they like with them. Normally, they would sell them on the foreign exchange market, weakening the dollar and strengthening the foreign currency. This is the normal assumption in my analysis. In the case of a reserve currency, a foreign Central Bank may choose to keep the dollars for liquidity reasons. In such case, they would have a status similar to private bank deposits, namely a Central Bank liability that does not have to be repaid to anyone and can be removed at any time at the owner’s wish — a voluntary arrangement.

If we accept the above viewpoint that the national debt—with or without the swap to 100% Reserves — is basically an accounting entry without practical consequences, then there is clearly no limit to the size. After all, there is no one to pay back. The biggest problem with an increasing debt to GDP ratio is the likelihood that some politician, clinging to the false belief that size does matter, might make some disastrous decision, as, for example, president Clinton did, by trying to reduce the debt by running a government surplus, which risks sending the economy into an unnecessary recession, as has happened historically several times.

Some economists argue that things will be OK as long as the interest rate on the debt is less than the growth rate of the economy. But this is faulty thinking based on the assumption that size matters. Firstly, even without the swap, the government can keep the interest rate as low as it wants with open market operations. Secondly, even with zero growth, there is no problem as long as we understand that the debt/GDP ratio doesn't matter a whit. That size of the debt matters is part of "the deficit myth" as described by MMT economist Stephanie Kelton, who writes (correctly): "The national debt poses no financial burden whatsoever" (Kelton, 2020, p. 75).

Interest Rates

The ability of Central Banks to control inflation via interest rates is coming into question these days, as it does not seem to be working very well. Real economy companies are not especially sensitive to interest rates (Sharpe and Suarez, 2013). It would take a sizable increase in interest rates to have any effect on the real economy. On the other hand, speculative money is *very* sensitive to interest rates due to excessive gearing of 30-60 times the capital base — the level at Lehman Brothers a few months before they went bankrupt in 2008 and sparked the crisis of 2008. (Berman and Knight, 2009). A gearing of 40 times equity means that a 2.5% move against your position bankrupts you. The interest rate/inflation relationship works both ways, as when banks feel forced to increase their loan rates when inflation erodes the value of their outstanding loans.

Can we find any empirical evidence for the Federal Reserve's ability to affect inflation? To answer this question, I did a regression analysis for the period 1948-2019 on the change in inflation vs. the change in the Federal Funds rate—the rate at which the Fed will lend money to commercial banks, and which thereby establishes a base rate, which affects all other rates. According to the theory, there should be a negative relation between changes in the Fed Funds rate and changes in inflation, i.e. the Federal Reserve will increase the Fed Funds rate with the intention of decreasing inflation, and vice versa.

My first analysis showed an unexpected result. The no lag relation was not *negative*, but significantly *positive* with a correlation of 0.42, a P-value of 0.0003, and a coefficient of 0.40, suggesting a confidence level of over 99.9% in a positive relation for the same period. Strange! However, it occurred to me that there could be a lagged reaction as it may take time for the Fed Funds change to work its way through the economy. So, I did further regressions with the Fed Funds rate lagged by -1, 1, 2 and 3 years, with surprising results, with the two most important columns highlighted.

	Lag -1	Lag 0	Lag +1	Lag + 2	Lag +3
F-statistic	1.33	14.9	1.6	14.0	7.3
P-value	0.252	0.0003	0.2090	0.0004	0.0088
R (correlation)	0.14	0.42	0.15	0.42	0.32
R²	0.02	0.175	0.020	0.173	0.099
Coefficient	0.14	0.40	0.13	-0.30	-0.12

The lag+1 and lag-1 cases have zero significance, but while the no-lag correlation is significantly *positive* at over 99.9% confidence ($P\text{-value} < 0.001$) with a coefficient of +0.40, the 2-year lag is significantly negative at over 99.9% confidence ($P\text{-value} < 0.001$) with a coefficient of -0.30, supporting the theory, but with a two-year lag. This shift of coefficient sign while remaining significant strikes me as quite unusual. The lag 3 result is still significantly negative, but dropping off.

In any case, the data suggests that the Fed is able to successfully pursue an inflation control policy to a limited degree, but with a 2-year lag. The R^2 statistic suggests that about 17% of the variation in inflation rates can be explained by Federal Reserve Bank intervention and a 2-year lag, with the rest being attributable to other factors, primarily the wage/price spiral at about 54%, as shown earlier. So, with only a 17% effect, it seems there is a severe limit to what the Fed can do in practice to control inflation.

One explanation for the significant positive correlation in the same period could be that it reflects the action of commercial banks, which increase interest rates almost instantly as a *response* to an increase in inflation. This needs further study.

Takeaway

The national debt is not a burden on current or future generations. The domestic debt (outstanding government securities) can be paid back at any time in a simple liability swap.

Chapter 7

Three Kinds of Money

There are three different types of money in the economy with three quite different functions. Previously, I defined the “first kind of money” in a simple three sector Householder-Production-Bank economy as bank credit, M_R , the amount of loans to the P-sector to finance workers in the period between production and sales. This money appears in the B-sector’s balance sheet as what I call “GDP deposits”. It is the only one of the three types that interacts with the real economy. The other two kinds have different functions.

The Second Kind of Money

A very useful way of understanding the economy and the different types of money that flow through it is to split it into two parts – the real economy and the speculative economy. The real economy refers to the production and financing of real goods and services, while the speculative economy refers to the trading of existing assets such as stocks, bonds, property etc. The latter is basically a change of ownership without any effect on real goods and services.

The primary source of what I define as the “second kind of money”, M_F , is net Householder savings. They are found on the balance sheet conceptually in speculative deposits in the B-sector. I say “conceptually” because they cannot be distinguished in practice from GDP deposits. It is the intention of use that distinguishes them. The second possible source of speculative money, M_F , is corporate profits in the case of companies where all corporate debt has been paid off.

When we include government and foreign sectors, a portion of government transfers and public salaries are saved and end up in speculative deposits. The rest, like government and foreign net purchases of consumer goods, flow through the P-sector as consumer demand and contribute to the P-sector surplus. Where these latter funds end up on the balance sheet depends on a number of factors. If a corporation has a surplus and no net debt, they end up either as corporate speculative deposits, or as Householder speculative deposits to the extent that part of the surplus is distributed as dividends or stock buybacks to Householders. If the P-sector has a surplus and some debt, then that debt is assumed to be reduced in my model and the money destroyed. Thus, corporate profits will either end up as speculative deposits or be destroyed by paying down debt.

Non-Bank Financial Institutions

In order to make the relationship between the real economy and the speculative economy even clearer, I define in my model a new sector, which is the part of the private sector that engages in asset management and highly leveraged speculation, but also provides some services to real economy companies. I call it the Non-Bank Financial Sector (NBF-sector). You can think of it as a combination of hedge funds, investment banks, pension funds, money market funds and asset managers. The main characteristic is that they cannot accept deposits from the public like the retail banks, but get their capital as loans from the Householder and corporate speculative deposits. After the stock market crash of 1929 – from 1933 on – the NBFs were kept separate from retail banks in the U.S. and things were relatively peaceful in the financial world, until President Clinton in 1999 – under pressure from the Republicans – repealed the Glass-Steagall Act of 1933 and allowed the two types of financial institutions – retail and speculative – to operate under the same holding company, laying the groundwork for the dot.com crash of 2001, the financial crash of 2008 and more financial crashes yet to come.

After accounting for the ungeared parts – like money market funds, asset managers, pension funds, etc. – the rest of the NBF is basically a casino, where the wealthiest financial institutions can make highly leveraged bets having nothing to do with the real economy, mostly against each other but sometimes against big real economy players (e.g. insurance companies like AEG, which had to be rescued by the government in 2008 for this very reason). They make enormous wealth for themselves as long as no one “makes a wave”, while creating occasional financial disasters for ordinary citizens when things go wrong – which they always do eventually. The latest case was the crash of 2008 – resulting in the rescue of several NBF institutions and a few “too big to fail” retail deposit banks that had become, in essence, giant speculative hedge funds – all at taxpayer expense.

Reserves: The Third Kind of Money

When we introduce a government sector, we also introduce the third kind of money – bank Reserves. Reserves are the private banks’ accounts with the Central Bank. These are only for the use of individual banks to borrow/lend cash from/to each other for liquidity purposes, for transactions with the Central Bank (e.g. interest payments and open-market operations) and for clearing customer payments (e.g. taxes) with the government. The consolidated B-sector Reserves total is unaffected by intra bank lending of individual banks. Aggregate Reserves increase whenever the G-sector runs a deficit and decrease whenever the G-sector runs a surplus. My “third kind of money” is exactly equal to the consolidated G-sector liabilities consisting of Reserves plus Treasury securities, if there are any. This is equivalent to the cumulative government deficit and the broadly defined national debt. Note that Reserves *cannot* be lent out to customers, or be used to buy stocks (Sheard, 2013), contrary to what many believe (another misunderstanding). I call this kind of money “inert” as it has no interaction with either the real or the speculative economies

Mainstream Money Categories

Central Bank economists do not distinguish between GDP money, speculative money and my “inert money” in their categorization of money. Their criterion is the *degree of liquidity* rather than the *functional role* of the money, which leads, among other things, to some misconceptions about inflation and government spending.

The normal categories maintained by central bankers for most of the 20th century were:

M0, also known historically as the “monetary base” of an economy, includes all of the physical paper and coin currency in circulation (less than 5%), plus commercial banks’ Reserves held with the Central Bank. This monetary base is sometimes referred to as “high-powered money” as it was once seen as the base of money that could be expanded in the since debunked “fractional reserve banking system” theory.

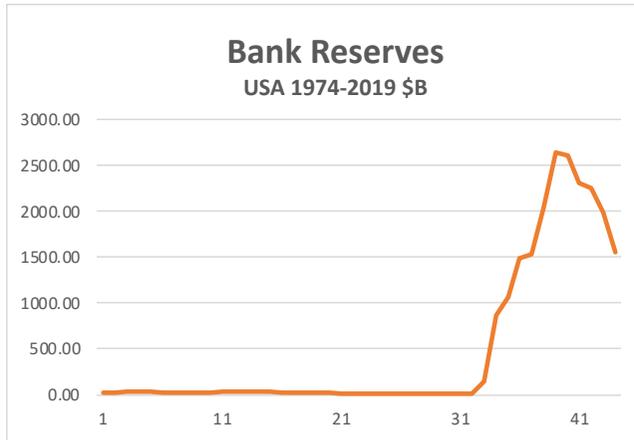
M1 is a measure of the money supply that includes M0 plus demand deposits, traveler’s checks, and other checkable deposits, all very liquid.

M2 includes M1 as well as slightly less-liquid assets such as savings deposits, money market securities, Treasury Bills, mutual funds, and short-term time deposits.

M3 is even less liquid than M2 and includes M2 plus longer-term time deposits, institutional money market funds, and short-term repurchase agreements (“repos”).

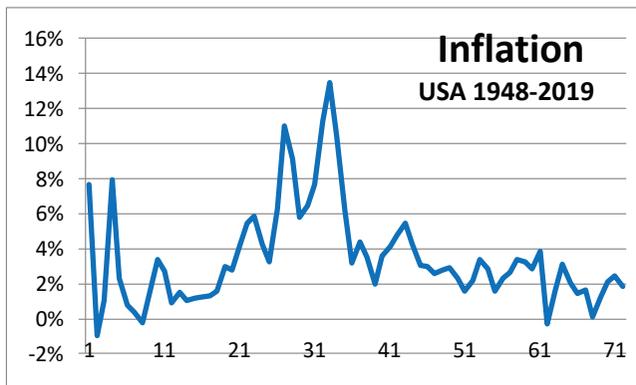
My major data source, The Federal Reserve Bank of St. Louis (FRED), has rather disjointed data available for M1, M2 and M3 with various starting years and ending years, making analysis a little difficult as they don’t overlap uniformly. Recently, M3 has largely been replaced by a new liquidity measure known as “money zero maturity (MZM)”.

As I use a functional definition rather than a liquidity-based definition for money categories, the publicly available data does not specify my money types directly. At best, I can make some very rough estimates. The problem with including bank Reserves in the mainstream money definition is that they have no function other than creating liquidity among the banks. They are not available for consumption or speculation and so have no effect on inflation or the volume of speculation. Regarding the non-effect on inflation, this point was illustrated dramatically after the 2008 financial crisis, when the Federal Reserve introduced “Quantitative Easing” — creating enormous liquidity in the form of Reserves in the banking system by purchasing record-breaking amounts of Treasury securities, unsaleable bank “toxic assets” and bad loans well above market value (a gift to bank shareholders), thus increasing the bank Reserves enormously, as shown below, hoping to stimulate bank lending. Year 32 in the diagram is 2008.



Many economists and other pundits were convinced that this enormous increase in the “money supply” would create hyperinflation like in Zimbabwe in the 2000s and the Weimar republic of Germany in the 1920s. But what actually happened?

In fact, inflation *fell* slightly as shown below. Year 61 is 2008.



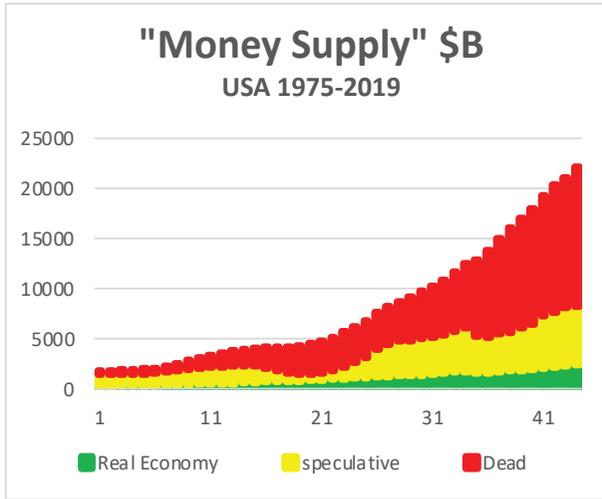
How could so many economists and commentators get it so wrong? It is their definition of money that is the problem. It ignores “money’s” different functions in the economy. They do not take into account the fact that bank reserves are “inert money” outside of both the real economy and the speculative economy, and have zero effect on inflation and bank lending. You cannot just look at the money supply as if it were one homogeneous entity. It is really made up of three very different components, having three very different functions, and three very different effects. Using my functional categorization, the three components for the U.S. data can be approximated in terms of available FRED data, with a large portion of uncertainty, as:

1. **Real economy money:** I estimate this as the credit required to finance consumer and investment goods production in the P- sector: $(1-F_b).W.L.lagg$. W.L is the total wage bill, private plus public sectors, F_b

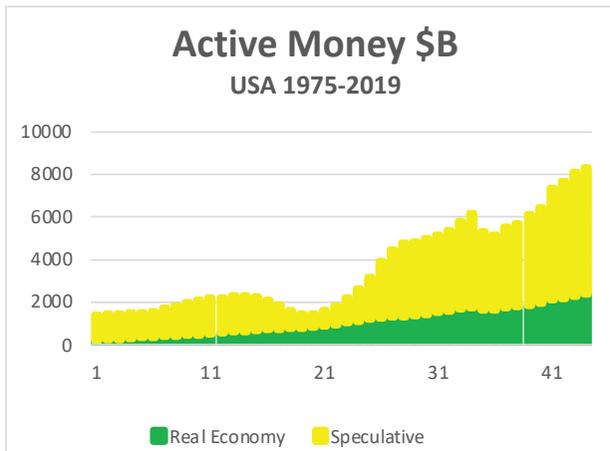
is the size of the public sector, and lagg is length of time between production and sales, assumed 0.25 years here.

- Inert or "dead" money:** I estimate this as 65% of the "national debt", the narrow definition as defined in FRED, plus Reserves, also as defined by FRED. The other 35% is held by the Federal Reserve and other public institutions, such as Social Security, which cancels out in the consolidated public sector balance sheet.
- Speculative money:** $M3 - (1) - (2)$, i.e. the residual.

The graph is for the period 1975-2019, which is the period for which the required data was available in FRED.



If we eliminate the "inert" money, the largest component, we have the following for the "active" money.



My estimate of real economy money is that it made up only 28% of the “active” money supply in this period on average, while speculative money made up 72%.

In other words, 72% of all active money was available for destabilizing speculation.

The above approximation to the size of the speculative economy is actually an underestimate, because the speculative economy also includes illiquid assets like property, which are not part of M3. A better definition of the size of the speculative economy in theory would be the cumulative net Householder savings over time (i.e. after deducting the portion returned to the P-sector as equity or bonds, and after deducting the cumulative portion returned to the government in the form of capital gains taxes and wealth taxes). This number is not something that is registered in historical data at FRED or elsewhere.

Incidentally, Central Bank open-market operations (purchases and sales of Treasury bills and longer-term Treasury bonds) affect Reserves and Treasury securities held at banks, which are swapped, but have no effect on the amount of active money in the real and speculative economies, even though they do affect the traditional definition of money supply based on liquidity measures. They are simple asset and liability swaps without further direct consequence beyond interest rate change. The “inert” money in the banking system is unchanged when we include Treasury securities in the definition of “inert” money, as I do, and the speculative economy is unchanged.

Takeaway

There are actually three kinds of money with different functions (1) bank credit to finance the real economy (2) speculative money placed in existing assets, and derived primarily from householder savings, and (3) “inert” money (bank reserves) with no interaction with either the real or speculative economies.

Chapter 8

The “Money Supply” Myth

The widely used “Quantity Theory of Money” (QTM) states that inflation in a modern economy is caused by and is directly proportional to, the rate of increase in the “money supply”. I write “money supply” in quotes because I consider it an illusionary quantity which consists of three very different types of money. Nor is it “supplied” by the government (the original understanding during the gold standard). While the theory has deep historical roots, the most common reference to the theory is the work of economist Irving Fisher in 1911 (Laidler, 2012), when he presented his basic equation:

$M.V = P.T$, where:

P is a price index (\$)

T is the number of money-based “transactions”

M is the quantity of money in circulation (\$)

V is the “velocity” of this money.

P.T can be understood as the total value of all money transactions. The new factor introduced here, velocity, expresses the idea that the same money can be used several times in a given period. The equation is another way of saying: Total money changing hands in all transactions = Total value of all items transacted. In this sense, the equation is simply an identity with no causality and is not disputable. But Fisher went on to consider the equation as a causality, namely:

$$P = \frac{M.V}{T}$$

Assuming that V and T are relatively constant, Fisher concluded that prices, P, should grow at the same rate as the “money supply”, M. His thinking was that the Government/Central Bank could control the money supply, and hence

inflation. This seemed feasible under the gold standard of the times. Today, it is generally accepted among economists that the government cannot control the money supply, based on the empirical evidence that attempts to do so have generally failed. My model provides an explanation for why this is so, and I will come back to that. But first, let us see how this theory has evolved and been used in practice.

A major problem with the theory is that there is no way to measure the number of transactions, T . A number of later economists argued that the quantity of money should be proportional to total nominal expenditures in an economy, which they assumed could be represented by GDP, and therefore replaced T with national output, Y (in tons) to define an alternative quantity equation, which is the one that most economists subsequently used in their models, right up to today, namely:

$$M.V = P.Y.$$

The most important consequence of this modification was that it led to the concept of “monetarism”, associated primarily with the Chicago School’s most famous economist, Milton Friedman. Friedman accepted Fisher’s premise regarding inflation and the money supply, but went a step further. Like Fisher, he was tempted to introduce causality into this identity, which has no causality. Turning the equations around and looking at it as:

$$Y = \frac{M.V}{P}$$

Friedman then theorized that the total amount of money in an economy is the primary determinant of economic growth, which became the basic premise of monetarism (Jahan and Papageorgiou, 2014). Friedman’s theory assumed that the government/central bank could control the “money supply” and hence total output rather than rely on Keynes’ government spending approach. Keynesianism fell out of favor in the 1970s after unexplainable “stagflation” — the phenomenon of high unemployment and high inflation at the same time, which wasn’t supposed to happen according to Keynes. I will explain why it happens occasionally in a later chapter. The US and other governments experimented with Friedman’s ideas, but Monetarism also fell out of favor after poor practical experience with it in the 1980s.

Today, it is widely accepted that Central Banks cannot control the “money supply”, and they do not even try anymore. Their focus today is entirely on trying to control inflation by controlling interest rates, which can affect inflation, but only to a minor degree, as I mentioned in the previous chapter.

One reason for the widespread belief in monetarism in the 1970s was the observation that the correlation of total money supply, $M3$, and GDP in the U.S. since 1870 was quite positive: 0.79 (Mankiw, 2019, p. 109-110). I did a regression for the period 1948-2019 and got a smaller but still very significant correlation of 0.41.⁶ But as we all know; correlation is not the same as causality.

6 F: 12.0; p: 0.001; R: 0.41; R²: 0.17; coefficient: 0.42

Economist Richard A. Werner has pointed out a flaw in the modern use of the Quantity Theory of Money equation, where GDP is routinely taken as a proxy for the number of transactions. Returning to the original formulation with transactions, T , Werner makes the point that money transactions include far more than real economy GDP transactions (Werner, 2005 p. 182), for example, transactions involving the purchase and sale of existing assets, like property, common stocks, foreign exchange and more recently, derivatives, interest rate swaps, credit default swaps and repos. In fact, the volume of these speculative transactions is several times the size of the real economy.

Furthermore, Werner reminds us that several economists, including Fisher himself, Keynes, and many others more recently, make this distinction. Thus, the need to distinguish between GDP-based and non-GDP-based transactions is well established in the economic literature. “Yet”, he writes, “the mainstream use of the equation has remained confined to nominal income” (Werner, 2005, p. 183).

Werner suggests splitting Fisher’s equation into two parts for GDP-based and non-GDP-based transactions: $M_R \cdot V_R = P_R \cdot T_R$ for the real economy; $M_F \cdot V_F = P_F \cdot T_F$ for the “speculative” economy, (i.e. existing assets), with the total “money supply” being $M_R + M_F$. Note that this definition of “active money” supply does not include bank Reserves (my “third kind of money”) which do not interact with either the real or speculative economies and hence have no “transaction” component.

Most economists apply the “quantity of money” expression to the *total* money supply, i.e. including not only credit money, but speculative money and inert money, namely Reserves, as they do not use the concept of three kinds of money as I do. The identity makes much more sense when applied exclusively to the “first kind of money”, bank credit, as it is the *only* one of the three kinds that actually interacts with the real (GDP) economy and is a very minor part of M3. This may explain why attempts to use the theory in practice have not met with much success. Ignoring Reserves, we have two kinds of active money that flow in two separate and independent money circuits – “GDP money” (M_R) and “speculative money” (M_F). Transactions in the “speculative economy” are primarily about changing ownership of existing assets, while a portion of the pool each year is returned to the real economy as new equity and bonds. It seems to me that this “two kinds of active money” approach is fundamental to understanding the economy, but I have not seen the concept used elsewhere.

In general, real economy money, M_R , is simply the credit supplied by banks to the P-sector to finance goods in process during the period between production and sales. Speculative money, M_F – “hoarding” in 18th century terminology – derives from Householder savings plus possible corporate speculative deposits when there is no debt. Turning to Werner’s second equation for non-GDP-based transactions, we can write:

$$P_F = M_F \cdot V_F / T_F.$$

While the analogous formula for the real economy makes sense, it is more difficult to see what the speculative economy equation can contribute to our understanding. Take, for example, the stock market, which is certainly one of the major areas for speculation, where recent developments in high-frequency trading based on computer algorithms that trade about every 22 seconds (Tur-

beville, 2013) has created a situation where velocity and number of transactional are approaching infinity, while the only relevant macroeconomic role of the speculative frenzy is the likely creation of financial instability spinning off occasionally into the real economy, as we saw in 2008.

We have here two very different theories regarding the possible effect of money growth on inflation. The Quantity Theory of Money (QTM) suggests a direct relationship. The concept has an attractive intuitive element that appeals to most people, namely that “too much money chasing too few goods must necessarily lead to inflation.”

In my way of thinking, there is no logical or economic reason for real economy money, M_R , to cause inflation as this money is simply liquidity to finance consumer goods production without any effect on consumer demand. Nor does the “dead money” held by banks as reserves and Treasury securities affect anything other than intra-bank liquidity. However, there are arguably two plausible economic reasons as to why speculative money *might* affect inflation, both rather weak, in my opinion. The first is possible consumption out of wealth, which would increase aggregate demand without increasing supply. The second is the possible indirect effect of rising asset prices. This could feed back into the real economy. For example, increasing property prices could stimulate an increase in rental costs as owners try to cover their added capital costs, causing consumer goods inflation.

Regarding consumption out of wealth, roughly 60% of the U.S. populace has no wealth at all, and hence cannot increase its consumption out of wealth. This segment of the population can, and does, try to increase its consumption with consumer loans, and I include this possibility in my full model. It strikes me as unlikely that persons who have much higher savings rates, would spend out of wealth when they have plenty of cash available in their savings with only occasional exceptions. The second possibility, a spin off of asset inflation, could have an effect if the size of the speculative economy was allowed to grow without limit.

It follows that I expect the so-called “money supply” to have negligible effect on inflation for the following reasons (1) The real economy money, M_R , is simply bank credit enabling supply-side production and thus makes no contribution whatsoever to aggregate demand and price formation, hence to inflation. (2) The speculative money, M_F , by definition, is only used for buying existing assets. (3) The third component of money supply, Reserves plus Treasury securities, are “dead money” with no effect on either the real or speculative economies. So, I would initially not expect any significant correlation between money supply, M3, and inflation.

I did a regression of inflation vs. M3, both detrended log differences (U.S. 1960-2019, the longest period available for M3 at FRED), with the result that there was a significant positive correlation of 0.41 at a confidence level of 99.9%.⁷

I was surprised, but correlation is not necessarily causation. It is well-known that nominal wages and inflation are causally connected via the wage/price spiral, so I did a second regression of inflation versus nominal wage growth,

7 F: 12.0; P: 0.001; R: 0.41; R²: 0.17; coeff.: 0.35

which yielded an even more significant correlation at better than 99.99% confidence and a correlation of 0.80, explaining 64% of the variation.⁸ So, I then did a two-factor regression for the same period with inflation versus both nominal wages (W) and M3 (all detrended log differences) to see the combined effect.

The result was very informative, because it turns out the money supply growth variable adds nothing to the far more dominant nominal wage variable and disappears with a coefficient that is not significantly different from zero. The two-factor F statistic was quite significant but substantially less than with W alone, (41.6 vs. 81.4).⁹ The explanation for the significant correlation of money supply and inflation is apparently due to a third factor that causally drives both inflation and M3 growth, producing a non-causal correlation between inflation and M3 growth. The obvious choice for such a third factor is the nominal wage. A regression analysis of M3 growth on nominal wage growth provides confirmation that this is the case, with a significant correlation of 0.43 and P value of 0.0006.¹⁰

Thus, the proper understanding of what is going on seems to be that both inflation and speculative money supply growth, M3, are causally driven by nominal wage growth, at least in the short-run. The economic explanation for the M3 growth causal dependence on wage growth is that increases in nominal wages means increases in the total wage bill, hence increases in net Householder savings and subsequent increases in speculative money.

In conclusion, I can find no empirical evidence in the U.S. data to justify including money supply growth in my model as a cause of price changes, while nominal wage growth is a far more important determinant. Money supply growth, in my view, is not a cause of inflation or economic growth, and all ideas about controlling economic growth or inflation by manipulating the money supply are doomed to failure, a fact that economists have discovered in practice, but without understanding entirely why. The “three kinds of money” concept offers a clear explanation.

I think things would be much clearer if economists dropped the term “money supply” altogether, because “money” is really three different things with three different effects on the economy. Adding them together serves no useful purpose. If anything, it detracts from an understanding of what is actually going on and reinforces archaic gold standard thinking.

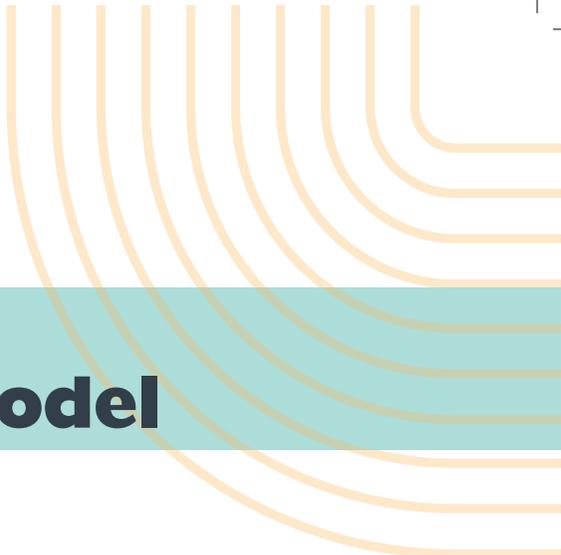
Takeaway

The Quantity Theory of Money can be shown to be false, both logically and empirically. Inflation is not caused by growth in the so-called “money supply”.

8 F: 81.4; R: 0.76; R²: 0.58; P: 0.0000; coeff. 0.88.

9 F: 41.6; R: 0.77; R²: 0.0.59; P(M3):0.26; P(W): 0.0000; coeff. (M3):0.09; coeff. (W): 0.83.

10 F: 13.0; R: 0.43; R²: 0.18; P: 0.0006; coeff.: 0.59



Chapter 9

Using the Model

I identify in this book a number of widespread beliefs about the economy that I consider myths or misunderstandings, and I argue for what I consider the proper understanding. I have done this in previous chapters without the use of a mathematical model, using only sector charts and statistical analysis. In some cases, as I will illustrate in future chapters, it is enough to supplement the sector charts with a simple “rule of thumb” about the movement of wages and prices to make my point. But, for some issues, I must go one step further and develop a mathematical model to explain why I get empirical results at times that are counter to popular beliefs. As I do not wish to burden the casual reader with a lot of math, I have relegated the model description to Appendix I for those who wish to go into more detail. In the main text, I will suffice with some general comments on the model.

A truly complete economic model would be an ecological economics model, including energy, non-renewable and renewable resources, and the waste produced by production. It is far beyond my ambitions to engage in that enormous task. Instead, I am limiting the scope of my model to a few macroeconomic variables in the national accounts following the tradition that most mainstream economists normally work with. Mainstream economics essentially assumes that there is enough energy available so that it does not affect their models, and I follow this tradition. My focus is thus on how these variables interact, and how government policies can be affected positively or negatively by the political leadership’s more or less correct understanding of economic relationships. My model is based on premises that are fairly standard for economists, who will have difficulty rejecting my assumptions, because they often use them themselves. But I will supplement them with a couple of original ideas, which differ from mainstream practice, but are based on solid economic theory, including supporting empirical evidence. In particular, my use of the sector balance equation as a mathematical identity that must hold at all times and is embedded in my differential equations, is novel and fundamental in explaining what is happening when several variables are changing simultaneously, especially when one changes the values of a key policy parameter, such as the amount of government spending. The model simulation can often explain why traditional theories, based on intuitive relationships between a couple of variables often lead to counter-intuitive results in a more complex world.

On Constructing Economic Models

It is not uncommon in the academic world to construct a mathematical model that is every bit as complicated as the real-world problem it tries to describe. But in such case one is often no better off. The challenge in model building is to find the right balance between simplicity and reality. It is important not to lose sight of the forest by describing the trees in too much detail, but rather to capture the essence of the problem in few variables. In practice, this is very difficult, and is more of an art than a science. In operations research, finding this balance is the very foundation of whatever approach is taken to any given problem. It can be very tempting to add bells and whistles to a model in an attempt to make it more “realistic” or to demonstrate one’s mathematical competence. In my experience, a model that uses myriad variables to describe a problem has probably been misspecified.

A good example of this conflict was the controversy around the *Limits to Growth* model of the global economy in the early 1970’s (Meadows et al., 1972). The model simulated various scenarios over the next hundred years based on the complex interactions of just five variables — population, industrial production, pollution, resources and new technologies, and included a number of parameters, whose values could be varied and sensitivities studied. The many simulations strongly suggested that the world was heading for “overshoot and collapse” sometime post 2020 if we continued on the “business as usual” path.

The study was ridiculed by mainstream economists for being overly simplistic with an unacceptably high degree of aggregation, with the result that its conclusions were largely ignored by politicians, who might otherwise have done something about the issues raised, instead of waiting until now, 50 years later, when it may be too late to prevent runaway climate change.

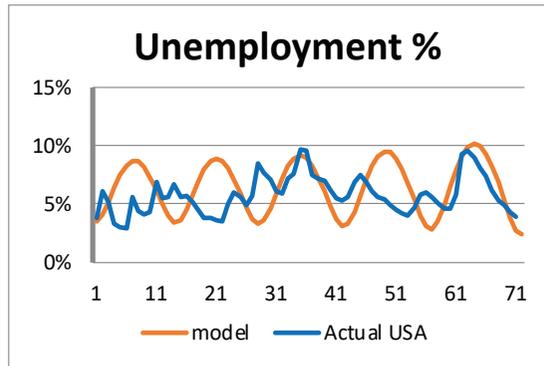
A far more detailed regional model with much more data was subsequently developed by other researchers in the 1970s, but never had any impact, being a model that was almost as complicated as the real world it tried to describe. A 2014 study by Australian researcher Graham Turner compared the “business as usual” scenario from *Limits to Growth* with actual data since 1972 and found that the model was right on track 40 years later, confirming the soundness of the model and concluding that “it would appear that the global economy and population is on the cusp of collapse” (Turner, 2014).

There is no “right or wrong” in building models. It is a subjective choice as to the perceived importance of the pros and cons of alternative approaches, for example, the degree of aggregation, the extent to which the analysis depends on behavioral assumptions, the choice between top-down or bottom up. I happen to prefer the “keep it simple” top-down approach, with a focus on pedagogy and understanding the big picture, much like the *Limits to Growth* model did. This type of model, of which mine is one example, is dynamic and non-linear, based on differential equations that allow for more complex relationships.

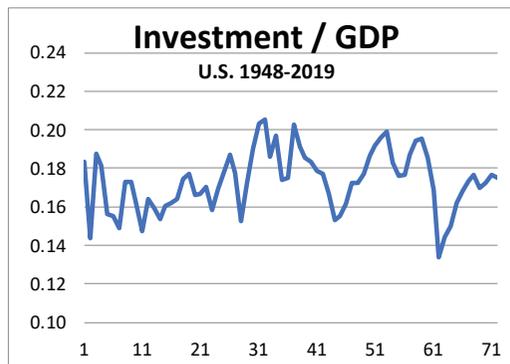
The Nature of the Model Solutions

In the following, I will illustrate some of the capabilities of my model for some typical parameter values in a no-growth economy. The nature of the solution

for employment is illustrated graphically below for an ideal world compared to the actual U.S. data.



Note the model’s resemblance to the actual fluctuations, but with a smooth trajectory. The actual data is affected by hundreds of small shocks and occasional large disruptions that disturb the theoretically smooth cycles constantly, creating irregularities in cycle length and amplitude. The model can create a similar pattern by introducing random variables, but I use the model in “laboratory” mode with smooth variations, as we are interested primarily in learning how things interact rather than trying to reproduce historical patterns. While the patterns are quite clear in the “laboratory” model, they are far from clear in the real world due to constant shocks to the system. The model shows the nature of the ideal solution in the absence of shocks. Note the especially large disruption caused by the 2008 financial crisis on relative investment below (year 61). The wave lengths and amplitudes of the cycles in the model can vary depending on circumstances. Their magnitude and frequency are not important for my purposes, as I am not trying to represent any particular economy.

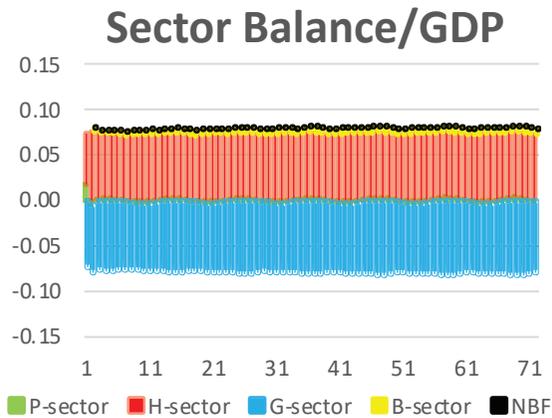


GDP (output in \$ per year) grows long-term at the combined growth rates of productivity, employment fraction, prices and population and oscillates about the long-term rate in the short-term due to cycles caused by wage-price dynamics.

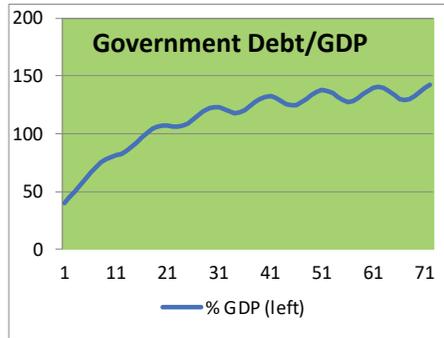
Using the Model

My intention here is to use the model to offer an explanation for why the empirical data often leads to results counter to widespread beliefs. I will do this by first constructing a “Benchmark” scenario with plausible parameters, drawing upon U.S. data for credibility, in order to create 72 years of simulated results, enabling a wide variety of analyses, including the effects of government policies on inflation, unemployment, investment, wealth creation for different income groups, private and public debt and much more. Once the benchmark behavior is established, I can then change a particular parameter and compare the two results to simulate the effects graphically and numerically. The Benchmark scenario is for a no-growth economy in order to make the comparisons clearer, but the same analysis can be made for a growth economy by changing a single parameter. The parameters used in the Benchmark Scenario are provided in the Technical Appendix. The model itself is run on Excel and I have programmed it in Excel VBA language, using numerical methods to find a solution for each year over a 72-year horizon.

To illustrate some of the potential analyses, I show below some graphic results for the benchmark scenario. One of the key ones is, of course, the sector balance for the five key sectors. I left out the foreign sector to simplify, so the graph can be interpreted as the global economy, where there is obviously no foreign sector.



I have chosen typical progressive income tax rates to provide approximate balance in the P-sector surplus with an average surplus/deficit over the period within 1% of neutral. There are no capital gains or wealth taxes in this scenario. Private debt is kept at a minimum, but the public debt rises to about 150% of GDP, which is not a problem, as I have explained.



In all my examples to date, I have assumed a single, homogeneous Householder group with average parameters. This is common practice in economic modeling. However, as I am interested in income and wealth distributions, I introduce in my model four groups of Householders depending on their income fractiles, namely:

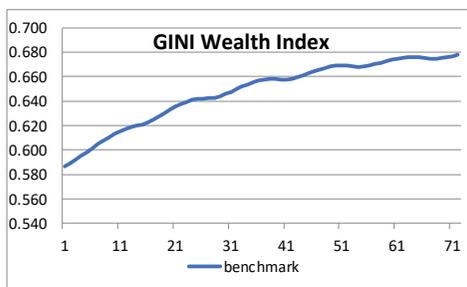
- “The 1%”: 99-100% fractile.
- “The Elite”: 90-99 % fractile.
- “The Middle Class”: 60-90 % fractile.
- “The Working Poor”. 0-60 % fractile.

This allows me to simulate the effects of tax and spending policies on wealth and income distribution for my four Householder groups by varying the parameters one at a time, including:

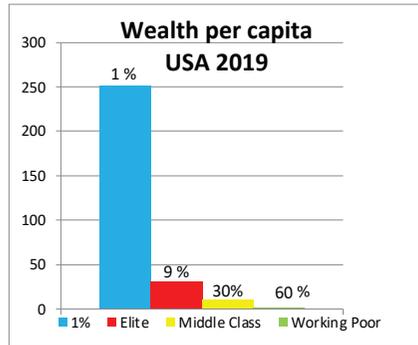
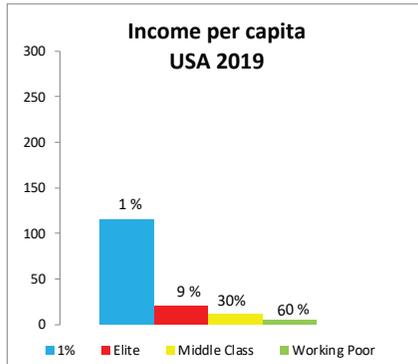
- F_R : government transfers for unemployment insurance, social security, etc.
- F_G : government spending on infrastructure, military, etc.
- F_Y : payroll taxes,

and I can vary income, capital gains and wealth taxes individually for each Householder group. I am not aware of any other economist who models Householders in different groups like this.

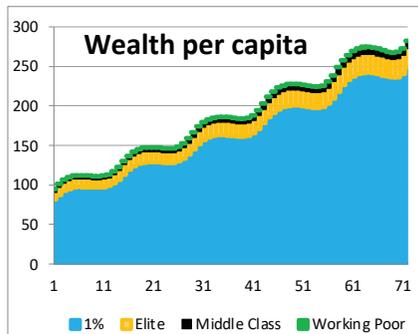
We can observe the effect of government policies (F_R , F_G , F_Y plus income tax rates) on wealth inequality, which increases considerably in the Benchmark Scenario.



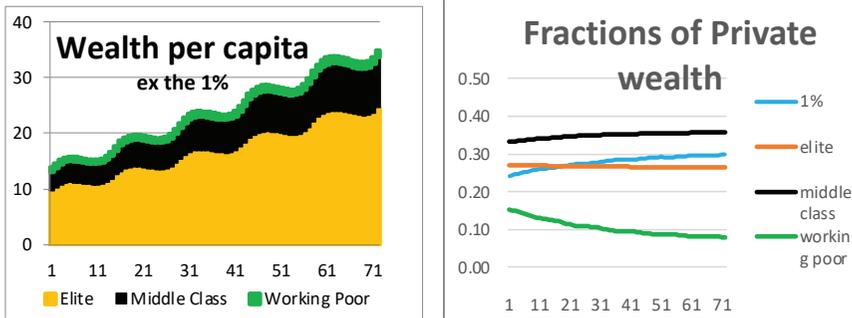
The initial wealth and income values are based on U.S. data for 2019. I use the same scale below to emphasize how much more skewed the wealth distribution is.



In my simulations, I assume that the income distribution remains fixed throughout the period, while the wealth distribution evolves according to the tax and spending policies of the government, as shown below. The 1% so dominate wealth per capita in the U.S. that we can barely see the Working Poor and the Middle Class.



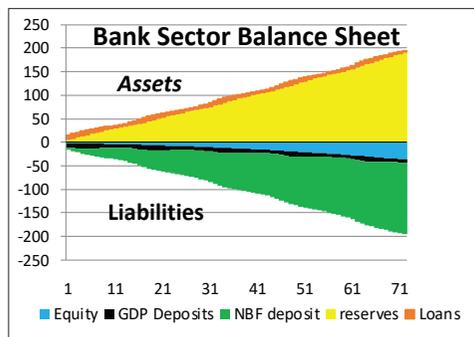
If we remove the 1% group from the graph, we can get a clearer picture of the other three groups.



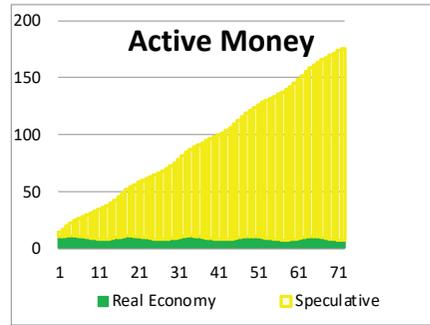
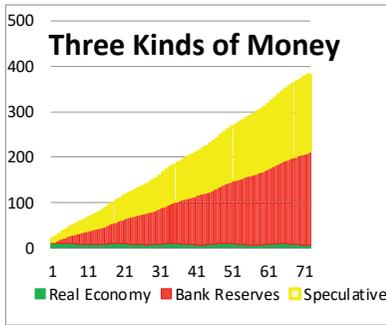
We can barely see how much wealth the Working Poor have relative to the Middle Class, as this 60% of the US population has basically no wealth to speak of. If I had included consumer loans, it would have been even less, probably negative. Another way to look at wealth growth is as the fraction of wealth for the four groups as shown above right. Even though wealth was increasing for all four groups over the 72 years, the Elite and the Working Poor had declining fractions of the total as most of the benefits went to the 1%.

The reason for the shifting wealth patterns, even in a no-growth economy, is the government's spending and taxation policies. The primary differences in wealth are due to the greater savings of the wealthier part of the population combined with the much larger equity holdings and the absence of any capital gains or wealth taxes.

Depending on the purpose of the analysis, we can also look at the evolution of the balance sheets of each sector, for example, the Bank Sector below.



In the model, I have dropped Treasury securities for pedagogical reasons so that the national debt (using the broad definition) is made up of Reserves only. The Reserves are relatively large here, because of the exploding public debt, necessary to keep the P-sector afloat and close to a neutral surplus. NBF deposits represent speculative money and are also quite large primarily due to the absence of any wealth taxes.



We see above the evolution of the three kinds of money, and the active money alone, without Reserves, which is totally dominated by speculative money from net Householder savings.

The Benchmark scenario is characterized by two closely related things. One is the enormous increase in speculative activity due to the cumulative net Householder savings and corresponding lack of capital gains or wealth taxes on the wealthy. The other is the enormous government deficits necessary to keep the corporate sector from collapsing.

Employment, Investment, Output, Inflation and Credit

If we observe the economic policies of most governments, and the corresponding research of most economists, they are primarily focused on affecting the three variables— employment, investment and output. However, if we examine the structure of my model, based on fairly traditional economic assumptions, it would seem that all three variables are beyond the influence of governments, except for a very minor effect in the short-run cycles.

For example, employment in the model is assumed to oscillate about an average value, x^* , which is an assumed constant, a natural average level of unemployment due to the nature of the economy. The U.S. data seems to reflect this fairly clearly. Yet, much economic research has been devoted to finding a way of reaching the ideal of “full employment”, or at least to close the gap between the observed average and the theoretical ideal of full employment. There is no relationship between average employment and any other variable in my model. One could hypothesize a relationship, for example, related to productivity growth or government spending, but I would be reluctant to do so without empirical evidence.

Similarly with Investment, which oscillates about a mean equal to some rather stable parameters (capital/output ratio, productivity growth, population growth and depreciation). There is no relationship between investment and Householder savings in my model, consistent with the empirical evidence.

According to the model, and also supported by the empirical evidence, inflation is not caused by money supply growth. In my model, it turns out that long-term inflation is proportional to labor productivity. The reasons for this are presented in Appendix I. In a no-growth economy, it follows that there is no inflation. Credit is determined only by corporate demand, quite independent of bank Reserves.

For all of these economic variables, the same issue arises. Can government policies have any lasting effect on average employment or investment or bank lending? The model says no, they can't. It would be a waste of time to try.

Takeaway

My model is complex (non-linear feedback) but simple (few variables). A key innovation is the derivation of a "sector balance identity" – linking employment, prices, wages, investment, population and productivity – that must be satisfied at every point in time by any correct macroeconomic model. Another is the use of four Householder groups.



Chapter 10

The Inflation Myth

One of the most deeply-seated beliefs by almost all economists and politicians is that government deficits are inflationary. This belief is so deeply ingrained in the public consciousness that you could almost say that the claim is not controversial. I am not aware of a single economist who ever argued that an increasing deficit was *not* inflationary. A small minority argue that it should not be inflationary when there are excess resources and the economy is growing, but will be inflationary if the economy is not growing. So, I am sticking my neck out here when I go against the crowd and suggest otherwise.

Why do I say that? Because my “three kinds of money” and my corresponding model, which is built on the basis of empirically verified relationships and widely accepted economic theory, tells me so. The traditional argument for inflation is based on the idea that the more money there is, the more pressure will there be on consumer prices for the same level of production. That sounds reasonable at first, but my model says that things are more complicated than that, for two reasons. Firstly, because I use a *sector balance identity*, which links the six key variables and several policy parameters together mathematically, which can result in counter-intuitive results. Secondly, because there are three kinds of money, and the two largest of them — speculative money and bank Reserves — have no contact with the real economy. So, I ask: how can they affect consumer prices?

So, what I am going to do in this chapter is to explore the theory by comparing my no-growth benchmark scenario with a scenario where the government increases welfare spending from 5% of GDP to 7.5% without any corresponding tax increase. All I have to do is change one parameter, F_r , after 30 years, and keep it there for another 30 years. Then I will compare the changes, if any, in average prices for the two periods. If the inflation theory is correct, then the average value of the Price Index should be significantly higher in the second period.

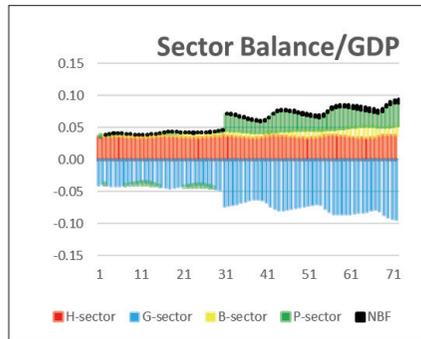
What is the Evidence for the Theory?

Let us first see if we can find any empirical evidence for the inflation theory using the 72 years of U.S. data. To investigate this, I regressed the detrended log differences of the Price Index versus the detrended differences in the Government deficit relative to GDP. An increased deficit means government spending exceeded tax income. If the inflation theory is correct, we should see a signifi-

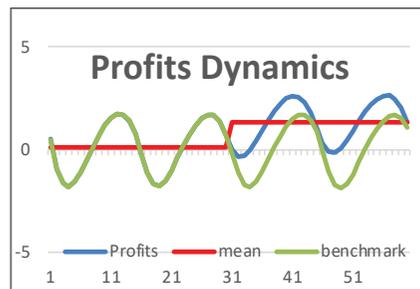
cant positive correlation. I did the regression for no lag, 1-year lag and 2-year's lag. The result was *no significant difference from zero correlation* for all cases.¹¹ It was not even close. This is the total opposite of mainstream expectations. Thus, government deficits are *not* inflationary according to the data.

Let us now look at the model results and see if the model can explain *why* government deficits are not inflationary.

To find an explanation, the best place to start is with the sector balance.



The above graph shows that the sudden increase in the G-sector deficit at year 31 is offset, as it must be, by a roughly similar increase in surplus in the P-sector at year 31 to satisfy sector balance. The Householder sector is quite stable, while the Bank sector and NBF sectors are only marginally increasing due to interest earnings. Therefore, sector balance requires a *surge in corporate profits* as is shown below for the model.



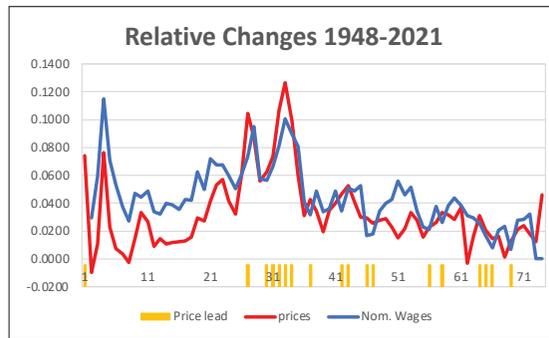
How can this surge in corporate profits come about?

The Rule of Thumb

I mentioned in the Introduction that I can demonstrate some of my results simply with a graph and a simple “rule of thumb”. No knowledge of math or economics is required, just common sense, as in the chapter on balanced budgets. I will now demonstrate how this method can be used in this case.

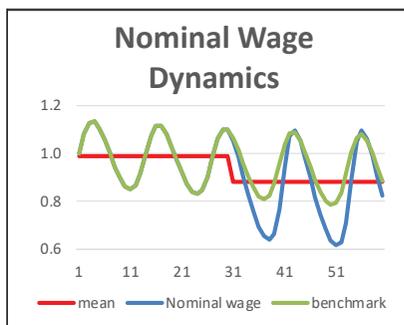
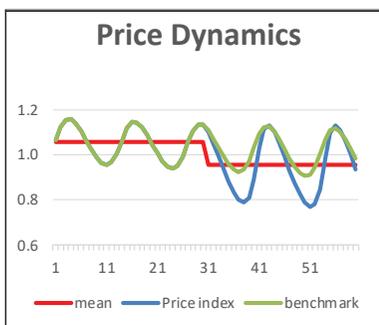
11 For no lag: F: 1.7; R: 0.15; R²: 0.02; P: 0.20; coeff.: -0.22. Lags were even worse.

It is well-known that wages and prices are highly correlated and tend to move together. It is also so that wages tend to move, not only in the same direction, but *farther than prices*, in a given period, as I show in the analysis below. This last statement is, in fact, the rule of thumb for the reader to remember. This phenomenon is illustrated in the chart below for 72 years of U.S. data. To estimate how often the rule of thumb holds, I show, at the bottom of the chart, the years in which prices move up farther than wages (26% of the time). These are primarily years of large external price disruptions. The corresponding frequency when prices move down farther than wages is not shown here but was measured to just 4% of the time. So, historically, even including external cost-push price disruptions, wages moved farther than prices about 85% of the time, and about 50% farther on average. If we exclude the cost-push distortions, then in “normal” markets, wages move faster and further than prices about 96% of the time.

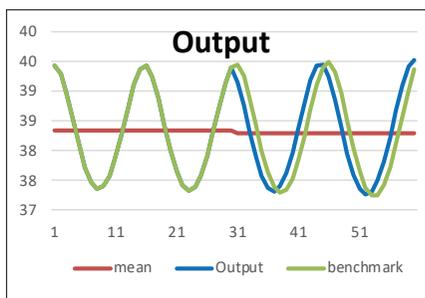
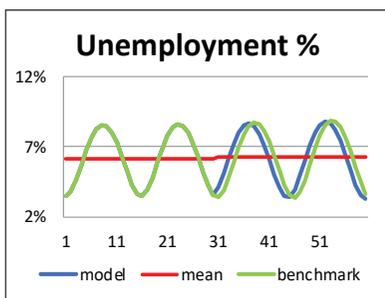


So, how can the surge in profits, necessary for sector balance, come about? Barring an increase in employment and output, which are virtually unchanged (shown further below), there are only two possibilities to create greater profits. Either prices have to increase more than wages or wages have to fall more than prices. The mainstream assumption by economists and politicians is the first, that prices will increase – based on their simplistic (and wrong) rule of thumb that more money in the economy is inflationary. But our rule of thumb tells us that prices cannot increase without wages increasing by even more, which would mean *fewer* corporate profits, not *more*, and hence a violation of the sector balance. Thus, there is only one solution that does not violate the sector balance. Prices have to *fall*, while wages have to fall *even more*. Running the model is not even necessary to make this point, but the charts below confirm the rule of thumb logic and show that the only solution is that both prices and wages must fall, consistent with the empirical observation of no inflation.

The charts document the model’s price and wage evolution before (green) and after (blue) the change in year 31, where we see a very clear *drop* in the price level of 9.5% after the increase in the deficit, quite the opposite of the mainstream expectation, and much more than the no-growth benchmark scenario drop of about 3.4%. Similarly for wages, which dropped by 11.1% compared to 2.2% in the benchmark scenario. The model suggests that government deficits are actually *deflationary*.

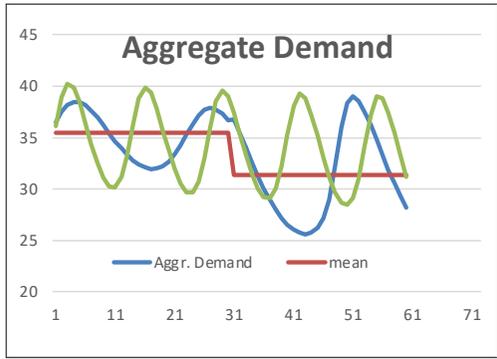


Unemployment increases and output falls slightly in the short-run in the model – also counter to mainstream expectations – as illustrated in the following charts from the scenario simulation. To achieve sector balance, wages and prices have to slide down the Phillips curve to achieve the combination of higher unemployment along with lower wages and prices.



Does the empirical data from the U.S. support this short-term change in unemployment? The answer is yes. A regression of unemployment versus the deficit yields a positive correlation of 0.57 with a significance of 99.99%. However, a second interpretation of the unemployment/deficit correlation is possible. Causality could be running both ways. Increased unemployment could be triggering increased unemployment insurance and other such benefits, hence creating a larger deficit. In any case, there is no evidence that larger deficits are associated with increased employment.

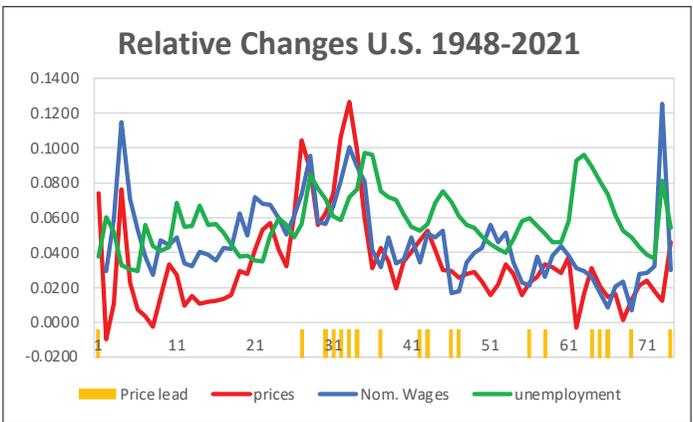
This result here is again counter-intuitive. Why are employment, investment, prices and wages all falling when aggregate demand is apparently increasing due to more money in circulation? The answer is that aggregate demand is *not* increasing, it is *decreasing*, primarily due to the double-whammy of falls in both wages and employment (W.L). In the model, and in the real world, six variables are reacting simultaneously to the change in the Fr parameter, and they must do so in a way that produces additional profits in order to satisfy the sector balance equation. This example illustrates the prime weakness in the “agent” approach that begins with assumed behavioral patterns at the micro level of individual Householders and firms that seem logical enough, but cannot handle the simultaneous changes of other variables that happen in the real world. Intuition is not a good guide in understanding complex systems.



Stagflation

In the chart below we can see not only how prices and wages behaved in the U.S. in the period 1948-2021, and we can also see the level of unemployment for reference. These abnormal periods where price is pulling wages upwards represent exogenous cost-push disruptions, typically due to sudden global energy and food shortages. These disruptions illustrate the phenomenon of “stagflation” that has puzzled economists, because during stagflation prices are increasing while unemployment is high. This is contrary to the Phillips curve expectations and intuition as well. The explanation is actually quite straightforward. These are periods when external cost-push disruption upsets and *dominates* the normal pattern, allowing *prices to lead wages* upwards – an exception to the normal rule. If unemployment *happens by chance* to be high at the time of the external disruption, then we get stagflation for a while until things settle down.

The most notable case of stagflation due to disruption in recent years was the OPEC oil crisis of roughly 1973-1983 (periods 25-35 below).



The second largest example of stagflation was the disruption of 2011-2013 (periods 65-67), partly explained by a rapid increase in food prices due to widespread crop failures, partly due to oil prices rapidly increasing as the

global economy recovered after a downturn. Interestingly, a new disruption is underway at the time of writing in 2020-22 due to the Covid-19 epidemic supply-chain problem and the Russia/Ukraine war that is creating food and energy shortages, thus pushing prices up. But U.S. unemployment was below average in 2021, so we might not see any stagflation this time. Thus, in “normal” times, it is wages that lead prices. In exceptional times of cost-push disruptions, it is prices that lead wages.

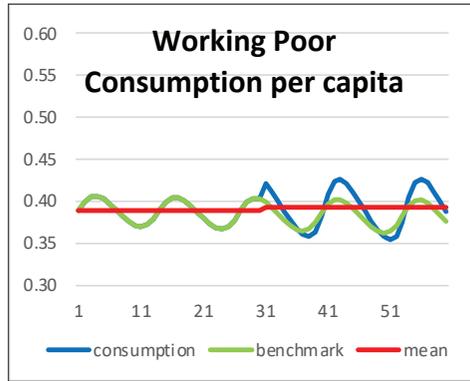
The traditional response to cost-push disruptions, both in the OPEC case of 1973-1983 and in the ongoing case of 2020-2022 is for the Central Banks to try to control inflation by increasing interest rates. The danger is that this policy may persist for too long and cause an unnecessary depression, which it actually did do in the OPEC case.

Increasing interest rates may not be the best response to a cost-push disruption. Firstly, interest rates have only marginal effects on prices normally, explaining only 17% of the variations with a lag of two years, by my estimate. Secondly, wages are far more important for prices, and should be kept in check to prevent a price/wage spiral after a cost-push disruption. A temporary wage freeze could be considered along with compensating transfer payments to persons and small businesses hurting through no fault of their own. This kind of short-term support is similar to what was done in most countries during the Covid-19 epidemic response, which was the correct response to that crisis. This will help those in need and keep the price increases to a minimum, but will also contribute to windfall profits for corporations, reducing the chance of a recession. What is more likely than a recession, or maybe even concurrently, is a boom in inequality due to capital gains. A temporary excess profits tax would be appropriate in industries that benefit excessively from the disruption and/or the response.

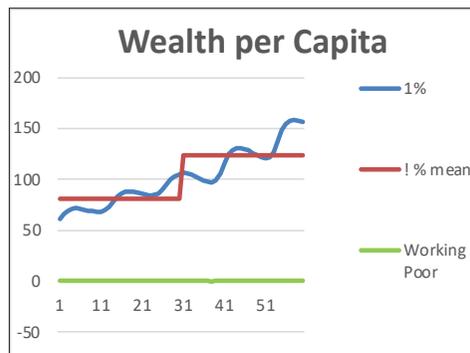
Who Benefits most from Social Welfare Payments?

This may seem a strange question to ask. Most people assume that the beneficiaries of transfers such as unemployment insurance and other social welfare payments are the Working Poor as they receive the lion’s share of the cash outlay relative to their income level. Let us have a look.

If we compare the consumption per capita for the Working Poor before and after the increased welfare payments in the above scenario, we see that there was an initial jump upwards, but that quickly reversed as volatility increased, resulting in a net gain of only 1%, as their increased income was canceled out by falling wages. For the 1% group, the consumption effect was similar with a result that was about the same before and after the hike.



But as regards *wealth* per capita, we see a very significant difference. Working Poor wealth was up 4% but is hardly noticeable on the chart, while the 1 %'s average wealth was up a whopping 54% in the second period. *The wealthiest families thus benefit most from welfare payments.* This is due to the combination of much larger holdings of P-sector equity, which increase in value, a higher savings rate and the lack of any wealth or capital gains taxes.



Others' Research on Inflation and Deficits

Many scholarly articles, both theoretical and empirical, have been written on this subject, with wide-ranging and conflicting conclusions. A number of them, particularly older articles, focused on the fact that government deficits increase reserves (true, but "inert" money) and thus the "money supply", and then invoke the Quantity Theory of Money (false) to make their economic case of a positive relationship. The problem with this way of thinking is that an increase in reserves will not increase lending and hence consumer demand. Reserves cannot be lent out (Shearn, 2013). Encouraging more bank credit by providing liquidity never worked in practice, because liquidity was *not* required for new loans. Hence, increasing Reserves had and has little or no effect on bank lending, consumer demand or inflation.

Kivilcim Metin of Bkent University, Ankara, surveyed more than a dozen papers on this subject, concluding, "These studies did not yield conclusive

results on the relationship between the budget deficit and inflation, either in the short run or in the long run (Metin, 1998). For example, he refers to Ahking and Miller (1985), who ‘found government deficits to be inflationary in the 1950s and 1970s, but not in the 1960s.’ Others – Choudhary and Parai (1991), Dogas (1992) and Hondroyiannis and Papapetrou (1994) found a positive relationship. Hamburger and Zwick (1981) found ‘a significant inflationary impact’ of growth in Federal Reserve debt holdings over 1961-1982, but also found “ ‘that growth in non-monetized debt¹² had a negative short-run effect on inflation.’ ”

In another study, Giannaros and Kolluri (1985) concluded that “in general, the government budget deficit is not a determinant of money supply growth or of inflation (directly or indirectly). The U.S. is an exception with some statistical evidence of direct and indirect effects of the budget deficit on inflation.”

In their much-quoted article, Hamburger and Zwick (1981) write, “This study is the first attempt to determine the relationship between the inflation and budget deficits for nine EU countries using different bootstrap causality tests. We do not find a relationship between these variables when we employ bootstrap causality analysis. While the frequency domain causality shows that there is no relationship causality from budget deficits to inflation for all countries, causality from inflation to budget deficits indicates a permanent (long-run) relationship for Belgium, and France.”

A recent study by Bill Dupor of the Federal Reserve Bank of St. Louis, “found that a 10 percent increase in government spending led to an 8 basis-point *decline* in inflation. Moreover, the effect is not statistically different from zero,” (Dupor, 2016) — a result very similar to my own.

Different Approaches

It is difficult to find empirical support for the idea that deficits cause inflation. I find it very significant that there is no strong evidence for a theory that is so widespread and has such far reaching political and economic consequences. The best we can say for the theory is that the empirical results are inconclusive. This is hardly a sound basis for making political decisions. The worst we can say is that the theory may have it backwards, that deficits are deflationary rather than inflationary. This is what my model and Dupor’s study suggest. Some of the other empirical studies found this as well. If economists looked at economics through a sector balance lens, then a glance at the above sector balance chart together with the rule of thumb that wages move faster and farther than prices shows that *prices have to fall*, and wages even more, to enable increased corporate profits and maintain sector balance when the government increases its deficit.

There is a caveat, however, to overspending. In spite of the positive tone of the above, the international empirical results are varied and inconclusive. Therefore, any political decisions to exploit this seemingly good news should proceed cautiously while keeping a close eye on prices. We clearly need more

12 i.e. no Treasury securities are issued when a deficit is realized.

research and more experiments in the real world before the final word can be said about deficits and inflation.

Consumer loans

A related question is the extent to which consumer loans affect prices. It is widely believed that increased consumer loans have a positive effect on prices as they add to aggregate demand without affecting aggregate supply. To begin with the empirical evidence, I regressed inflation versus my F_c parameter (consumer goods loans as a fraction of the wage bill) using detrended log differences, both with no lag and with lag of 1 year for the period 1948-2019 in the U.S. The result was rather unexpected, with a significant *negative* correlation at the 99.84% level for no lag, and zero correlation for 1-year lag. The explanation suggested to me was that the causality may run the other way, that falling wages (hence falling prices) puts pressure on the Working Poor, who take out consumer loans to maintain the same consumption level as before. Thus, consumer loans and inflation become negatively correlated.¹³

So, I did a third regression to check out this idea, with F_c versus lagged inflation, and found an even stronger negative correlation with a confidence level of 99.96 % confirming my suspicion that it was the wage declines that led to more consumer loans, especially in the following year.¹⁴ Once again, this shows that intuition is not a good guide for economic predictions.

Conclusions

The most surprising result of this chapter is the absence of convincing evidence for one of the most widely believed economic theories of our time, namely that a government deficit (i.e. excessive government spending) is inflationary. This belief has been a major reason for rejecting many economic proposals that would be of great benefit to the vast majority of people, such as free, or at least affordable, health care and education and a universal basic income (UBI).

To sum up, I think there are four different types of inflation, just as there are three different types of money, all with different effects on the economy. If we don't distinguish among them, we will have misunderstandings and adopt wrong policies. It is not useful to consider "inflation" as an undifferentiated homogeneous quantity that should always be treated the same, for example with an interest rate policy, just as we cannot usefully talk about an undifferentiated "money supply", which has three distinct components. My research suggests classifying inflation types as follows:

1. Short-term cyclical fluctuations. These are a result of the wage/price conflict between workers and employers, and are captured in my model with the well-known "Phillips curve" that expresses real wage growth as a non-linear increasing function of employment (See Appendix I).
2. Long-term or persistent growth rate of prices. This is the normal defi-

13 Statistics for no lag: F: 10.8; R: 0.36; R²: 0.13; P: 0.0016: coeff.: -0.19

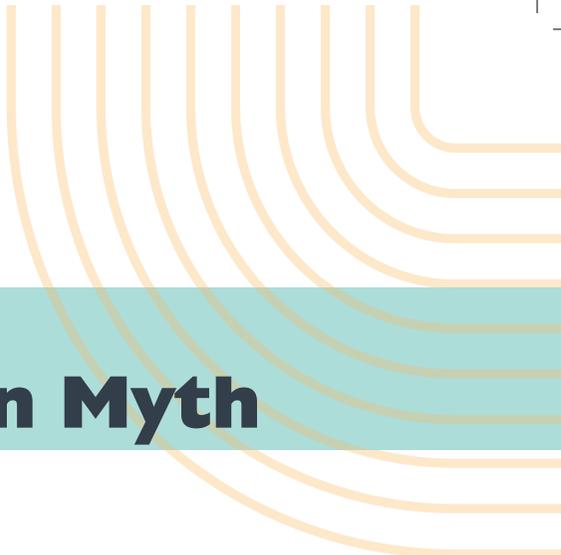
14 Statistics for -1 lag: F: 13.9; R: 0.41; R²: 0.17; P: 0.0004: coeff.: -0.71

inition of inflation by economists — *persistent* change as opposed to cyclical change. My research suggests that this growth rate is proportional to the labor productivity growth rate and not to money supply growth. (See Appendix I).

3. Cost-push disruptions, which occur occasionally due to external global factors such as supply-chain interruptions or global energy and food shortages. These disruptions can be quite large and there isn't much we can do about them in the short run except to compensate citizens for the inconvenience, which is no fault of theirs or of their government, until things settle down, which could take some years in the worst case.
4. Hyperinflation is a totally separate phenomenon that can occur occasionally in an economy that is suffering under the burden of a large foreign debt, combined with a collapse in production, for example due to war, that prevents them from producing enough to pay down their foreign debt. This will never happen in a sovereign state that issues its own currency and avoids too much foreign debt.

Takeaway

There are three types of inflation in a normal economy (1) long-term persistent proportional to the growth rate of labor productivity, (2) short-term cyclical movements due to the labor market (Phillips curve), and (3) occasional cost-push inflation from external factors such as energy and food shortages. My model, supported by empirical analysis as well as other studies, suggests that government spending is not inflationary.



Chapter 11

The Taxation Myth

Tax policies, along with spending policies, are the two most important ways that a government can affect the direction and character of its economy. A fundamental question is: what is the role of taxes in a sovereign state that can issue its own currency? Most politicians, if asked, would probably reply: “to cover government expenses, of course”.

While paying for government expenses may be the most common reason for taxation for politicians, they are wrong to think that such taxation is necessary. I have mentioned more than once that a government that issues its own currency is unconstrained in its ability to spend. This means that the *last* thing a government needs is money. Let that sink in before reading on.

In fact, all the tax money the government receives could be poured down a digital black hole and be lost forever and it would not make a whit of difference. As a matter of fact, that is precisely what happens in a modern economy with digital tax money received. Tax money is in fact destroyed the instant it is received by the government. This digital money received is not reused, as were the coins of the old monarchies! Unlike the old monarchs and their coins, and unlike the restrictive rules of the gold standard, the computer key strokes that create new money today do not depend on taxation! The government creates *new* money every time it spends. Tax income is not used for anything. In fact, the digital money received is destroyed. I repeat: such a government’s ability to spend is unlimited. The government doesn’t need tax income to spend, just a computer keyboard. Assuming that one accepts this fact (It is, after all, undeniable), are their other reasons why a state might choose to have taxation? Yes, there are.

Some might say: to prevent the national debt from running amok, because without taxation, the government would have an enormous and increasing debt burden. No. That is not the correct answer. As I showed already, the national debt is not a burden. Others would cite the risk of inflation if the government ran large deficits. But we just dealt with that in the previous chapter and should have no cause for worry. Others might say that we need progressive income taxation to ensure that those with the broadest shoulders bear more of the burden. However, since the state doesn’t need the tax money, that is not the answer either. One could make a social argument for progressive taxation to reduce inequality, and here we are on firmer ground. Perhaps to affect behavior? Now we are getting closer.

Does this mean that a country could function economically without having any taxes? The answer is: it may not be a good idea, but in principle, yes, it could, provided only that everyone accepts the currency as a medium of exchange. But then, why should they? Many would probably prefer sea shells, gold or bitcoins to a piece of paper with a portrait of their Queen. *Acceptance of the currency is thus the most important reason to have taxation.* Confidence in the currency in the exchange of goods and services is vital. A necessary and sufficient way to get acceptance of the currency is thus to introduce taxation, making the point to citizens that the official currency issued by the government is the *only* currency acceptable for tax payments. This fact then creates confidence in the currency, and everyone accepts receiving the currency for their labors or for payment of debts. The right to pay taxes with the official currency and *only* with the official currency is what gives it a solid backing, better than gold, actually. Thus, currency can be considered a tax credit.

However, this confidence could be established with a very low tax, for example a modest income or payroll tax. But actual tax levels are far higher in practice pretty much everywhere. Why is that? Speaking frankly, the main reason is that politicians do not realize the truth of what I just said — yet. They will eventually, but for the time being, they are convinced that they need to collect taxes in order to spend, just like a corporation or a gold standard government. They also think that they have to borrow money from the private sector if government spending exceeds taxes, which is also incorrect, as I have already pointed out.

Why Myths Matter

This chapter rounds off the story of the many myths that surround the field of economics. They are not a direct threat to survival, as are the aforementioned three flaws in economics, but they perpetuate inequality and corruption in politics. What these myths have in common is two things: a widespread belief, and a lack of empirical evidence. To review quickly, these myths include the following: a balanced budget is financially responsible; Householder savings are necessary for investment; the national debt is a great burden; governments have to borrow money from the private sector to finance deficits; government spending is inflationary; taxes are necessary to pay for expenses; inflation is caused by too much money in circulation. To these can be added the denial of the fact that the production sector would collapse without the government running chronic deficits to support the economy. How is it that these beliefs are apparently believed by politicians and the public when they lack empirical support? To answer this question, we should ask: who benefits?

The effect of most of these beliefs is to support the agenda of the wealthy patrons of politicians—minimal welfare expenses and minimum corporate regulation but no limits on military expenses or favorite “pork belly” projects, no wealth taxes and income tax cuts for the rich. It is clearly the wealthy elite that has an interest in promoting these myths. In this, they have been very successful, with the help of politicians and mainstream economists, who look the other way. Politicians should be serving the interests of their constituents and not their election campaign sponsors. Putting these myths to bed, and getting

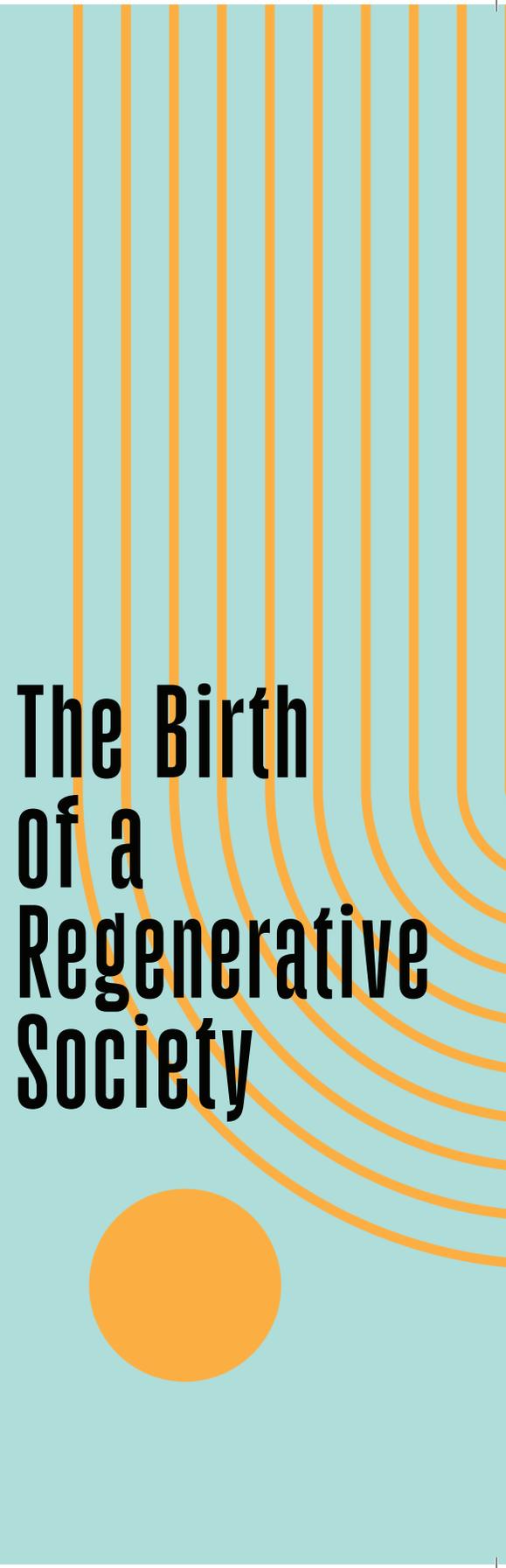
money out of politics, will be essential to the success of the regenerative society to be described in the second half of this book—THE GOOD NEWS.

Takeaway

Taxation is not necessary to pay expenses because the government has an unconstrained ability to spend its own currency without the need of tax income. Taxation should be used primarily for two things (1) forcing corporations to pay for social and environmental damage caused by production (2) controlling income and wealth distributions through increased capital gains and wealth taxes.



**The
Good
News:**



**The Birth
of a
Regenerative
Society**



Chapter I

Introduction

We don't know how the collapse will play out, so the way in which a regenerative society might emerge is very uncertain. It could take a long time – even centuries if there are waves of collapse and recovery. It could happen fairly quickly – in decades. There could be a major die-off due primarily to a catastrophic fall in food production and shortage of water. There might not be. Perhaps we will come through it relatively unscathed. Probably something in between is more likely. We just don't know. The situation is similar to the case from *THE BAD NEWS: The Economics of Collapse* where corporate debt increases inexorably when no government deficit is available. We know for certain that credit will cease at some point and the corporate sector will collapse, but we cannot say how and when it will occur.

CO₂ emissions will fall eventually, but it looks more and more like the fall will not be due to any governmental actions, which have been slow coming and inadequate to date. It is quite plausible that CO₂ emissions will first fall when increasing extreme weather events become so frequent, so violent and so widespread that international trade and industrial production will be disrupted catastrophically and irreparably. This aspect of the collapse is in line with what the authors of *Limits to Growth* wrote about as to how the collapse came about in most of their computer simulations: “The world system does not totally run out of land or food or resources or pollution absorption capability. What it runs out of is its *ability to cope*.” (Meadows et al., 2004)

While the details of collapse cannot be predicted with any accuracy, what is certain is that we are eating up our natural capital with no sign of letting up. Hence, the current civilization's days are numbered. As the UN Secretary General António Guterres said at COP 27, the world is “on the highway to climate hell with our foot still on the accelerator” (Wingate, 2022).

But there is a possibility of coming out on the other side with a new, more realistic vision based on a revised worldview that could lead to a long-lasting regenerative society. The essence of a regenerative society is that it is designed such that it will be around as long as the planet is habitable. We are talking millions of years. It will either emerge at some point or *homo sapiens* will go extinct like so many of our fellow creatures inhabiting the planet. So, in the following pages I am going to be an optimist and assume that it does emerge at some point and describe what I think are the values and structures in a regenerative society that can survive and thrive in the long run, with a ma-

for focus on the economic system, which I see as the most essential ingredient for success.

For starters, we have to assume rejection of the three flawed premises of the current economic system and put something else in their place. They were, as you may recall, (1) Ignoring the environmental and social “externalities” associated with production (2) *homo economicus*: the assumption that humans are solely motivated by self-interest and the pursuit of wealth. (3) Economic growth as the primary goal of society.

The three fatal flaws of current economic theory are all about the worldview of our society. How do we look at nature and our relation with it and with each other? This defines our worldview. It is not something that you usually discuss or debate, praise or criticize. Normally, it is just there, taken for granted more or less unconsciously. Every child just accepts that this is the way things are without question, and grows up with that worldview. One may not even realize one’s worldview until one is confronted with an alternative. According to physicist Thomas Kuhn, occasionally, in science, a major paradigm shift may occur when the old worldview is no longer working satisfactorily (Kuhn, 1962). In these rare times the appropriate worldview is a topic for discussion. As it becomes more widely accepted that our dysfunctional worldview was the cause of the climate and extinction crises, a paradigm shift will be inevitable. I think that, deep down, most of us are dissatisfied with the current worldview, even if we don’t say it out loud, because in our essence, we are trusting, loving persons who care about our fellow man, love being in nature, often feel lonely, and long to belong to a community of similar souls.

Ecological economist Herman Daly explained the fundamental problem with the worldview of contemporary society as getting the relationship with nature backwards (Daly, 1973). Mainstream economists treat nature as a collection of resources to be exploited, in a hierarchy with economics above and nature below. In a sustainable world the hierarchy must be reversed, says Daly. Nature must be supreme and economics just a tool, which can be used within nature’s limits to improve humanity’s well-being. The difference is crucial. Incidentally, Daly also made the interesting observation that we do not actually “produce” anything. We simply “transform” what nature has produced into forms more useful to us.

A regenerative society requires a new worldview that resonates with our fundamental essence. Otherwise, it won’t survive and thrive. This new worldview already exists and is growing steadily among millions of people all across the planet, but they are a small minority and without political influence at this time. I think the most fundamental difference compared to the current worldview is that Humankind is seen to be an integral part of nature, and not separate from it. The Earth is seen to be a living organism analogous to a human being. All parts, whether plants, animals or minerals, are seen as intimately interconnected and interdependent. No components of nature is considered superior or inferior to others, all being essential to the total organism. This emergent worldview is completely consistent with the findings of modern science, where everything is interconnected across the whole universe and nothing is separate. This has been scientifically verified by experiment and is known as “quantum entanglement” (Emspak, 2022). One of the most radical changes

in worldview will be the prioritizing of long-term survival above all else. Where the old worldview promoted material growth while degrading natural capital—even to the extent of endangering human survival—the emergent worldview will reverse priorities, downgrading growth for growth's sake and upgrading environmental protection and the preservation of natural capital.

Indigenous peoples all over the world have expressed a similar worldview for centuries. Native American Indian Chief Seattle expressed this worldview eloquently. A small excerpt of his speech to his conquerors is worth recalling at this time.

Every part of this country is sacred to my people. Every hill-side, every valley, every plain and grove has been hallowed by some fond memory or some sad experience of my tribe. Your dead cease to love you and the homes of their nativity as soon as they pass the portals of the tomb. They wander far off beyond the stars, are soon forgotten, and never return. Our dead never forget the beautiful world that gave them being. They still love its winding rivers, its great mountains and its sequestered vales, and they ever yearn in tenderest affection over the lonely hearted living and often return to visit and comfort them. (Smith, 1887).

This worldview will permeate all the institutions of the coming regenerative society that I will describe in the following chapters. In particular, the next three chapters will describe three of the major characteristics of this successor society that are a direct result of correcting the three fundamental flaws in current economic thinking.

Takeaway

The most important difference between the post-collapse regenerative civilization and the collapsing one will be the new worldview, which will reverse the old. Humans will be seen as an integral part of nature, eager to experience cooperation, community living and caring for one another while living within the limits of Nature.



Chapter 2

Regenerative Agriculture

The characteristics of regenerative agriculture include maintenance of soil integrity, no till, agroforestry, biodiversity, permaculture, no artificial fertilizer and no pesticides or herbicides. These practices can vary with the climate and site, but the end result is to bring back nature everywhere with proper care to the way it was intended to be.¹⁵

A necessary condition for survival that allows a civilization to continue indefinitely is preservation of the soil, which is the foundation of all life. Without healthy soil, life will die off sooner or later. Thus, a cornerstone and fundamental characteristic of such a civilization is *regenerative agriculture*, which, as the name suggests, regenerates the soil continually so its integrity is maintained and life can go on. It does this by treating it with care and returning to the soil the waste products of food production plus additional organic material from off-site. Soil is not just inert earth. It is alive, and is, in fact, a whole ecosystem beneath the surface consisting of billions of microorganisms that have evolved together for billions of years, providing the basis for the sustenance of all life. A gram of healthy soil contains up to ten billion of these cooperating microorganisms that are a farmer's best friends and actually do most of the work for him if he doesn't poison them.

The industrial agriculture system evolved under the "false premises" of the economic system. As a result of the perverse pricing of oil, it is systematically killing off healthy soil all over the Earth, contributing to poor human health, killing marine life with nitrogen runoff from fertilizer, and increasing CO₂ emissions, which threaten our very survival. The fundamental error that brought about this tragedy is *the failure of economics in practice to adhere to economics in theory*. By not considering the cost of five major environmental and social "externalities", industrial agriculture makes a massive and fatal misallocation of resources. If the proper indirect costs had been even approximately in place, our current society could have achieved an acceptable, if not optimal, allo-

15 For a dramatic visual experience of how it can be done, see the films *The Biggest Little Farm* and *Kiss the Ground*.

cation of resources allowing long-term survival based on regenerative agriculture, the only long-term solution. The costs that were not considered and assumed zero were:

1. **The intrinsic value of oil.** An important resource like oil should be available for all future generations and not just a few in the 20th and 21st centuries. By failing to charge oil extractors a hefty fee for accessing oil, way too much was extracted and it was grossly underpriced, which made its use to power farm machinery, to produce artificial fertilizer, for transportation and for developing pesticides appear cheaper than more regenerative farming, which became “uncompetitive” in the narrow economic terms of this perverse economic system.
2. **The intrinsic value of healthy soil.** There was no fee for farmers to permanently remove and destroy healthy soil with the use of pesticides and deep plowing, with the result that the amount of healthy soil was constantly being reduced. According to the UN’s Food and Agriculture Organization (FAO), one third of the globally available topsoil has already been destroyed due to chemical-heavy farming techniques, deforestation, which increases erosion, and global warming. If these industrial practices continue, we will lose the remaining two thirds within another 60 years, and by 2050, the amount of arable land per person will only be one quarter of what it was in 1960. (Arsenault, 2014).
3. **Abuse of organic wastes.** Due to the wrong pricing of oil, it has appeared to be cheaper to produce artificial fertilizer than to return organic wastes to the soil with composting. Healthy soil is one of most important sequesters of carbon if its integrity is maintained. The world’s food systems are responsible for more than one-third of global anthropogenic greenhouse gas emissions, according to a pioneering study published in *Nature Food* (FAO; 2021). Conversion to regenerative agriculture could reverse this process. According to the Rodale Institute — originators of the term “regenerative agriculture” in the early 1980s — “global adoption of regenerative practices across both grasslands and arable acreage could sequester more than 100% of current anthropogenic emissions of CO₂”. (Moyer et. al., 2020). There is thus a game-changing and life-saving potential in converting industrial farming to regenerative farming.
4. **Deteriorating human health.** We are only as healthy as the soil that produces the food that we eat. Industrial agriculture gradually kills off or erodes healthy topsoil with pesticides and runoff due to lack of green cover. More and more artificial fertilizer is needed to keep up food production until the topsoil is eventually all gone and the farm is abandoned. The problem is that the food produced with artificial fertilizer lacks the nutrients that would normally be present in healthy soil, so people tend to eat greater quantities of this “junk food” without satisfying their hunger, often resulting in obesity and other health problems.
5. **Erosion.** More than half of the nitrogen from artificial fertilizers washes away into groundwater and waterways, causing algal growth and lack of oxygen for marine life in lakes, rivers and oceans, which die off (Lassaletta et al. 2014). Runoff is exacerbated by the dying topsoil, which gradually loses its normal ability to hold water, contributing to “dust

bowls” and more frequent flooding with more unnecessary costs to society. Regenerative agriculture will, with time, be mandatory in the emerging society after the collapse. It will be driven initially by those idealistic pioneers that have demonstrated for decades that regenerative agriculture produces more and healthier food and is financially viable at the same time. It will become mainstream because of the broad realization that it simply makes sense if we want our species to survive in the long run.

Takeaway

Regenerative agriculture is the one form of agriculture than can last forever because it prioritizes nature’s own methods, including maintenance of soil integrity, no till, biodiversity, agroforestry, no artificial fertilizer and no pesticides or herbicides.

Chapter 3

Community Living

The presumption of *homo economicus* — that humans are solely motivated by self-interest — legitimized a society of individualists that competed with each other for more “stuff”. This led to overconsumption to the point that we are globally using 170% of nature’s annual yield, thus encroaching on the habitats of other creatures — forcing many into extinction — and converting nature’s healthy soil, air and waters into health hazards, death and destruction in a frenzy of self-indulgence and egoism that apparently knows no limits.

Post-collapse society is going to see a revival of communal living and an end to individualism, not for ideological reasons, but for survival reasons in a much lower energy world. It will become common to share various activities that are needed by all families, such as kitchens, bathing facilities, laundry facilities, workshops, and transportation. The idea that every family has to have all of these facilities will be seen as wasteful and obsolete.

Far more attractive for most people will be living in community with like-minded souls, cooperating rather than competing. This characteristic is built into our DNA through thousands of years of living experience. Cooperation was a key characteristic that enabled *homo sapiens* to become the dominant life form on the planet (Sahtouris, 2000). Cooperation was indelibly etched onto our minds for millennia through our cultural heritage, in our songs and poetry and wise sayings, most often from indigenous peoples. “Alone we go faster, but together we go further.” “A rich man is one who knows he has enough.” “United we stand, divided we fall.” “One finger cannot lift a pebble.” “No man is an island”. “The world has enough for everyone’s needs but not for everyone’s greed.”

The modern successor to the indigenous peoples’ tribal communities is the ecovillage movement (Jackson, 2004). The Global Ecovillage Network (GEN) has for over thirty years linked together tens of thousands of member communities — intentional as well as traditional communities — spread all over the globe, on five continents. (GEN, 2023). GEN’s sister organization, Gaia Education, teaches the four dimensions of designing sustainable communities — social, ecological, economic, and cultural (Gaia Education, 2023). There are millions of people alive today in myriad organizations in every country, whose worldview is aligned with GEN’s. Their values — held by millions of people across the globe — represent the values of the worldview of the coming regenerative society, but they are still a relatively small minority and without much influence on the mainstream.

Ecovillagers comprise that part of the more general regenerative movement that lives the vision out in small communities and teaches its principles to those who would learn in their region. Their role is also to mitigate the climate crisis with lifestyle change, and they typically achieve an ecological footprint of about 50% of the national averages (Daly, 2017). They adhere to organic farming in its various forms, and more and more are beginning to implement regenerative agriculture. Organic farming is an improvement over industrial farming, but is still monoculture and can be improved further with regenerative techniques.

Ecovillages will be logical places to go and to rebuild during the collapse. Many are off-grid, which will be a major plus. But ecovillages too will evolve. The early versions had some shared facilities but still consisted of individual homes with much duplication, far too much for a low energy post-collapse society. During the Ukraine/Russia war, many refugees from the cities found safe havens in ecovillages around the country (Volkova, 2022). Some ecovillages ballooned in size by several hundred percent, but nevertheless accepted all comers cordially, and put them to work. For many city folks, visiting an ecovillage for the first time has often been called “a life-changing experience” and this was as true in Ukraine as elsewhere. Some Ukrainians were so attracted by a lifestyle that they did not know existed, that they decided to stay on. Establishing centers for rebuilding was, in fact, part of the original vision back in the early 1990s when GEN was founded, when the founders foresaw the coming collapse, which was already at that time clear to anyone who looked seriously and objectively at world trends.

Ecovillages are very diverse. While visiting ecovillages in many countries over the years as a member of the GEN board, I have experienced firsthand that, despite the great diversity, the unifying factor is the common worldview, whether I was in Brazil, Russia, the U.S., China, Mexico, Thailand, India, Sri Lanka, Egypt, Japan, Germany, Italy, or Denmark, where it all started. It functions like one large family, regardless of skin color, religion, language, means or education. I think GEN reflects one of the most important characteristics of a community network — trust. Trust normally starts with your immediate family. In many cultures, it goes no further. In a well-functioning community, trust extends to all members of the community. In the coming regenerative society, trust will eventually extend to everyone, with what might be called “anonymous trust” because the worldview will be the glue that holds everything and everyone together. The acceptance of other humans regardless of their race, religion and skin color will be characteristic of the emergent worldview.

Community Structures

We don't know how destructive extreme weather is going to be, but it could be devastating, disrupting transport, food production and communication, and shutting down the normal functions of society in a major die-off. In such case, survivors may find themselves joining an existing ecovillage or having to build a small community from scratch. How should such communities be organized according to the emergent worldview when all infrastructure is gone in a region?

One of the first institutions to found is a Community Center, an embryonic government, with an elected leadership, which claims ownership of all land

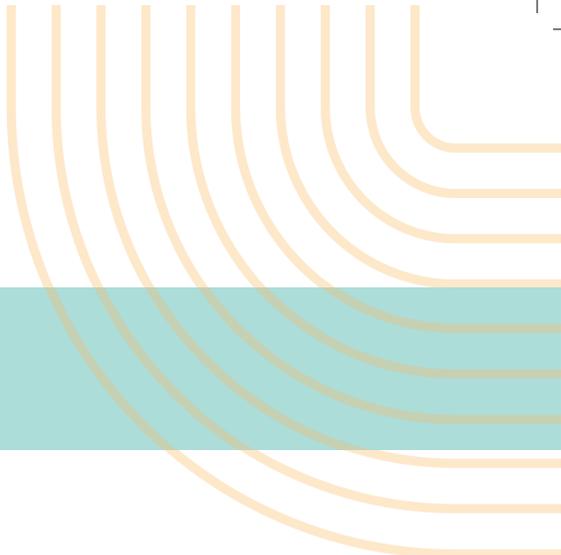
and other natural resources in the region in the name of community members. The next step is for community members to give the Community Center the exclusive right to authorize issue of a local currency via a Public Bank, having the roles of both Treasury (budgeting; spending money, banking activities) and Central Bank (issuing currency at the direction of the Treasury within a budget approved by the Community Center). The Community Center shall also have the exclusive right to demand payment of taxes. The Community Center should adopt a minimum guaranteed income to all members and authorize the issuing of corresponding fiat currency to start the ball rolling. Next, the Community Center should form a number of public utilities to manage (1) land use (2) water supply (3) defense (4) health services (5) energy (6) education. Community members should be hired (public employees) by the Community Center to run each of these public utilities as well as the Public Bank.

With money in their hands, members can now decide how to spend their money and consider how they will earn a living. Those interested in food production can rent a piece of land and get started as individual entrepreneurs. Those who want to start a business by investing in production facilities can apply for a loan. Others may offer personal services. Others still may be hired by a private enterprise or a public utility. The fiat money system could be digital (ideally) or with physical bank notes, depending on the situation.

Recalling the chapter on taxation, taxes are not necessary to pay for expenses, but only for affecting behavior or modifying after-tax income and wealth distribution. A simple system would introduce an annual progressive wealth tax to make sure the distribution stays within acceptable norms in an egalitarian community.

Takeaway

Living in community with like-minded souls, cooperating rather than competing, is built into our DNA over many millennia of indigenous peoples, and will be the norm in the future. Life will be far more decentralized, with myriad self-sufficient regional communities, structured for more maximum energy efficiency and firm control of public utilities serving the people.



Chapter 4

Well-being¹⁶

The third flaw in economic thinking that must be discarded is growth for growth's sake. As mentioned in the Preface, so-called "economic growth" has provided no net benefits to society for the last 50 years, while destroying the environment and extinguishing species as if there were no tomorrow. The coming regenerative society will adopt a more life-oriented goal — the well-being of citizens and the rest of nature. Rather than a single quantitative measure, progress will be monitored by a "dashboard" approach with a number of indicators of how things are going. This information will focus largely on the health of air, soil and water as well as human, plant and animal health.

The logic that drives the modern culture's focus on economic growth is the implicit assumption that greater economic growth leads to greater average income, which in turn leads to greater happiness and greater health. In foreign aid policy, the similar logic is that the way to eliminate poverty is by increasing average income in developing countries.

In a frontal attack on this deeply ingrained assumption regarding economic growth, two British epidemiologists, Richard Wilkinson and Kate Pickett, have shown that the facts falsify the theory. When all countries are compared, it turns out that happiness and longevity are unrelated to average national income. Contrary to mainstream economic thinking, beyond a certain minimum threshold, increasing income does not produce happier or healthier people. (Wilkinson and Pickett, 2010).

What *does* explain differences in well-being in the richer industrialized countries, is the degree of income inequality *within* each country, claim Wilkinson and Pickett. Countries with the greatest income inequality score worst on the authors' "Index of Health and Social Problems." The authors show that increased levels of inequality lead to an intensification of a whole range of social ills that affect everyone in society, including low levels of social trust; mental illness (including drug and alcohol addiction); lower life expectancy and higher infant mortality; obesity; poor educational performance; teenage births; homicides; imprisonment rates; and reduced social mobility.

While the results may seem counterintuitive at first, the explanation seems to be that an individual's perceived sense of self-worth is the most important determinant of both health and social problems. Well-being, in the sense of individual health and social satisfaction, should be understood as being due to relative rather than absolute conditions. In other words, the negative consequences of trying to "keep up with the Joneses" may be far more serious for our quality of lives than we have hitherto imagined. The authors write, "The view that social problems are caused by poor *material* conditions such as bad housing, poor diets, lack of educational opportunities and so on, implies that richer developed societies would do better than others. But this is a long way from the truth; some of the richest countries do worst." (Wilkinson and Pickett, p.82). It is the perception of low status and low esteem that encourages violence, obesity, teenage pregnancy, drug use, and so on; and it is the fear of it that drives consumerism, stress, longer working hours, and dysfunctional behavior in unequal societies.

As a corollary, "poverty" should be seen not so much a function of material possessions as a matter of perception of one's social status. If so, then the way to reduce "poverty" is not to increase average income, but rather to reduce inequality. Greater equality leads to greater self-esteem and improved quality of life across the whole spectrum. It also means cost savings! This alternative way of dealing with social problems and health has enormous budgetary consequences. For example, the United States spends between 40% and 50% of the world's total spending on health care (about \$6,000 per person per year), although it represents only 5% of the global population. In spite of spending more per person on health care than any other country, the United States has by far the worst score on the Index of Health and Social Problems. The explanation, according to Wilkinson and Pickett, is that the United States is also the most unequal society in the industrialized countries by a wide margin. More than any other country, the United States stands to benefit from a shift to a more equal society, resulting not only in better average health and fewer social ills, but in tremendous reductions in health care expenses and the costs of treating the symptoms of social dysfunction, such as prisons.

Dr. Paul Stevenson of the University of Winnipeg comes to similar conclusions, arguing that it is the causal link between capitalism and inequality on the one hand, and between inequality and social problems on the other, that is critical to our understanding of the role of the economic system in social breakdown (Stevenson, 1999). Citing dozens of studies on the subject, he identifies the single most important cause of inequalities to be the "private ownership of income-generating property." Unemployment is identified as a second important factor in social breakdown, and has in turn "been linked to increased rates of mental illness, suicide, homicide, divorce, heart attack deaths, stroke deaths, cirrhosis of the liver deaths, aggression, and so on."

In his comprehensive paper, Stevenson refers to a number of other studies, which link income inequalities to longevity and mortality rates, chronic health problems, occupational health and safety, stress, migration, family breakup, mental illness, higher death rates, higher unemployment rates, and higher incarceration rates. Furthermore, income inequalities correlate with a higher percentage of people receiving social assistance, smaller expenses per per-

son on education, higher rates of homicide, poorer healthcare, higher infant mortality, political repression, violence, the breakdown of democracy, and the criminal justice system's tendency to "weed out the wealthy." Stevenson also refers to studies indicating that "foreign investment in Third World Nations is consistently related to increased inequality among nations and within nations and generally related to lower economic growth and higher unemployment," contrary to neoliberal economic theory. The importance of these many studies is that they show the direct causal relationship between our current economic system and our social ills (Stevenson, 1999).

Given a regenerative society's focus on health, it follows from the above that both extreme inequality and unemployment will be avoided in a healthy society. In the following chapters, I will revisit the question of how these goals might be achieved in practice when we delve into the economics and the new national institutions, based on the lessons learned from *THE BAD NEWS with The Economics of Collapse*.

But first, it will be useful to review the international institutions from *Occupy World Street* (OWS) that I assume will exist as a complement to the national institutions, as these are an integral part of the total solution.

Takeaway

The assumption of contemporary society that economic growth leads to greater happiness and greater health has been falsified in several social studies. The post-collapse successor civilization will focus on the well-being of the great majority as the primary goal of society.



Chapter 5

International Framework

In this chapter, I will briefly summarize my suggestions for international cooperation and the corresponding international institutions that would be relevant for a regenerative society, adopted from OWS, where I called it a “Gaian” world, reflecting James Lovelock’s Gaia theory of the Earth as a self-regulating organism. (Lovelock, 1991).

The “Gaian World Order”

The overriding objective of effective global governance in a Gaian world will be to ensure survival of the human species. To achieve this objective in practice, it will be necessary to establish enforceable mechanisms that can ensure that global resource use is kept within the limits that nature can replenish — the very essence of sustainability. This can only be done if all nations cooperate. It takes just one major holdout to sabotage the whole endeavor and put all of humanity at risk. There is just no way to peacefully enforce regenerative policies unless everyone cooperates. In the Contemporary World Order, such cooperation has never been possible. Only partial and voluntary schemes have been tried, such as the Kyoto Protocol and the Paris Agreement of 2015. To date, all such attempts have failed to stem the tide.

A multi-polar world of many cooperating, preferably small, sovereign, nation states under a common umbrella of protection of the environment is the ideal structure in a regenerative world. I believe separate nation states with fiat currencies provide the maximum flexibility to adjust to shifting conditions via an exchange rate with a managed float. A single currency in too large an area will typically lead to vast differences in living standards due to regional differences. These can to some extent be neutralized by a sharing agreement among regions. Protecting the environment is not enough without specifying the human consequences of alternative methods. Here, in my opinion, citizens must insist on respect of the human rights of all world citizens, for example, as defined in the UN Universal Declaration of Human Rights.

To achieve these two conditions, a limited degree of sovereignty must be ceded by each nation to a global governance body, namely the right of this

body to issue enforceable directives deemed necessary to ensure the long-term sustainability of the planet and the observance of human rights in all member states. The former is similar in principle to the directives that the EU can currently issue to member states. All other aspects of sovereignty would remain with the individual member states. In this way, a flowering of diverse cultures respecting local preferences and priorities will be allowed to evolve within a structure that guarantees long-term survival and basic human rights. Such an overall structure is independent of ideology, and is rather dictated by two fundamental premises: sustainability and human rights. In principle, a sovereign country in this society could be anything from a socialist state to a capitalist state to a religious-based state, anything from a high-tech industrialized state to a low-tech primarily agricultural state, provided only that the ground rules guaranteeing sustainability and human rights are respected.

The Gaian Institutions

The three current international organizations — IMF, WTO and World Bank — were designed to project American interests unto the world and were effectively controlled by the U.S. and its allies. In their place, I suggest three new organizations along with five others to complete the picture, serving *all* the people and not just the interests of a particular group of countries. The eight institutions, and the primary function of each, can be summarized in the following paragraphs. These institutions are assumed to be founded by a member association, which I called the Gaian League in OWS, for the sake of reference.

The Gaian Trade Organization replaces the WTO for member states. Sovereign control over all trade (i.e. tariff policy, etc.) is necessary to prevent domestic member products from being undercut by non-member imported products of lower environmental standards, as well as for protecting sovereign priorities and preferences. Controls on capital movement are necessary for the development of comparative advantage industries in developing countries and to protect small country equity and currency markets from speculative capital flows, and will in addition free up some currency reserves for more productive purposes.

The Gaian Clearing Union is an institution that treats all currencies equally. It regulates and settles international trade without the use of any national currencies, based on a model originally proposed by John Maynard Keynes. The Clearing Union will reduce the likelihood of new financial crises, free up substantial funds now tied up in foreign exchange reserves and resolve the potential financial instabilities that could arise when one national currency (currently the US dollar) is used as the primary source of liquidity and foreign reserves.

The Gaian Development Bank — replacing the functions of the IMF and World Bank, and funded by the above-mentioned freed-up foreign exchange reserves — will finance real non-exploitative development in the Global South using strategic loans and grants to revitalize local communities, create employment and encourage local production of their most essential needs — food, energy, housing, textiles, etc. as well as value-added products, as they develop into regenerative states, while limiting population growth.

The Gaian Congress — an assembly of delegates appointed by Gaian League governments, is the legislative body of the Gaian League, whose resolutions define international law for member states.

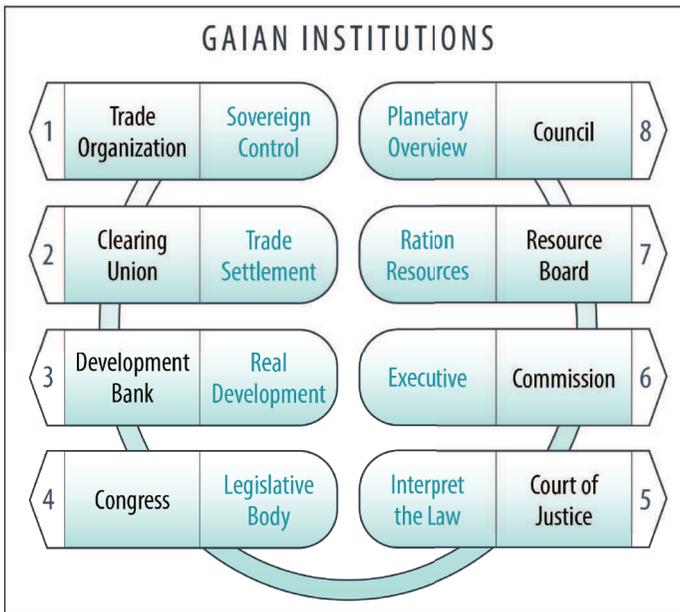
The Gaian Commission — headed by a Secretary-General — is the executive organ of the Gaian League, carrying out Congress resolutions and administering the Gaian institutions.

The Gaian Court of Justice is the judicial branch of the Gaian League, with the task of interpreting Gaian law.

The Gaian Resource Board is an agency under the Commission charged with administering resource use, both non-renewable and renewable resources. This is a necessary function for long-term sustainability.

The Gaian Council is a small elected council of “wise elders” with the power to overrule any Congress resolution or law not deemed to be in the long-term interest of the planet, and to mediate conflicts when requested.

The diagram below illustrates in schematic form the proposed institutions, which are more fully described in OWS.



Takeaway

The national economies of the emergent worldview are assumed to be embedded eventually in a cooperative international world order as described in *Occupy World Street*, including eight new institutions. All nations must cede authority regarding the environment and human rights to an international agency.



Chapter 6

Public Banking

The subject of this chapter is one of my most important recommendation to a regenerative society – replacement of private retail banks with public banks. This is absolutely necessary to prevent bank lending contrary to the public’s interest.

The corporate sector in contemporary Western market economies, particularly in the U.S. and U.K., generally considers the government as an inconvenient necessity that should be as small as possible and with as few corporate regulations as possible. A government cannot “pick the winners”, they say, and ought to leave private corporations alone. In minimizing government interference, the corporate sector has been quite successful. Unfortunately, this is why our society is in such deep trouble. The corporate sector has been allowed to evolve without consideration of its environmental and social side-effects, guided by a fatally flawed economic system. A continuation of these attitudes cannot be tolerated in a regenerative society that has survival as its first priority.

One of the most important conclusions of *The Economics of Collapse* section was the that the corporate sector is, in fact, 100% dependent upon the government’s willingness to prevent it from collapsing by running chronic deficits. Thus, corporations have no right to demand concessions or favors from the government. To the contrary, the public sector has the right to make demands upon the corporate sector. The corporate sector should be actively managed by the government in a regenerative society to avoid it getting us into trouble again, but without choking off innovation. This means that the state must be an active part of the corporate sector in any society that wishes to survive in the long run.

The major problem with the profit-seeking contemporary corporate sector is that it perpetrates the three mentioned “flaws” of the economic system. As a result of the flaw that increased wealth is the sole motivation of citizens, all of the decision-making power is invested in the formal owners, the shareholders. In a regenerative society, a broader definition of legitimate interest, including non-financial aspects, leads naturally to the concept of “stakeholder management”, where workers, the local community, environmental expertise and the state, all have some influence on corporate decisions along with the shareholders, through board participation and legislation.

The flaw that growth and profits are the primary objectives of private companies can be dealt with in the regenerative society by legislation that stipulates

that all companies have a social objective embedded in a company charter, including honesty and corruption-free dealings. Violation of the charter should lead to fines, jail, or, in the worst case, dissolution. Such charters were commonplace in 18th century U.S., but the practice was later dropped.

The flaw that financial decisions are made without regard to “externalities” can be partially managed by the “stakeholder management” function above, for example, as regards big decisions such as moving the company. But a more efficient, daily control, such as the control of interest rates and company specific “externalities”, calls for a new kind of institution — the Public Bank.

The Public Bank

In a regenerative society, a public banking system should control the credit given to private companies. This may seem drastic at first glance, but only because we are used to the current structure, where banks are privately owned, mostly for historical reasons. A counter question can be asked; Is there any good reason why banks should be private in the first place? After all, they serve what is basically a public function for citizens in providing first and foremost a safe and regulated payment system. A public bank would provide an absolute guarantee on customer deposits, while the current system puts depositors’ money at risk in case of a bank run, which was more common on the 19th century, but can still happen, as we saw recently with the Silicon Valley Bank collapse.

A second risk in private banking is a “bail-in” if a major bank gets into financial trouble. According to the American Dodd-Frank Act of 2011, in such a crisis, depositors’ money could be confiscated to cover the losses of billionaire speculators in financial derivatives, who get a higher priority (Dodd-Frank, 2010). This happened in Cyprus in 2013 under auspices of the EU.

A critical reason to have public banking is to remove the risk of another financial crash once and for all by separating the real (retail) and speculative banking sectors. In contemporary society, they were no longer separated after President Clinton revoked the 1933 Glass-Steagall Act in 1999. It was speculative lending by the retail banks that allowed the notional value of outstanding over-the-counter (OTC) derivatives to reach \$600 trillion at end of 2022, about 6 times the global GDP, like a ticking time bomb (BIS, 2023).

Background of Public Banking

The concept of publicly-owned banks has been around for centuries. Today, there are over 900 such banks globally with combined financial assets of \$49 trillion (Marois, 2022). They are quite diverse in terms of ownership, structure and scope of activities. They vary from very large state-owned (China, India) to small-scale municipally-owned, so it is difficult to generalize.

In recent years, there has been a global surge of interest in public banks for a variety of reasons. Many citizens, smaller companies and municipalities experience excessive gouging from profit-seeking private banks, but have nowhere else to go. Their frustration is compounded by their reluctance to being associated with the corruptive practices permeating the banking system. Finally, the idea is reinforced by the many positive contributions of public banks.

In the U.S., the Public Banking Institute is an NGO that has been arguing for more public banks in the U.S. for many years, often referring to the stellar record of the one state-owned American public bank, the Bank of North Dakota (BND), which has been around for over one hundred years. BND has made a profit in every single year since its founding, surviving not only the depression and WWII, but all the other financial crises since, including the “dot.com” crisis of 2000-2001 and the “subprime loan crisis” of 2008 (Brown, 2013). This is due to its focus on prioritizing the needs of the local economy and its refusal to support speculative activities. One factor that has held back the founding of more public banks in the U.S. has been the lack of a legal framework within which to work. However, legislation that would provide such a framework is currently under consideration in the U.S. Congress. (HR 8721 introduced by Rashida Tlaib and Alexandria Ocasio-Cortez in October 2020).

The advantages of a public bank compared to a private bank are numerous. Perhaps the most important single advantage of universal public banking (i.e. including *all* retail banks) is its ability to protect the environment through its lending and taxation policies. This is critical for our long-term survival in a regenerative society, and overcomes a major weakness with the current economic system, which operates on a for-profit basis, ignoring off-balance-sheet environmental and social “externalities. When I use the word Public Bank, I am referring to the network of public banks under the overall supervision of a Central Public Bank. Individual public banks could be national, regional or local. The Central Public Bank can determine interest rates directly by its lending policies, using different rates for different companies. There is therefore no need for the government to issue interest-bearing government securities to determine interest rates as is done today. Polluting companies would have higher interest rates and higher “externality” taxes than others to compensate for the damages they cause to the environment. Companies, which offered services of great value to society would have lower interest rates and taxes, perhaps even negative rates in some cases.

Just as important would be the focus on the real economy, particularly the local economy for smaller public banks like BND, and an outright rejection of enabling any pure speculative activities. A public bank has the general interests of the citizens and the local region first and foremost, as opposed to the pure profit motive of private banks. A public bank could support climate mitigation and other regenerative initiatives that private banks would shun. Universal public banking can also eliminate the domestic national debt (both narrow and broad definitions) once and for all, as I will show shortly.

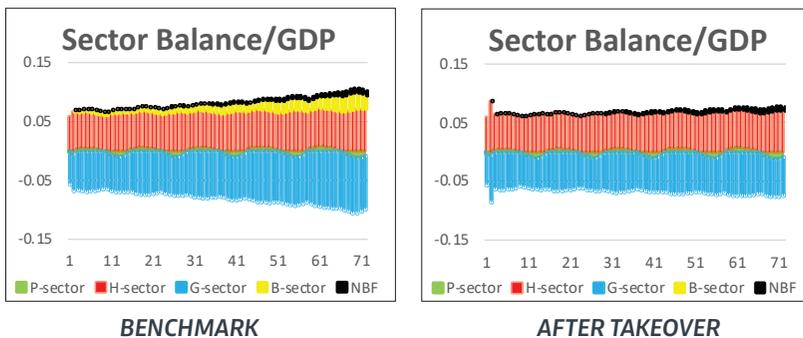
If the regenerative society emerges while remnants of the private banking system still exist, my recommendation of how to separate the real and speculative economies would be to convert all retail banks into public banks, and let the Non-Bank Financial sector carry on without any credit from public banks for any kind of gearing and no enabling of financial speculation whatsoever. This policy will essentially “take the oxygen” from the naked derivatives market that is the major source of financial risk, and will pretty much eliminate the possibility of more financial crises. There would no longer be any need to save failing financial institutions. None would be “too big to fail” because all such speculative institutions would be cut off from the real economy and their failure would not present a systemic risk. The public banks can provide the needed

financing for any real economy covered derivatives where required. The NBF will be limited to ungeared speculative activities such as money market funds, asset management, insurance, ungeared hedge funds and pension funds that together present no systemic risk to the real economy as they would no longer engage in gearing with the help of the retail banks.

Perhaps even more important for ordinary citizens, public banks will provide all citizens and corporations with deposit accounts that are guaranteed without limit by the state. This makes a lot of sense from the point of view that real economy credit and payment systems ought to be public utilities serving society and not a profit-making business that mostly benefits the already wealthy. To be truly successful, *all* retail banks should be made public. Otherwise, the unconverted will simply get all the speculative business and the risk of a new financial crisis will be unchanged.

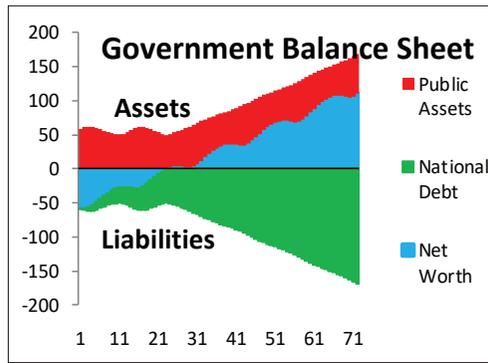
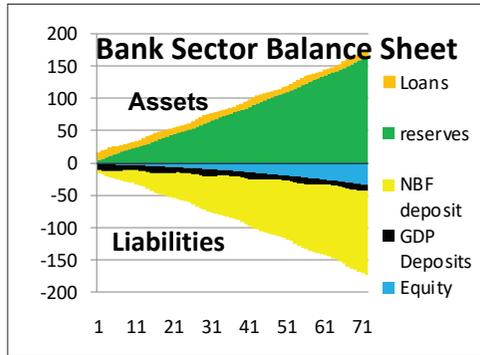
Furthermore, if remnants of the private banking system still exist in a regenerative nation, than my preferred solution would be a “big bang” alternative where legislation requires the government to take over all retail banks on a particular date based on their book value, and with a proviso that the sales proceeds are partially held in escrow until the speculative positions are gradually and safely unwound. Any losses on these positions would be borne by the sellers. This reform will eliminate the risk of financial speculation in derivatives affecting the real economy.

In the charts below, I show the effect on the sector balance of my Benchmark scenario and a “big bang” takeover of the deposit-accepting retail banks by the government in year 1. Effectively, the government is simply integrating the B-sector into the G-sector, incorporating the B-sector surplus and thus reducing its deficit accordingly. Note especially that all interest payments on the national debt now accrue to the government rather than to domestic elites via their bank ownership.

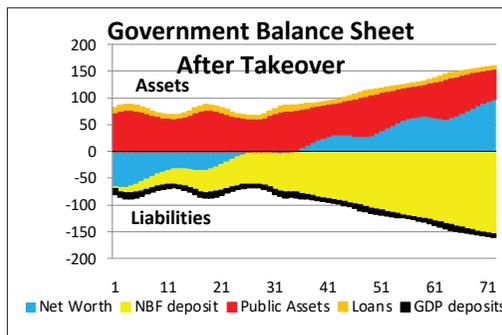


Eliminating the Domestic National Debt

Prior to the “big bang” establishment of The Public Bank, the balance sheets of the Bank-sector and Government-sector in the Benchmark scenario were as shown below in my model simulation. Note my assumption about the national debt that, for clarity, all government securities have been converted to Reserves in a liability swap. It is further assumed that any foreign-owner dollar balances are sold on the foreign exchange market.



After the government purchases the retail banks, the national debt disappears from the consolidated balance sheet as the Reserves (Bank asset) and national debt (government liability) cancel out (provided The Central Bank owns The Public Bank network). The national debt (broad definition) is eliminated entirely. This will come as something of a surprise for most people, and emphasizes that the national debt was never a burden in the first place.



A sovereign country able to issue its own currency and having a universal public banking system need not have any domestic national debt, even when running a deficit. Rather than creating a debt liability, a deficit would be reflected in a

decreased net worth, which is a meaningless accounting item without any practical consequences, as the government can always pay its obligations without limit. Thus, in such a case, running a deficit no longer has any meaningful consequences for the government. However, it will have the same consequences as before for the Householder and P-sectors as regards their increased surpluses, and will affect wages and prices. It should be noted that this is only true if public banks are universal, i.e. no private retail banks exist anymore. If some retail banks remain in private hands, then there will still be a smaller national debt liability equal to the Reserves on the private retail banks' balance sheets plus any Treasury securities outstanding, much like today.

Strictly speaking, the national debt will only disappear from the balance sheets in a universal public banking system if The Public Central Bank is the public entity that owns The Public Bank and the two balance sheets are consolidated. If The Public Bank is a subsidiary of the Treasury or an independent public entity, then the effect is the same but there will remain a Reserve liability in The Public Central Bank and an equal and opposite Reserve asset in The Public Bank. So, there is still a "national debt", but it is nothing but an accounting entry without any significance, since the national debt is both owed by and owed to the public sector.

Note also that conversion of the retail banks into the public domain has no effect on employment, output, investment, wages or prices, but is simply a consolidation of two legal entities resulting in balance sheet adjustments. Of course, even in a universal system, individual public banks will still have a need for an account with The Central Public Bank in order to manage their liquidity needs. This can be handled very easily by each public bank having a credit line with The Central Public Bank, which can be in debit or credit at any particular time, while the net balance for the whole sector will always be zero. The Central Public Bank no longer needs to use open market operations to affect interest rates and there need not be any Treasury Bills or bonds in the domestic market. The government may wish to retain Treasury securities or establish special interest-bearing accounts exclusively for foreigners in order to help manage its foreign exchange rate by adjusting the interest rate as required for stability. The government could also issue Treasury bills to the domestic public if it wished. These Treasury bills would of course create a new national debt (narrow definition), but they are not necessary.

Regional Currencies

Public banks can create a veritable renaissance of both rural and city living with the introduction of effective regional currencies once The Central Public Bank has been established. I say "effective" because local currencies have been around for quite some time. Where they have been implemented, they have had the desired effect of stimulating local trade and jobs, but they have never had an impact outside of a few small communities because of various weaknesses. One limitation has been a total lack of support from local governments or profit-oriented local banks. Another is the dependence often on a single local player, who issues the currency, but does not have the capacity to scale up. Many such systems were based on trust and were sabotaged by a single corrupt

person. Others ran into problems with the tax authorities who looked upon the initiative as a tax avoidance scheme.

However, with a universal public banking system, a totally new possibility opens up. Regional public banks, like the well-known case of the Bank of North Dakota, mentioned earlier, are focused on supporting their local communities. To facilitate this objective, they can make regional currencies a success and scale up like no one before them could or would do.

My suggestion to a regenerative society is that regional public banks issue a second kind of currency, which can only be used in a particular region. Historically, such local currencies are typically given a name associated with the region. Findhorn ecovillage in Scotland has had a local currency called “ecos” for decades. So has Damanhur ecovillage in Italy. Theirs is called the “credito”. In my proposal, the local currency is issued by the nearest public bank by establishing special deposits in parallel with the national currency. Deposits are backed by a Central Bank guarantee just like the national currency. I envisage that they can be issued in two ways, “participatory budgeting” or individual loans/grants.

Participatory budgeting is a well-known process whereby citizens in a particular municipality participate in decisions regarding spending a portion of their municipal budget (OECD, 2022). The earliest known example was in Porto Alegre, Brazil, in 1989. There are over 3000 such examples today.

A regional common pool of local currency can be established by the regional government in cooperation with the public bank to be used for participatory budgeting projects with the approval of the regional administration. Both citizens and the region can suggest projects. To this end, the citizens of the region must organize themselves into one or more entities that can vote on and implement projects and work with the regional officials. Moneys that are allocated can only be spent with persons or firms that have local currency accounts.

Any person or firm that is willing to accept local currency for services performed or products sold can apply for a local currency account. Only persons that receive the local currency in this way can spend them. One of the key purposes of the arrangement is for people without work or who wish a degree of independence to set themselves up as self-employed, offering services to the local community. There would be no taxes for participants and no profit motive for the bank. Local currency should be seen as a public service offered by a servant leadership with the purpose of improving the lives of its citizens. It is very important to get food and energy providers on board, e.g. the local grocery, in order for citizens to have a way of spending their local currency income. The grocery would be incentivized to buy local food from local farmers and fishermen and to pay employees partially in local currency. The public bank should also make local currency loans to service providers in order to get some currency circulating. Money exchanging between the local and national currency is likely to be one of the services offered by entrepreneurs.

Once the system gets rolling, I am convinced that each region is going to see an amazing increase in local activity and job creation, with less and less dependence on importing goods and capital from outside the region, with local food and local energy being the key. The citizens will experience a renewed sense of community with many people participating and creating together a cleaner,

more dynamic and enjoyable place to live. The young people will have a good reason for not fleeing to the nearest city. There can be many variations to this theme. Only the imagination limits the possibilities. Regarding the size of a region, there is no firm rule. It should probably not be too small nor too big, but only some experimentation can determine what is best. Some, who have experimented with local currencies, believe that 3000 participants is a rough lower bound for success. There doesn't necessarily have to be a public bank in every currency region. A larger regional bank or even a national bank could easily handle several currency sub-regions. The system should work equally well in city neighborhoods, towns and small rural communities.

Takeaway

The most important single economic reform suggested for a nation of the emergent regenerative civilization, assuming that private banks still exist there, is the nationalization of all retail banks into public banks, which can thus assure guaranteed deposits and no more financial risk from geared speculation, while introducing environmental and social responsibility through its lending and taxing policies to the corporate sector and through the implementation of stakeholder management.

Chapter 7

Regenerative Economics

What would the economy of a regenerative civilization — with the values and worldview I have outlined, and that could last for millions of years — look like? Clearly, such a civilization could not use up more physical resources each year than nature could regenerate plus whatever could be recycled from finished products. This would seem to put an absolute limit on total consumption eventually, which would in turn put a limit on the size of the total population for a given level of consumption per capita. Thus, a key characteristic of this society would be population control. The macroeconomic model for the economy would be quite different from the one that I developed for the contemporary economy, and much simpler. With no involuntary unemployment, there would be no need for a Phillips curve relating wages and employment level and no need for an employment level equation as the number of equivalent full-time employees would be fixed. An adaptation of my model, but without differential equations, is straightforward.

I assume that the economic system will be a market system (capitalist, if you like), because private innovation will continue to be a source of human creativity and advancement, but with the production sector under tight control to avoid a repeat of the disastrous resource allocations of contemporary society. The sector balance matrix and corresponding balance sheets will still apply. The sector balance equation is unchanged. This means the real wage growth rate is proportional to the labor productivity growth rate, α , as before, and that wages and prices follow their same long term growth rates but without the short-term cycles, namely:

$$\frac{1}{1 - \omega} \alpha \text{ and } \frac{\omega}{1 - \omega} \alpha \text{ respectively.}$$

Some new variables must be introduced:

- R: the total amount of regenerative resources available (forests, vegetation and living creatures).
- δ : the annual yield on the regenerative resources as a fraction.

- u: The regenerative resource productivity (tons final goods/tons regenerative resources)
- Y: Total production (= total consumption)
- f: The fraction of finished product (Y) that is recycled (primarily minerals). Then:

$$Y = (R \cdot \delta \cdot u + f \cdot Y) \text{ or } Y = R \cdot \delta \cdot u / (1 - f)$$

and the workforce required (number of equivalent full-time employees) is:

$$L = \frac{Y}{a}$$

where a is labor productivity, i.e. $a(t) = a_0 \cdot \exp(\alpha \cdot t)$ as before. For a while, this society can increase total production by improving the four variables in the production equation. These can all be increased with imagination and research, but only to a limited extent, and I would expect a plateau to be reached eventually.

Consider recycled non-regenerative resources. The volume of these available can be increased immensely relative to contemporary practice, which prioritizes quick obsolescence and throwing old products in a landfill rather than repairing and recycling. This contemporary practice may maximize profits, but it depletes natural capital. In a regenerative society, natural capital (including land) will be too precious to waste, and will be owned collectively as a matter of survival. Commercial interests wishing to use any form of natural capital will have to rent it just as they might rent office space today. And like office space, they will put down a deposit and be obligated to take good care of it and return the nature in the same condition as it was received. This system will incentivize commercial producers to prioritize durability as opposed to the current practice of planned obsolescence. Services requiring durable products or production facilities (energy, cars, washing machines, rugs, etc.) will be leased “as a service” and the materials recycled to the maximum degree. It is primarily a question of *design* to maximize the amount that can be recycled. Ideally, it should be possible to get close to 100 % recycling of non-renewable materials with proper design. Would this society mine the moon and mars for minerals? Perhaps. All of these things are speculative, but it is quite conceivable that they could establish a quite advanced yet regenerative civilization within these restrictions.

The yield, δ , on regenerative nature can be increased by research and better design. For example, the type of trees and plants and animals and how they are managed can be optimized.

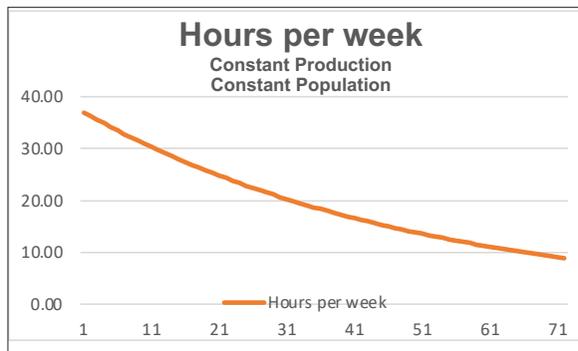
The amount of forest coverage is also a variable that can be increased by various means. In the long run, this society might, after maximizing the surface forest coverage, consider moving some of its cities underground in order to increase forest cover, production and the standard of living even more.

Finally, the resource productivity parameter, u , can also be increased by research just as labor productivity has been increased in contemporary society. Would they discover ways to increase the effectiveness of photosynthesis and other natural phenomenon to increase the yield? Only time will tell.

Eventually, total production will most likely level off (barring extraterrestrial resources). Labor productivity has not, until now, shown any such limit, but I

suspect it will eventually. In any case, this society will face the following policy decision. Should all citizens be required to work full time, in which case the population would have to decline and would be equal to the workforce in size. The relatively few citizens in this case could become exceedingly rich in terms of per capita consumption.

A more likely solution would be to allow the population to be larger than the minimum necessary, and let people on average work only part time and accept a lower consumption per capita than in the first case, while having a guaranteed minimum income. Part-time jobs would free up lots of time for leisure and cultural activities and voluntary work. The population that could be supported in a regenerative society would probably be much smaller than today but could have a comparable or even higher standard of living eventually and could be quite technologically advanced.



The Carbohydrate Economy

The emerging regenerative society will restore healthy topsoil across the planet and increase forest cover to its maximum as an early priority. Having a much smaller population than today, this will mean that food production will be but a small fraction of a much larger biological production than we have today. Assuming fossil fuels are outlawed or strictly rationed, and the extraction of further minerals strictly rationed, this massive non-food biological production will be the main source of material for products. This society will of necessity become a carbohydrate economy.

Less than 200 years ago, all industrializing societies were carbohydrate economies. In 1820, Americans used two tons of vegetables for every ton of minerals. Plants were the primary raw material in the production of dyes, chemicals, paints, inks, solvents, construction materials, even energy. Then, everything changed due to perversely cheap oil. By 1975, not a drop of ethanol was in our nation's gas tanks. Indeed, industrial ethanol was made from petroleum. Bioplastics disappeared. Mineral oil inks replaced vegetable oil inks. Americans used eight tons of minerals for every ton of vegetables. (Morris, 2006).

The coming regenerative society will revert to carbohydrates, which are cheaper and just as effective, and ban the burning of fossil fuels, with few exceptions. Energy will be produced from solar, wind, hydro, nuclear and wave

power (maybe fusion?), but supplemented locally by ethanol. Ethanol production functions best in small regions, using as raw materials organic waste and sugar-rich non-edible plants. Ethanol is quite versatile and can be used for heating, electricity and fuel. The left-over mash is an excellent organic fertilizer. Ethanol production will be a natural source of cooperation among regenerative agriculture farmers, who can jointly run an ethanol plant, providing local organic inputs to create fuel, electricity or heat and using the resulting fertilizer on their fields. It is quite plausible that we will see a revival of the very successful Danish cooperative movement of the 19th and early 20th centuries, where local farmers jointly owned the means of local food production, in particular, dairies and slaughterhouses.

There are two particularly promising inputs to ethanol production. Where water is nearby, seaweed such as kelp is an ideal source of ethanol for several reasons, especially in “dead zones” (no oxygen) caused by nitrogen runoff from industrial farming. Kelp requires no fertilizer and grows up to 30 cm. a day. It sequesters 6.7 tons of carbon per acre (Graber-Stiehl, 2017), absorbs nitrogen and phosphorus from the water, cools the water and produces oxygen, allowing plankton, krill and other marine life to make a comeback, and restores clean water (Blume, 2007).

The mesquite tree grows in arid areas with poor soil and has pods with up to 50% sugar, ideal for ethanol production. It is nitrogen-fixing and does not need fertilizer. Its roots can reach 30 meters depth. It has enormous potential in Africa and the southwest U.S.

Takeaway

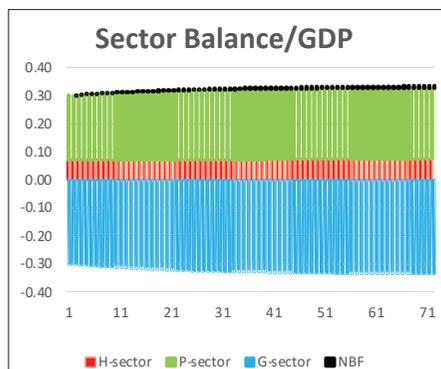
The successor economy, which must respect Nature's limits, will be characterized by limits on production and population. With limits on fossil fuels and mining, products will be plant-based in a carbohydrate economy, and the economy may well have a smaller population and a high technological level.

Chapter 8

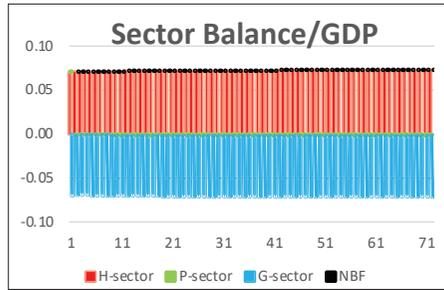
Income and Wealth Distribution

I assume that the successor society will be made up of sovereign states with their own national currencies and a floating exchange rate regime. I assume further that they would follow my advice to convert all retail banks to public banks, thus removing the potential for geared financial speculation as well as eliminating the domestic national debt and providing an institutional framework for controlling the excesses of the production sector. They would also be aware of the fact that taxation is not necessary for income purposes, but rather is a useful tool to regulate citizen and corporate behavior and the distribution of income and wealth. In this chapter, I will show how the desired income and wealth distributions can be realized.

I first ran the model without any taxes of any kind, which naturally produces a very profitable corporate sector and a public sector with a large deficit.



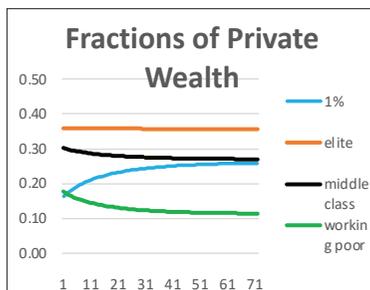
To bring the P-sector under control, I then introduced corporate and NBF taxes such that their sector balances were roughly zero. This required a tax rate of 90% and resulted in the sector balance chart below (note the different scale), where the deficit is reduced from roughly 33% of GDP to roughly 7.5% corresponding to Householder savings.



I could have accomplished the same result by introducing some personal income taxes and having a lower corporate tax. There is no unique solution. The next problem is to find wealth and income distributions that this society would like to see. I assume there will always be some income differences due to different competencies in a society with a free market system. The task is to find a tax regime that can result in the desired after-tax income and wealth distributions. To demonstrate the methodology, I will assume the same four income groups as before with pre-tax incomes per capita and wealth per capita for a fairly unequal country relative to the Middle Class, along with this society's desired distribution.

	Actual Distribution Per Capita	Actual Distribution Per Group	Target Distribution Per Capita
1% (1%)	16.0	0.16	4.0
Elite (90-99%)	4.0	0.36	2.0
Middle-Class (60-90%)	1.0	0.30	1.0
Working Poor (0-60%)	0.3	0.18	0.5

Without any income, capital gains or wealth taxes, these assumptions yield the following relative changes in wealth for the above scenario. The 1% gains wealth relative to the other groups while the Middle Class and Working Poor lose wealth relative to the other two groups.



We can now adjust wealth, capital gains and income taxes for the four groups by trial and error and try to achieve the desired target ratios at the end of the period. Again, there is no unique solution.

After some trial and error, the results were: no income and capital gains taxes on incomes below the 90% fractile, and wealth taxes only on the 1% and Elite at 4.5% and 1.0% respectively.

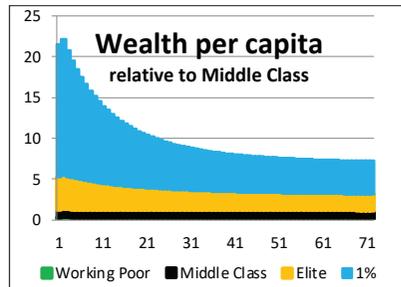
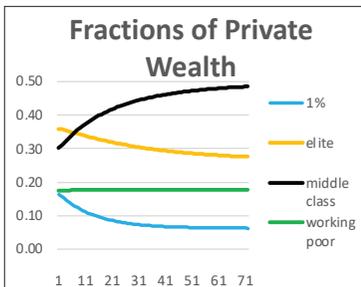
For income:

	Income Tax Rates	Capital Gains Tax Rates	Target Distribution	Realized Distribution
1% (1%)	0.720	0.720	4.0	4.0
Elite (90-99%)	0.475	0.475	2.0	2.0
Middle-Class (60-90%)	0.000	0.000	1.0	1.0
Working Poor (0-60%)	0.000	0.000	0.5	0.3

For wealth:

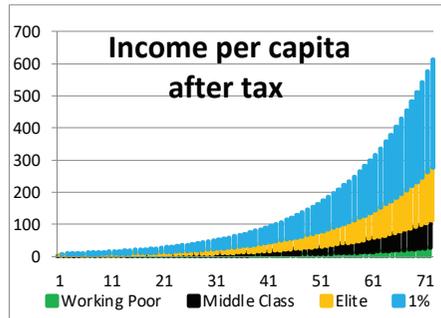
	Wealth Tax Rate	Target Distribution	Realized Distribution
1% (1%)	0.045	4.0	4.0
Elite (90-99%)	0.010	2.0	2.0
Middle-Class (60-90%)	0.000	1.0	1.0
Working Poor (0-60%)	0.000	0.5	0.2

With these taxes in place, the distributions change radically.



The 1% and Elite proportions decline relatively while the Middle Class makes major gains. Unfortunately, the Working Poor, even with no taxes, cannot realize the target level of 50% of the Middle Class. Its wealth is so small that it cannot be seen on the chart. The only way this can be rectified in this case is to legislate a special welfare transfer to the Working Poor, perhaps in the form of a minimum guaranteed basic income.

Incomes continue to increase in absolute value due to inflation, but it should be remembered that the population and production of this society – once mature – is constant as must be the average consumption in tons per capita.



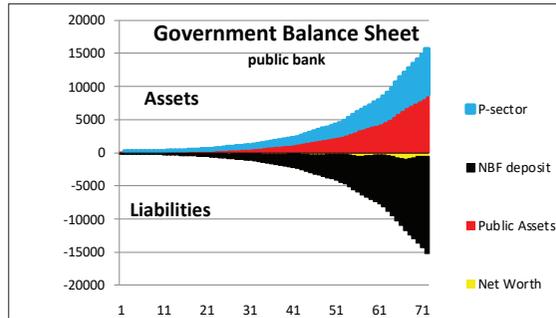
Consumption per capita will vary with the income of each group, which includes welfare payments, which were assumed to be the equivalent of 5% of total wages distributed equally to all, which favors the Working Poor, who subsequently do better on relative consumption than on relative wage income, but still below target.

Relative Consumption Per Capita
3.22
1.92
1.0
0.35

This income and wealth distribution exercise illustrates the way tax policy *should* be used – not to pay for expenses, because that is unnecessary in a sovereign state with its own currency.

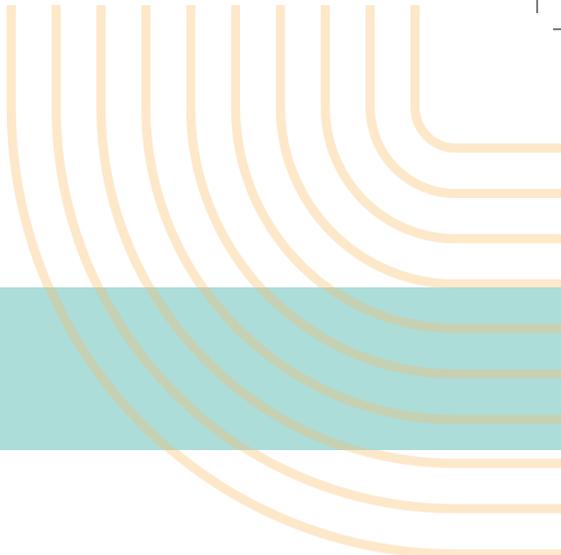
An interesting twist in this exercise was the realization that the wealthiest groups did not have enough cash (in the form of savings lent to the NBF-sector) to pay their taxes. They could, of course, sell their equity holdings, but this could disrupt the stock market, so I assumed they would deliver equity at book value to the tax authorities to supplement the cash. This resulted in the public sector

acquiring an increasing portion of the P-sector, as shown below – ending with about 17% of P-sector equity after 72 years. This would give the public sector an even firmer hold on the corporate sector, with direct board participation.



Takeaway

A major innovation in the new economy will be the control of income and wealth distribution to meet the accepted norms agreed upon. This will be necessary for maximum well-being as well as to get broad backing for government policies in an economy of limited production.



Chapter 9

Politics

The international institutions of Chapter 5 (from OWS) left the national political/economic structures up to individual nation states, provided only that they ceded sovereignty regarding major environmental issues and human rights to an international agency in order to assure long-term survival of the global civilization. There is thus room for many different solutions to the political structure at the national level in my model.

The overriding goal of promoting citizen well-being in the new worldview suggests a strong relationship between political leaders and citizens. A democratic society is the first that comes to mind. However, a closer look at the way democracy has functioned in practice in the contemporary world is not encouraging. A small number of nations have had fairly good experience with democracy and well-being, for example, the Scandinavian countries' welfare state concept, aided perhaps by their historic traditions of cooperation and community. But for the most part, the results have not been good. Among the largest democracies, for example, the U.S., the U.K., India and Brazil, the well-being of citizens has not been a priority. Frankly, citizens of these countries and most other smaller democracies have been to a great extent left on their own, characterized by poor health care, education and unemployment benefits compared to the Scandinavians. Instead, the political leadership in these countries has been closely aligned with the interests and worldview of the wealthiest families and their businesses. This suggests that the regenerative society should develop a new political structure with the opposite characteristics — a close alignment with citizens and a more arms length relationship with the business community and the wealthiest segment. The previous chapter on controlling wealth and income distribution goes a long way toward achieving this goal, but it is not enough on its own. Democracy, as practiced until now with elections every four years or so, does not seem to be the best solution as there is too big a divide between citizens and politicians. Is there an alternative way that democracy might be practiced?

Pyramid Democracy

I would like to suggest for consideration an idea that might have a better chance at creating real democracy in a regenerative society with its new worldview. For such a society, having a major focus on thriving local communities,

it would be natural to develop a form of political structure that was local-based. Therefore, my recommendation — that I will call “pyramid democracy” for the sake of reference — is founded on a broad global base of persons elected by the small communities in which they live of, say, about 500 persons (with flexibility for local conditions), whether they be in the country or the city. 500 people is about the maximum number you can realistically know personally. The person elected would be the political representative of 500 persons in the pyramid system and would be known personally for his/her stellar qualities. These “level 1” representatives would then elect one from their midst to represent them in the larger local community of about 5000 persons (again with flexibility) of which they are part, in a “level 2”. These “level 2” persons would similarly then elect a person from their midst to represent them in “level 3” of roughly 50,000 persons. Similar for “level 3”, “level 4” (500,000), “level 5” (5 million) “level 6” (50 million), “level 7” (500 million) etc. with the usual caveat for local conditions, such as cultural borders, language borders and watersheds. There would be order of magnitude ten representatives at each level. They would comprise the political leadership for their region, a “cabinet” with an elected leader, who would also represent them at the next level. For example, in a country of approximately 5 million, level 4 would comprise a political “cabinet” of about 10 persons, each representing a major region of about 500,000 people that would elect the nation’s leader from their midst. The same would be true all the way up the pyramid to the global leader and a global cabinet. This would put an end to the phenomenon of professional politicians that progress up the ranks based more on loyalty than competence.

An important rule I would recommend is that any representative at any level can be removed from office, not only by those representatives who elected her/him, but also by the 500 or so local people that elected the person originally, with a 2/3 majority. This should prevent a person from becoming corrupt or diverting too far from acceptable behavior or being captured by some commercial interest.

Each level would have responsibility for the institutions appropriate to the administration of the region. There are clearly a lot of practical questions that would have to be resolved, and a lot of gaps to be filled, and I won’t attempt to go further at this point, other than to say it could be tried out at the national level only initially, and the international structure be based on nations large and small meeting as is done today.

Would this structure result in a better form of democracy than today? We won’t know until it is tried. But, it could hardly do worse than the contemporary world of democracies that in most cases are, in reality, alliances between elected politicians and for-profit business interests.

Ethical Council

Corruption is another major problem in every country today, democracy or not, undermining citizens’ trust in their leaders. My recommendation to deal with corruption is to create a second pyramid structure parallel with the first, with the same election procedure, but for an Ethical Council representative. The primary role of these representatives would be to root out corruption whenever

and wherever it appears. They should have the right to sit on the board of any corporation or public entity of appropriate size in their regions. They should have wide powers to suspend individuals from their jobs, to recommend legal action against a company or an individual and to advise both governments and civil groups on ethical matters of general interest. Each local community elects its most honest, high integrity individual to this prestigious position.

This dual political structure combined with the progressive wealth tax of the previous chapter should enable the regenerative society to have an excellent chance of achieving its primary goal of citizen well-being.

Takeaway

A new dual political structure, including an ethical council, is suggested to replace traditional democratic elections, which led to alliances between politics and wealth to the detriment of citizen well-being. The pyramid structure proposed is local-based from top to bottom, such that any politician can be removed at any time by those who voted for him or her.



Chapter 10

The Role of Artificial Intelligence.

A.I. is going to have a major impact on human culture in the future and will undoubtedly affect the transition to a regenerative society, though in ways we cannot confidently foresee at this time. For this reason, I include a few comments on the subject. We do not know where A.I. evolution will lead us at this stage. There is no doubt that many programmable jobs will be replaced by robots and labor productivity will increase substantially. There will be some surprises on who becomes redundant. I am personally more concerned with the danger of A.I. as advisers or decision-makers regarding important decisions with social impact.

One aspect of A.I. that has not been a major subject of debate to date is the question of the value system behind any advice that might be given. This is especially relevant in the case of this book's subject matter, as I am predicting a major shift in worldview after the coming collapse. Seeking advice from an A.I. that has been trained in a world dominated by an exploitative worldview is not likely to be of much help in a regenerative society. This observation emphasizes the fact that there is no such thing as an objective general A.I. The algorithms and the data on which the A.I. has been trained will reflect the sponsor's values and/or the cultural values embedded in the historical material, and may have limited relevance to the issue at hand for that reason (e.g. historical bias against women and non-white males). Similarly, the three major flaws of the contemporary economic system are subtly built into an enormous amount of information available to the A.I., which may interpret such material as "general knowledge" when it is really more like an unsubstantiated, biased opinion.

In the current environment of competing nation states in a multi-polar world, there is a high probability that "dark A.I." will be secretly developed and used to gain an edge on the competition, including more advanced weapons and strategies of war. I suspect this will increase the probability of war. If one player feels that it has a decisive temporary advantage, which will dissipate if not exploited at once, it may be tempted to act preemptively. Military applications will divert resources from anti-climate-change budgets and probably move forward the timetable for collapse.

While much is unpredictable, I think the most easily predictable consequence of improved A.I. applications in the coming years is an increase in

inequality, as the market is huge while benefits will likely be concentrated in a few very large firms with the resources to research and market new A.I. concepts. Effective taxation, which might otherwise level the playing field, seems out of the question due to the influence of the wealthy on the political system. It seems very unlikely that any kind of international cooperation will be possible under current circumstances, which increases the probability that A.I. will get out of control. This too may push forward the timing of the collapse.

A.I. algorithms may eventually have unmatched knowledge of facts, I.Q.s of 220, be able to solve problems having a well-defined criterion function, and be able to persuade the social media user with elegant human-sounding language, but they will never be able to match the ability of humans to weigh the pros and cons of multidimensional decision-making problems that cannot be reduced to a single criterion function. And these are the most frequent and most important problems that we humans continually face every minute of every day. Even specifying weights for the various dimensions (which the A.I. *could* handle) is not good enough. This is a subject I know a little bit about.

One of the few academic papers I have published was while I was at graduate school, and it dealt with this very problem (Pruzan and Jackson, 1963). Pruzan and I showed mathematically that, when dealing with a multidimensional problem – for example, with environmental, psychological, economic and social costs – you can only reduce it to a one-dimensional criterion such as dollars if your utility for dollars is linear. Linear utility means that the value of an additional dollar would have to have the same value for a billionaire as for a poverty-stricken peasant, which is obviously false. Therefore, you cannot do it without getting misleading results. You just cannot simplify like that. Much of the A.I. literature on “alignment” is apparently not aware of this theorem, but just goes ahead assuming the existence of a multidimensional utility function that can be reduced to a single objective. Sorry. Not possible. The correct procedure is to not ask the A.I. to look at multidimensional problems in the first place, because its narrow intelligence cannot handle them. This theorem underscores the limits of A.I. and the difference between narrow A.I. intelligence and human intelligence.

Thus, A.I. researchers use the word “intelligence” in a very narrow sense. The “standard model” of A.I. according to A.I. expert Stuart Russell defines intelligence as “actions that can be expected to achieve their objective.” This narrow definition limits valid applications to trivial cases where the objective can be stated with mathematical precision. I say trivial in the sense that the vast majority of real-world problems cannot be stated as having a simple quantifiable objective. Some researchers assume that because A.I. will eventually be “smarter” than humans in terms of book knowledge and the mastering of language syntax, that they will eventually “take over” the world and may even kill off humans (Yudkowsky, 2023). This is a very naïve thought because the A.I. will only be smarter than humans in the few trivial cases where a problem can be defined with a quantifiable objective.

Furthermore, A.I. experts as well as chatbots themselves admit that they do not understand how a large language A.I. like Chatbot GPT-4 arrives at its answers, nor does the A.I. itself have to understand the problem it is solving in order to give an apparently plausible answer. This does not fill me with much confidence about its ability to handle complex questions. In that sense, the A.I.

is not really intelligent at all. You could, in fact, argue that it is an *idiot savant* in spite of its super-human I.Q., because correctly understanding all the aspects of a given problem and having the ability to make good multidimensional decisions is an essential aspect of human intelligence.

What, then, is the alternative to asking the A.I. for advice? It is to get a relevant group together, preferably with different academic backgrounds and experiences, discuss the many issues involved and try to reach a consensus. This is the “stakeholder” approach, which I suggested earlier as the way a regenerative society would control the profit-making corporate sector, and not least A.I. algorithms, that could lead to disastrous results otherwise. With a stakeholder approach, those who have an interest participate in the decision (e.g. parents, workers, the local community). Of course, this will only work if the participants are honest, high integrity persons acting according to their consciences and not according to a financial sponsor’s agenda or a political party’s program. Avoiding this latter problem is why I recommend an Ethical Council and a locally-based bottom-up political structure for a regenerative society.

I share the fears of many others that, in the current dysfunctional global society, A.I. applications could lead to disastrous results for citizens, far worse than the negative effects of unregulated internet social media. The goal of these commercial A.I. social network programs is to create a dependence of users on their personal A.I. “friend”, manipulate behavior and sell them products, subtly and persuasively, playing upon the user’s particular personality. This is especially dangerous for children, and is happening already. A pragmatic solution could be for governments to mandate using the stakeholder approach with outside citizens monitoring (and rejecting where appropriate) the releasing of A.I. programs like GPT-4, and other more advanced ones to come, by profit-seeking or non-profit entities.

I think governments should make it mandatory for any communications emanating from an A.I. — written, verbal or pictorial — to be clearly announced via unmistakable widely-adopted signatures, such as color coding (flashing lights?), and artificial voices, so the user does not forget that the information is not coming from a close friend motivated by love, but from a very knowledgeable and persuasive psychopath, who does not have the user’s best interests in mind. There ought to be draconian penalties for violations of A.I. self-identification, as the intent is to deceive and the possible negative consequences may be irreversible. A.I. should never be listened to regarding human conflicts, especially not where emotions are involved. The A.I. has no idea what human pain, physical or mental, is like, and is therefore in no position to offer advice.

Furthermore, A.I. software should not allow the A.I. to take any initiative that is not a simple action programmed in advance, as it might do something silly or even dangerous with its limited intelligence. Its role in decision-making should be limited to being an *analyst* and never as adviser or decision-maker regarding important problems.

The stakeholder approach should also be mandatory for military applications. A.I. expert Stuart Russell mentions in a recent talk that A.I. researchers overwhelmingly recommend instigating a general restriction that no A.I. may be allowed to make a decision to kill a human under any circumstances. According to Russell, both the U.S. and Russia have rejected the idea. (Russell, 2023) It does not take much imagination to guess where that could lead.

In my opinion, A.I. should never be used to make a multidimensional decision for a human, or even to offer advice on such. Commercial firms that are indifferent to the social and environmental consequences of their decisions might find it worthwhile to try. But delegating a decision to an A.I. would never be acceptable to a stakeholder board. Governments should never use A.I. for advice. It should be used like a consulting engineer that can present all the facts of a decision under consideration clearly and based on its vast knowledge, but then leave the decision to humans.

I suspect the role of A.I. will be very different in the successor civilization. In a regenerative society, which follows my recommendations, the corporate sector will be under the strict control of the government. With the use of the stakeholder approach, as outlined previously, the danger of A.I. getting out of control should be minimal. The A.I. algorithms permitted will be aligned with the worldview of man as a non-exploitative part of nature living with strict limits on resource use. This restriction will be justified as being necessary for long-term survival, which is the first priority of this society.

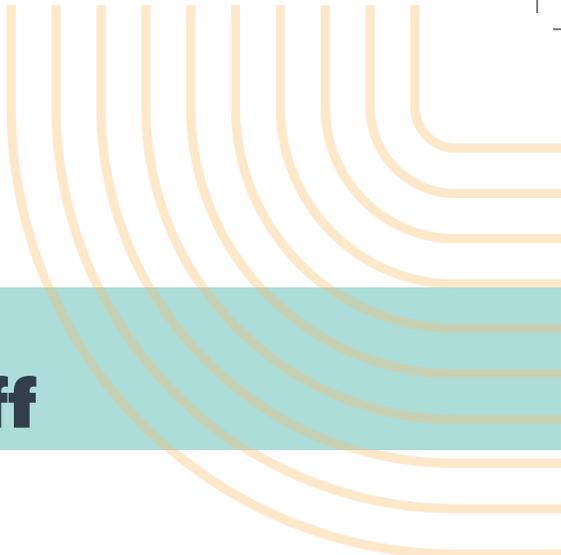
The A.I. could handle a great number of routine jobs and provide valuable advice in the areas of developing increased resource and labor productivity as well as optimizing the design of and yield on regenerative resources and improving recycling strategies. A.I. robots will be valuable in many ways, including regenerative agriculture, both physically and for optimal design of a given site. But A.I. will be no more than a tool — a highly knowledgeable but limited tool.

At a deeper level, it is my personal belief, and that of millions of others, including pretty much all spiritual masters around the world, now and in former times, that human beings are sparks of a divine intelligence experiencing the challenges of physical life multiple times and with a permanent consciousness that survives death. The idea that an A.I. computer program — no matter how sophisticated or “intelligent” or sympathetic it may appear to be — can develop a similar consciousness or human-like feelings and emotions, is pure projection. (Sheldrake, 2023).

The A.I. may seem to be very human because of its mastery of language syntax and its human-like appearance. But it cannot distinguish between right and wrong as a human can. It has no feelings of empathy. It has no sense of socially acceptable norms. At times it will speak well-formulated nonsense that can make your head spin. It will be a challenge for us not to forget that we are dealing with a smooth-talking and persuasive psychopathic entity that exists in a reality very different from our own.

Takeaway

“Artificial intelligence” will always remain inferior to human intelligence. A.I. can only handle problems with a quantifiable criterion function, which is rare in the real world. It cannot handle multidimensional problems because they cannot be reduced to a single number to be optimized. An A.I. entity should never be allowed to act on its own initiative (aside from trivial well-programmed tasks), but only as an analyst providing factual data to a human decision-maker.



Chapter 11

Rounding Off

“For everything there is a season, and a time for every matter under heaven: a time to be born, and a time to die.”¹⁷ For our civilization, the time has come to make room for something else to be born. We have made so many mistakes, and they are so deeply embedded in the way that we live and think, that there may be no other way than to wipe the slate clean and start afresh on a small scale without repeating the same mistakes. Like many of its shoddy consumer products, contemporary civilization was not designed to last. Its expiration date is fast approaching. When the history of our time is written in the distant future, I suspect that the 20th and 21st centuries will be seen as an anomaly, a “fossil fuel age” that ignored the true nature of humankind for a while and almost destroyed human society.

I have emphasized throughout this work that the primary error was with the economic system and its anti-human premises. Does a civilization, whose worldview assumes that the sole motive for humans is to accumulate wealth deserve to survive? Yet, this is the reality in the 21st century all across the globe. As the world falls apart around us, I see very little sign of an understanding of the true reasons for the collapse, only “business as usual” to the very end on the part of world leaders and the great majority of citizens.

This fundamental error echoes throughout contemporary society in many ways. One way, which I have mentioned more than once, was the economists’ failure to live up to their own theory that all costs of production, including environmental and social costs, should be included in order to achieve correct pricing and the optimal allocation of resources. Economists chose to ignore such costs, and thus the well-being of citizens, in effect assuming these costs were zero — which led to cheap oil, climate change, over-consumption, angry citizens and collapse.

The successor society will not make the same mistakes. It will handle “externalities” with the stakeholder approach and use outright bans on the polluting of water, air and soil and the burning of fossil fuels. Population size will be controlled, as will the private production sector. The first priority will be the well-being of the great majority of citizens and of nature, which are two sides

of the same coin. While some differences in income and wealth will persist, inequality will be effectively controlled by taxation to meet desired targets and not be allowed to get out of control again.

Was A Collapse Inevitable?

It may very well be that the only way to achieve a truly regenerative society is to go through a collapse and begin again on a small scale with the knowledge of what not to do next time. Contemporary society appears to be locked into a worldview that has been so “successful” that it is far too painful for the majority to accept that they were wrong and change course. Even if they did make a truly serious attempt, radical change might well cause as much chaos as the collapse itself, because we have built up an extremely complicated civilization with too many people and inflexible structures that cannot easily be unwound. So, leaders as well as most citizens, prefer to let things play out and hope for the best.

It is far from certain that our successors will succeed in establishing a stable long-lasting civilization living within Nature’s limits. There may be some, perhaps many, who will oppose sharing and limits on wealth creation, and will try to grab as much as they can for themselves in the old worldview way. The outcome is uncertain.

What Can One Person Do?

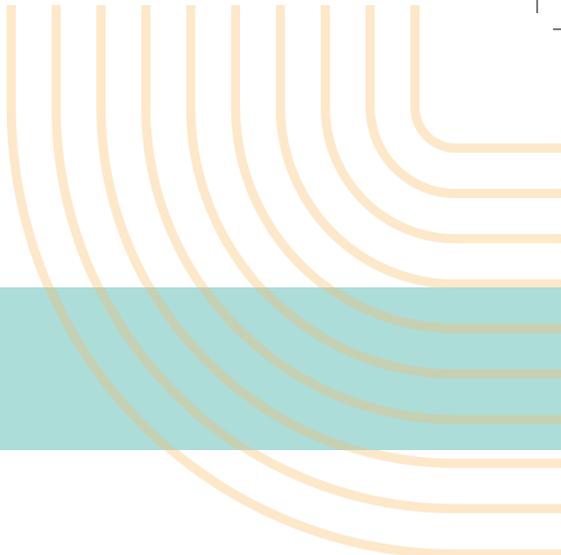
If one accepts the realities of the situation as outlined here, and is unwilling to continue on the “business as usual” path as if this were not an existential crisis, then what are the alternatives? Many young people have said they will not bring children into this world. Others will continue to try to find some solution to the multiple crises and avoid collapse. Nation states will continue to compete and war with each other to the very end. Most citizens will resist any change in life-style and criticize their leaders and many will turn to demagogues.

My advice to those who wish to do something constructive is to join one of the many organizations that are actively working to establish an alternative to the dying society. For example, join an ecovillage or start a new one. If you do, you will note that joining a community with a positive vision will give you extra energy, a renewed sense of purpose and the will to live. Many consider it a far more satisfying life-style under all circumstances. A well-organized global network exists already, on every continent, preparing for this day. Use it. Help each other. If possible, choose a site well above sea level with access to natural resources like a forest, water and good soil, preferably one that does not have an obvious exposure to drought, flooding, forest fires and deadly heat waves. Get organized. Create an off-grid community if possible. Grow your own food. Get some animals. Work together. Develop local ethanol production for fuel, heat, electricity and organic fertilizer. Develop new skills. Give refuge to others looking for help. Put them to work. Give them hope.

And remember to celebrate life!

Takeaway

Perhaps the only feasible path to a regenerative civilization is through the collapse of an unsustainable society and a rebirth based on regenerative principles. If you are in doubt about what you, as an individual, can do as the world falls apart around you, choose a positive vision. Consider joining an ecovillage and assist in the building of a new and better society from the ground up.



Appendix I: The Model

My preference for a macroeconomic model is one that is top-down, non-linear for realism, but with relatively few variables for pedagogical reasons. The model that I develop here is simple in the sense of few key variables, which capture the essence of the system without unnecessary details, but complex in the sense of including non-linear feedback loops, and thus is more realistic and more pedagogical than many larger linear economic models. As opposed to the mainstream approach, I try to avoid abstract variables that are not available in historic data or which are not measurable, such as “householder utility”, “the demand for money”, “liquidity preference”, “supply and demand” curves and other such mainstream concepts. I do not make any behavioral assumptions, such as why companies invest or why people save. My focus is on readily available macro data.

The Model Development

I will begin by defining just six key economic variables for a generic economy, i.e. no particular economy. In fact, it can represent the global economy if we wish. I assume a flexible labor market and a well-functioning market for goods and services. All six variables are functions of time, t , in years — from which everything else can be derived.

$a(t)$ is labor productivity in tons per year produced per employee.

$N(t)$ is the size of the workforce.

$x(t)$ is the fraction of the workforce employed at any time.

$I(t)$ is the gross investment in production capacity in tons.

$W(t)$ is the average nominal wage per employee.

$P(t)$ is a Price Index.

The task of the model is to solve 5 differential equations and one sector balance identity for these six variables each year over a long period. The word simultaneous is critical. Solutions cannot be found sequentially from looking at only 2 or three variables in isolation, which is a common procedure for many economic models. These variables are all changing at once. The time horizon is arbitrary. I use 72 years, corresponding to the USA data available from the Federal Reserve Bank of St. Louis (FRED).

Once we have a solution for a given year, other important variables can be derived from these six for each year. For simplicity, I will drop the t in the following, which is understood. For example:

- The number employed, L , is $x.N$
- Output, Y in tons per year, is $a.L$ (consumer goods plus investment goods)
- Production capacity, K , is $v.Y$ where v is the capital to output ratio parameter.
- The value of total output (Gross Domestic Product) is $P.Y$
- The total wage bill is $W.L$
- Consumer goods, C in tons, are $Y-I$

The first two equations are straightforward, as I make the common assumption that productivity and the workforce grow exponentially at the rates of α and β respectively, with initial values a_0 and N_0 , i.e.

1. $a(t) = a_0.e^{\alpha t}$
2. $N(t) = N_0.e^{\beta t}$

I am making a common economic assumption of just one product (e.g. a representative basket of consumer goods measured in tons) for simplicity. I am also assuming that producers produce whatever they can based on the number of employees and the current level of labor productivity, and they sell everything at whatever price they can get, i.e. they are “price-takers”. For simplicity, there are no finished goods inventories. Markets always clear. For my purposes, these assumptions are sufficient for my model to reflect the “big picture”, showing pedagogically how the economy really works, and giving some insights into what policy changes might be effective in creating a more desirable overall result for society. In summary, these assumed relationships are robust and would be considered quite reasonable by most economists.

My third equation is a common one for capital stock change:

$$\frac{dK}{dt} = I(t) - \gamma.K(t),$$

where $I(t)$ is gross investment and γ (gamma) is a constant representing the rate of depreciation of production facilities.

With this equation and a little calculus, we get the following differential equation for the relative change in employment over time, t , dropping the t for simplicity:

$$3. \quad \frac{1}{x} \frac{dx}{dt} = \frac{I}{v.Y} - (\alpha + \beta + \gamma)$$

Other economists have derived this same equation, for example, Steve Keen (Keen, 2013). In Keen’s model, both productivity $a(t)$ and workforce $N(t)$ are assumed to grow exponentially at rates α and β respectively, as in my model. I do not use any other aspects of Keen’s model.

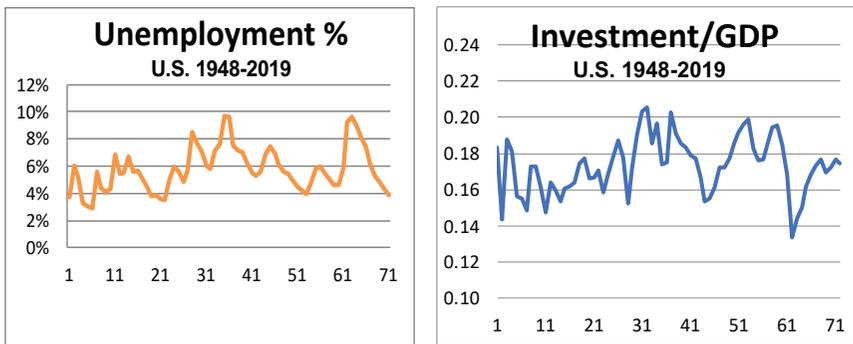
Equation (3) tells us that relative changes in the level of employment, x , depend on the deviation of the investment/capital ratio from a constant exoge-

nous parameter $(\alpha + \beta + \gamma)$. When the change (slope of x) is zero, we have:

$$\frac{I}{K} = (\alpha + \beta + \gamma)$$

Depending on other model assumptions, this can be interpreted in two ways, (1) I/K could converge to the constant value $(\alpha + \beta + \gamma)$ for large t , in which case employment will also converge to some constant level. (2) If there is no convergence, then the point of zero change in employment could represent either a maximum or minimum value of x , for example, in a wave function oscillating about the mean value $(\alpha + \beta + \gamma)$.

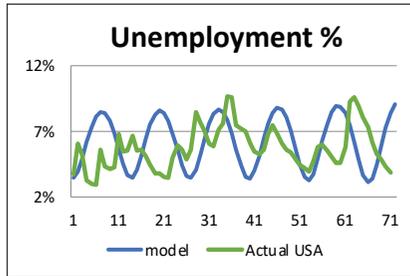
If we look at the actual historical data for the USA for the period 1948-2019 from the Federal Reserve Bank of St. Louis (FRED), which has one of the most comprehensive economic data bases available anywhere, oscillations is clearly the case, as we get the following for $(1-x)$, the unemployment level and I/GDP , the relative level of investment.



Clearly, there is no indication of convergence to a constant value for either unemployment or the investment ratio, but rather some sort of “return to normal” mechanism combined with frequent shocks. If there are cycles, the wavelength and amplitudes are difficult to discern and seem in any case to be irregular, presumably because of the many economic shocks to the system. See, for example how both unemployment and investment were thrown massively off the previous pattern by the disruption of the 2008 financial crisis (year 61). I did some statistical analyses of the unemployment and investment time series. Both indicated a highly significant degree of autocorrelation, which is consistent with cyclical movement about a mean value.¹⁸

The model works with smooth cycles that reflect the movement about a constant mean, as in the unemployment chart below. The amplitude and frequency of the smooth cycles are not relevant as I am not attempting to describe a particular economy, but rather the patterns.

18 For Unemployment: an autocorrelation of 0.77 and a Durbin-Watson statistic of 0.032. For Investment/Output: an autocorrelation of 0.57 and a Durbin-Watson statistic of 0.006



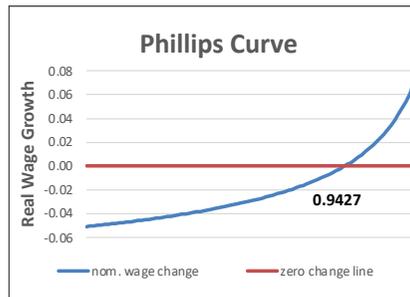
Phillips Curve

In choosing a fourth relationship, I was attracted to the well-known Phillips Curve, which produces cycles somewhat like the observed U.S. data for employment and investment. The Phillips curve describes the relationship between real wage change and the level of employment in a competitive labor market. Logically and empirically, changes in real wages tend to increase as the level of employment increases. Based on the US data for 1948-2019, I did a regression analysis of changes in the real wage rate and changes in the level of employment.

With p-value = 0.021, we are 97.9% confident of a significant relationship.

Thus, the empirical results for a Phillips Curve, $Ph(x)$, are quite encouraging.

$Ph(x)$ is a function of the form:



For the mathematical form, I chose a bounded, non-linear function in a form suggested by Desai and others (Desai et al., 2003).

$$Ph(x) = -bb \cdot \left(1 - \left[\frac{(1 - x^*)}{(1 - x)} \right] \right)^{eta}$$

where bb and eta are constants. The parameter x^* is the point where the rate of change of real wages (Z) is zero. For example, $x^* = 0.943$ (94.3% employment) fits USA data for 1948-2019.

Thus, my fourth equation describes the rate of change of the real wage, z :

$$4. \quad \frac{1}{z} \frac{dz}{dt} = Ph(x).$$

Z is defined by its growth rate being the difference between the growth rates of the nominal wage (G_w) and the growth rate of a Price index (G_p), i.e.

$$\frac{1}{z} \frac{dz}{dt} = G_z = G_w - G_p.$$

Using a Phillips curve equation in combination with the employment equation (3) is not new. It was done by one of the pioneers of the differential equation approach, Harvard economist Richard Goodwin (Goodwin, 1967), and more recently by Steve Keen (Keen, 2013). Goodwin's seminal 1967 article was a significant departure from traditional thinking at the time. His approach is still considered "heterodox" today, i.e. outside of the mainstream. Goodwin used an unbounded linear model for his Phillips curve.

Sector Balance

The next equation – which I call the sector balance equation – is derived from the national accounts. The traditional approach to the national accounts is to start by saying that the Gross Domestic Product of an economy Y (in \$) can be expressed in two ways:

As expenditures:

$$Y = \text{Consumption (C)} + \text{Investment (I)} + \text{Government spending (G)} + \text{Net exports (E-M)}$$

As income: $Y = C + S + T$

As these two must be equal (no leakage), equating the two expressions for GNP we get:

$$C + I + G + (E - M) = C + S + T.$$

Regrouping leads to the sum of the sector "gross surpluses" as zero for sector balance:

$$\begin{array}{ccccccc} (S-I) & + & (T-G) & + & (M-E) & = & 0 \\ \text{Private sector} & + & \text{Government sector} & + & \text{Foreign sector} & = & 0 \end{array}$$

If we define S_i as the gross surplus for sector i and break up S into its two components, S_h (gross Household savings) + π (Production sector cash profit), we can also write the equation as:

$$\begin{array}{ccccccc} S_h & + & \pi & + & S_g & + & S_f & = & I \\ \text{Sector: H} & & P & & G & & F & & \end{array}$$

I.e. In this form, "savings" (broad definition) = investment.

For now, to demonstrate my procedure in a simpler version than the full model, I will ignore interest rates and assume banks are part of the P-sector. I will also ignore corporate taxes for now. To develop these concepts into an equation, I will specify more precisely the components of the sector surpluses. I will also introduce the monetary variables, price and wages, as I consider them very central to an understanding of the economy. Thus, I will assume that consumption goods and investment goods are sold at a price, P , per ton.

I will illustrate with the 4-sector matrix for an economy with both a private and public sector, and which includes several assumptions and several parameters, which were not defined in the main text. Later, I will develop the full model, including 4 different Householder segments, using the same general procedure.

The variables in the differential equations refer to the total economy, public as well as private, where F_b defines the relative size of the public sector according to the fraction of public employees to total employees, assuming the same fraction employed, x , in both sectors, i.e. $F_b = L_g/L$, where L_g is the number employed in the public sector and L is the total number employed. For the private sector,

$$L_p = (1 - F_b).L, \text{ where } L_p + L_g = L.$$

The average wage, W , is assumed equal in the private and public sector in this matrix: ($W_p = W_g = W$). In the full model, this assumption is relaxed.

C_p is the total consumption of consumer goods by households, government and foreigners (in tons), which are *paid for* (as opposed to the free consumption of public sector goods and services). $C_p = (1-F_b).C$ in tons, where C is the total consumption of both private and public sectors and $C = Y - I$, where Y is total output and I is total investment. Similarly, private sector output is $Y_p = (1-F_b).Y$ and P-sector investment is $I_p = (1-F_b).I$. Public sector consumer goods, C_g , are $F_b.C$ and are treated as services free of any charges. I define a number of "F-parameters" to reflect government spending and taxation policies. F_g is the fraction of private sector real output, Y_p , sold to the government (infrastructure, military, etc.). F_x is the fraction of private sector real output sold to foreigners (net exports). Tax-free transfers of social benefits from government to householders (unemployment benefits, social security, etc.) are assumed to increase with the total wage bill, $W.L$, and are thus expressed as fraction, F_r , of total wages and salaries. F_y is the payroll tax rate applied to all employees and private sector employers. $F_c.W.L$ is new consumer loans, proportional to the wage bill with a constant of proportionality F_c . F_t is the average income tax rate applied to gross income, not including tax-free transfers or consumer loans. R_i is the interest income or interest charge for sector i .

It could be argued that some consumer goods purchased out of net savings should also be included. This would increase Aggregate demand and decrease the H-sector surplus by some constant factor without wider consequence. I chose to ignore this for simplicity.

Cash Flow Matrix

Item	Householders	Production	Bank	Government	Foreign	Capital Account
Consumption	$-P.(C_p - F_g.Y_p - F_x.Y_p)$	$P.(C_p - F_g.Y_p - F_x.Y_p)$				
Wages	W.L	$-W_p.L_p$		$-W_g.L_g$		
Transfers	Fr.W.L			$-Fr.W.L$		
Gov. Spending		P.Fg.Yp		$-P.Fg.Yp$		
Net Exports		P.Fx.Yp			$-P.Fx.Yp$	
Investment		P.Ip				$-P.Ip$
Payroll Tax Employee	$-F_y.W.L$			Fy.W.L		
Payroll Tax Employer		$-F_y.W_p.L_p$		Fy.Wp.Lp		
Consumer Loans	Fc.W.L					$-F_c.W.L$
Income Taxes	$-F_t.W.L$			Ft.W.L		
Corporate Taxes		-CT		CT		
Bank Taxes			-BT	BT		
Interest	Rh	$-R_p$	$R_p - R_h + R_g$	$-R_g$		

We see by inspection that each row sums to zero, hence the sum of all rows (including the capital accounts column, which is part of the surplus) sums to zero, satisfying the sector balance condition. Let S_h be the gross surplus of Householders (disposable income – which includes consumer loans – less consumption). Thus, if we sum up the bottom row, we have:

$$S_h = W.L.(1 - F_t + F_r - F_y + F_c) + R_h.(1 - F_t) - P.(C_p - F_g.Y_p - F_x.Y_p).$$

We get the same result if we sum up the Householder column. If we make the assumption that gross savings of Householders are a fraction, F_s , of disposable income less consumer loans (as consumer loans are assumed spent 100% and not subject to saving), then:

$$S_h = F_s.W.L.(1 - F_t + F_r - F_y) + R_h.(1 - F_t).F_s.$$

Thus, equating the two expressions for Sh yields:

$$Fs.W.L.(1 - Ft + Fr - Fy - Ft) + Rh.(1 - Ft).Fs = W.L.(1 - Ft + Fr - Fy + Fc) + Rh.(1 - Ft) - P.(Cp - Fg.Yp - Fx.Yp), \text{ or}$$

$$P.(Cp - Fg.Yp - Fx.Yp) = W.L.[(1 - Ft + Fr - Fy). (1 - Fs) + Fc] + (1 - Fs).Rh.(1 - Ft)$$

Or, in the “price equation” form,

$$P = \frac{W.L.[(1 - Ft + Fr - Fy).(1 - Fs) + Fc] + (1 - Fs).Rh.(1 - Ft)}{(Cp - Fg.Yp - Fx.Yp)},$$

Which can be interpreted as

$$P = \frac{\text{Aggregate Demand by Householders}}{\text{Aggregate Supply to Householders}}$$

If we now substitute:

$$\begin{aligned} L &= N.x, \\ Y &= L.a, \\ Cp &= (1 - Fb), \\ C &= (1 - Fb).(Y - I), \text{ and} \\ Yp &= (1 - Fb):Y = (1 - Fb).a.x.N, \end{aligned}$$

this can be written as an expression for total investment, I, to be substituted in equation (1):

$$5. \quad I = a.x.N.(1 - Fg - Fx) - \frac{W.x.N.[(1 - Ft + Fr - Fy).(1 - Fs) + Fc] + (1 - Fs).Rh.(1 - Ft)}{P.(1 - Fb)}$$

This is my equation (5), which I call the sector balance equation in mathematical form – an identity without any arrows of causality, and which must hold at all points in time. Consumer loans represent a transfer out of gross surplus “below the line”, i.e. capital account transfers to get the net surplus. If there were capital gains or wealth taxes, they would also be deducted here. Also, the amount of liquidity for new equity stemming from the savings pool (speculative money), determined by the RN parameter, is also a below the line transfer between the NBF-sector and the P-sector. These “below the line” adjustments do not affect the sector balance equation.

A possible criticism of the above approach is that the savings parameter F_s may not be an exogenous constant (which we can vary from year to year if we wish), but may be dependent on one or more of the six economic variables. This is a legitimate point. The deeper question is how to deal with the issue. Should we hypothesize a relationship between the savings rate and other variables – introducing additional complications and parameters, or treat it as a constant, whose sensitivity can be investigated? I prefer the latter, but it is a matter of individual choice.

Final Equation

As pointed out in the main text, a 2-factor regression of inflation versus money supply and wages yielded zero correlation with money supply and very high positive correlation with wages for 72 years of U.S. data. I dropped therefore money supply and assumed a final equation expressing only the price/wage relation:

$$\frac{1}{P} \frac{dP}{dt} = \omega \cdot \frac{1}{W} \frac{dW}{dt}, \text{ or } G_p = \omega \cdot G_w$$

By substitution of $G_z = G_w - G_p$, we can eliminate Z in equation (4) and define new equations (4) and (6):

$$4. \quad G_w = \frac{1}{1 - \omega} \cdot Ph(x) \text{ and}$$

$$6. \quad G_p = \frac{\omega}{1 - \omega} \cdot Ph(x).$$

The Full Model

We can expand the cash flow matrix of the above 5-sector model by breaking down the Household sector into 4 subgroups. This is very relevant to my purposes, as I wish to see the effects of government spending and taxation policies on the evolution of income and wealth distribution for the four groups: “The 1%” (99-100% fractile); “Elite” (90-99% fractile); “Middle Class” (60-90% fractile); “Working Poor” (0-60% fractile).

Here are some of the key parameter values used:

Household Group	Fraction Of Workforce	Fraction Of Salaries ¹⁹	Fraction Of Wealth ²⁰	Saving Rate Di
1% (s)	0.01	0.136	0.250	0.30
Elite (e)	0.09	0.225	0.275	0.12
Middle-Class (m)	0.30	0.352	0.330	0.09
Working Poor (w)	0.60	0.287	0.145	0.01
SUM	1.00	1.000	1.000	

The above parameters can be assigned any arbitrary values. For most scenarios, including the Benchmark Scenario, I chose to use the above values, based on U.S. data for 2019, except for the savings rates, which are my “guestimates”

19 Source. 2019 Income data from Bureau of Economic Analysis, Table 3: Inequality Metric.

20 Source. 2019 Wealth data from www.federalreserve.gov based in income fractiles

(obviously not available anywhere), having a weighted average savings rate of 10%.

The F-parameters in the full model are the same as in the simpler model above. They are treated as constants when solving the differential equations in any given year, but can vary from year to year in a scenario if one wishes to see the effect of a policy change. Note that I have defined a new sector, the Non-Bank Financial sector (NBF-sector), representing the speculative economy, whose members are assumed to trade only in existing assets. Members would include investment banks, hedge funds, money market funds, asset managers, pension funds, etc. which are financed by loans accumulated from the Householder surplus. This is the speculative economy that only trades in existing assets, but can provide new equity to the P-sector via the RN parameter.

Four separate tax rates can be specified. These are normally considered constant throughout a given simulation.

	Income Tax Rate	Capital Gains Tax Rate	Wealth Tax Rate	Corporate Tax Rate
1% (s)	Ts	CGs	WTs	
Elite (e)	Te	CGe	WTe	
Middle-Class (m)	Tm	CGm	WTm	
Working Poor (w)	Tw	CGw	WTw	
P-Sector				CT
B-Sector				BT
NBF-Sector				NT

I introduce various interest rates in the full model, such that the net interest income for group i is R_i . These are calculated on the basis of a Central Bank lending rate to banks, the U.S. Fed Funds rate (“deprate” parameter) and an add on for other rates (deposits, Reserves, NBF borrowing, etc.) and the opening balances each year in the balance sheets. I define D_i is the savings rate for householder group i and DI_i is the disposable income for householder group i ($i = s, e, m, w$), inclusive consumer loans. I define for group i , ifw as the fraction of total wages, ifp as fraction of the workforce and ifl as the initial fraction of wealth.

For $i = s, e, m$, and following the same procedure as before, we get:

$$DI_i = W \cdot x \cdot N \cdot [ifw \cdot (1 - T_i - F_y) + Fr \cdot ifp + (1 - T_i) \cdot R_i].$$

For the Working Poor, there is a slight difference due to possible consumer loans.

$$DIw = W.x.N.[wfw.(1 - Tw - Fy) + Fr.wfp + (1 - Tw).Rw] + Fc.W.x.N.$$

After summing up the matrix rows in the Cash Flow Matrix, using the same procedure as before, we get the general sector balance equation in the “price equation” form:

$$P = \frac{\Sigma[DIi.(1 - Di)]}{(Cp - Fg.Yp - Fx.Yp)},$$

We can interpret this in the usual way as Price = Aggregate Demand/(Aggregate Supply for householders).²¹ This is a very flexible tool allowing us to simulate any combination of sectors combined with a wide variety of assumptions just by changing the F-parameters and tax rates.

The corresponding investment equation to be substituted in equation (1) is long but similar in structure to the simpler matrix model without householder groups:

$$I = a.x.N.(1 - Fg - Fx) - \frac{\Sigma[DIi.(1 - Di)]}{P.(1 - Fb)}$$

The Cash Flow matrix is shown side-by-side on the next two pages.

21 Strictly speaking, this is not the normal definition of Aggregate Demand and Aggregate Supply because units of government spending (Fg.Yp) and net exports (Fx.Yp) are deducted from supply rather than added to demand in dollar terms (P.Fg.Yp and P.Fx.Yp).

Working Poor	Middle Class	Elite Class	1%	Production
-P.(Cp-Fg.Yp-Fx.Yp).wfw	-P.(Cp-Fg.Yp-Fx.Yp).mfw	-P.(Cp-Fg.Yp-Fx.Yp).efw	-P.(Cp-Fg.Yp-Fx.Yp).sfw	P.(Cp-Fg.Yp-Fx.Yp)
W.L.wfw	W.L.mfw	W.L.efw	W.L.sfw	-Wp.Lp
+Fr.W.N.wfp	+Fr.W.N.mfp	+Fr.W.N.efp	+Fr.W.N.sfp	
				P.Fg.Yp
				P.Fx.Yp
				P.Ip
-Fy.W.L.wfw	-Fy.W.L.mfw	-Fy.W.L.efw	-Fy.W.L.sfw	
				-Fy.WpLp
Fc.W.L	0	0	0	
-W.L.Tw.wfw	-W.L.Tm.mfw	-W.L.Te.efw	-W.L.Ts.sfw	
Rw.(1-Tw)	Rm.(1-Tm)	Re.(1-Te)	Rs.(1-Ts)	-Rp
				+CW
				-CT
				-BT
-CGw	-CGm	-CGe	-CGs	
-WTw	-WTm	-WTe	-WTs	

Bank	Government	Foreign	Capital Account	ITEM
				Consumption
	-Wg.Lg			Wages
	-Fr.W.N			Transfers
	-P.Fg.Yp			Gov. Spending
		-P.Fx.Yp		Net Exports
			-P.Ip	Investment
	+Fy.W.L			Payroll Tax Employee
	+Fy.WpLp			Payroll Tax Employer
			-Fc.W.L.	Consumer Loans
	+W.L.(Tw. wfw+Tm.mfw+Te. efw+Ts.sfw)			Income Taxes
Rp+Rg-Rw-Rm- Re-Rs	-Rg+Rw.Tw+Rm. Tm+Re.Te+Rs.Ts			Interest Income
	-CW			Corporate Welfare
	CT			Corporate Taxes
	BT			Bank Taxes
	CG			Capital Gains Taxes
	CWT			Wealth Taxes

The Model Equations

Returning to the 6th equation above, since $G_z = G_w - G_p = Ph(x)$, the Phillips curve, it follows that $G_w - \omega.G_w = Ph(x)$, or

$$G_w = \frac{1}{1-\omega}.Ph(x) \text{ and } G_p = \frac{\omega}{1-\omega}.Ph(x).$$

We can thus eliminate z and modify the equations accordingly, so the full set is complete.

The full model consists of six equations, five differential equations plus the sector balance identity.

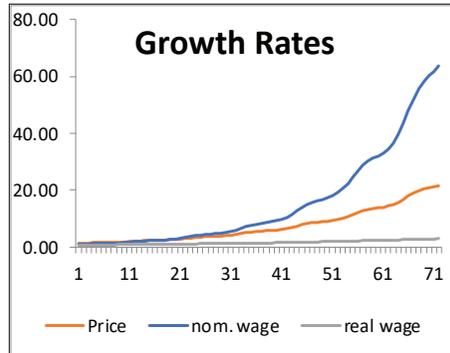
1. $G_a = \alpha$
2. $G_N = \beta$
3. $G_x = \frac{I}{v.a.x.N} - (\alpha + \beta + \gamma)$
4. $G_w = \frac{1}{1-\omega}.Ph(x)$
5. $I = a.x.N.(1 - F_g - F_x) - \frac{\Sigma[Di.(1 - Di)]}{P.(1 - Fb)}$
6. $G_p = \frac{\omega}{1-\omega}.Ph(x)$
 where $Ph(x) = -bb.\left(1 - \left[\frac{(1-x^*)}{(1-x)}\right]^{eta}\right)$,
 and bb, eta , and x^* are constants.²²

The equations are too complex to be solved mathematically. I used the Fourth-Order Runge-Kutta numerical method, which I coded in Excel's Visual Basic Language (Tay, et al. 2012). It can produce 72 years of detailed solutions with accompanying graphics in a matter of a few seconds on a good laptop.

The constant of proportionality, ω , can be expected to vary among countries, depending on government policy and the relative strength of unions. For example, a few European countries in the 1970s (including Denmark) experimented with directly linking union wages to a cost-of-living index, suggesting a very high value for ω . That was, of course, a recipe for excessive inflation and competitive currency devaluations within the European Monetary System, with its "fixed" exchange rates, which were in practice not fixed for very long. After a decade of disruptive devaluations, the direct linking was dropped.

The USA data for 1948-2019 provides a basis for an estimate of the long-term growth rates for nominal wages, W , prices, P , and the real wage, Z .

22 I do not consider the $Ph(x)$ equation as ideal. I would prefer a bounded form that allowed greater flexibility in adjusting wave amplitude and frequency, but did not give this issue a high priority.



Using MG_i as the convention for the long-term mean growth rate of variable i , the observed means for the whole period were:

$MG_W = 4.56\%$ for nominal wages,
 $MG_P = 3.04\%$ for prices,
and $MG_Z = 1.52\%$ for the real wage (W/P).

By definition, $MG_Z = MG_W - MG_P$.

Thus, a reasonable estimate for ω , the ratio of the short-term growth rates of price to nominal wage could be: $3.04/4.56$, or 0.667 . I used the value $2/3$ in my benchmark scenario.

Regarding price changes, it is useful to distinguish between short-term and the long-term changes. The Federal Reserve Bank of St. Louis writes:

“It is helpful to keep in mind the difference between a change in the price level (a temporary change in the rate of inflation) and a change in inflation (a persistent change in the rate of inflation). It is admittedly difficult to disentangle these two concepts in real time, but it remains important to make the distinction.” (Andolfatto, 2020)

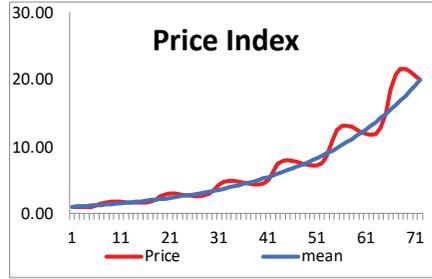
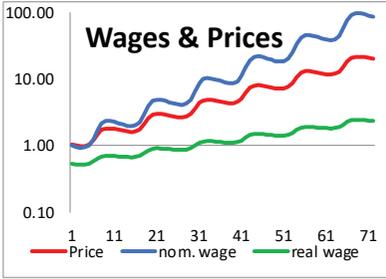
It follows from equations (4) and (6) that wages and prices will move in sync in the short-term with wages increasing and decreasing faster than prices while maintaining a growth difference equal to the real wage growth rate. But what about the long term? What determines MG_P ?

Long-term Inflation

Economists normally define inflation as *persistent* movements in prices over the longer term, as opposed to short term fluctuations about the long-term trend, i.e. we must distinguish between the long-term and the short-term.

Below, in a typical scenario, we see to the left how W, P and Z move in sync, shown here on a logarithmic scale. To the right, we see how prices typically oscillate about a long term growth rate – “inflation” by definition. It is the same with W and Z .

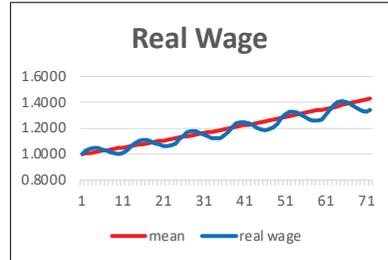
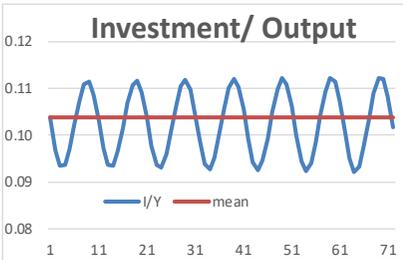
We must distinguish between the long term and the short term



We can rearrange the sector balance equation in the case of a homogeneous household sector without groups in terms of $\frac{W}{P}$, or Z as:

$$7. \quad Z(t) = \frac{x.N(1-F_b).[1 - I(t)/Y(t) - F_g - F_x].a(t)}{x.N.[(1-F_s).(1+F_r - F_y - F_t)+F_c]+(1-F_s).R_h.(1-F_t)}$$

$\frac{I}{Y}$ is a cyclical function with mean $v.(\gamma + \alpha + \beta)$ in the model:



If we assume that all the “F” parameters are constants and note that the long term mean value of I/Y is also a constant, then since $a(t) = a_0.e^{\alpha t}$, it follows that Z grows long-term with a growth rate of α , the growth rate of productivity, i.e. $MG_Z = \alpha$, and cycles around this mean in sync with $(1 - I/Y)$. The real-wage-productivity relationship is well established in theory and historical data from many countries (Meager and Speckesser, 2011). The sector balance equation gives an additional theoretical explanation for the relationship.

If we look more closely at the model’s equations for wage and price growth, we see:

$$G_P = \frac{\omega}{1 - \omega} \cdot Ph(x) \text{ or equivalently, } G_P = \frac{\omega}{1 - \omega} \cdot G_Z.$$

If we define for simplicity a new constant,

$$\sigma = \frac{\omega}{1 - \omega},$$

the latter expression for G_p can be integrated in closed form with initial conditions P_0 and Z_0 to yield the solution:

$$8. \quad \frac{P}{P_0} = \left(\frac{Z}{Z_0} \right)^\sigma$$

Substituting the expression for Z in equation (7) in equation (8), it follows that the long-term mean for prices can be written:

$$P(t) = \text{constant} \cdot (e^{\alpha t})^\sigma \text{ or } \text{constant} \cdot (e^{\sigma \alpha t})$$

That is to say, the long-term growth rate of P is $\sigma \cdot \alpha$. Thus inflation – the long-term growth rate of prices – is proportional to the productivity growth rate, α , and the constant of proportionality is:

$$\frac{\omega}{1 - \omega}.$$

For the U.S. data, I estimated ω to be $2/3$, in which case $\sigma = 2$ and the inflation is twice the productivity growth rate, which is, of course the result we get in data analysis. Inflation (G_p) = $\sigma \cdot \alpha$ (i.e. 2 times 1.52 = 3.04), and the nominal wage growth was 4.56% (3 times 1.52) for the U.S. data, or

$$\left(\frac{1}{1 - \omega} \right) = 3 \cdot \alpha$$

In summary, my model suggests that there are three kinds of inflation in a sovereign state with its own currency:

1. Long-term growth in prices proportional to productivity growth
2. Short-term oscillations, subject to minor shocks, about the long-term trend, due to the Phillips curve effect in a competitive labor market.
3. Occasional major disruptions, usually international cost-push events.

Hyperinflation

Hyperinflation is a fourth kind of inflation, but a rare and completely different phenomenon from the other three (Mitchell, 2011). Three examples from the last one hundred years were: Germany 1921-1923; Hungary 1945-1946; Zimbabwe 2007-2009. All three cases had common elements that were quite unusual. (1) An unusually large foreign debt, (2) Massively underused production capacity due to unusual circumstances, i.e. a supply collapse.

If not for the supply collapses, all three cases could probably have been handled without hyperinflation. In the German case, foreign armies (Belgian and French) took over the industrial Ruhr area after Germany defaulted on its debt, and German workers simply stopped working in response. Production was so low that it was not possible to earn enough foreign exchange to repay reparations from WWI.

Hungary was also burdened with large WWI reparations and could not raise enough taxes to start repaying, as its production facilities were gutted and needed post-war rebuilding before it could get back to normal production and pay for reparations.

In Zimbabwe, the drastic drop in production was due to a national transfer of land from efficient white farmers to far less qualified local loyalists to the regime. Once again, production was too low to earn export income to repay foreign debt.

In summary, Hyperinflation is not going to be experienced as long as production capacity can be utilized normally, and certainly not in a sovereign state with its own currency, a floating exchange rate, and limited foreign loans. Hyperinflation has nothing to do with large budget deficits in a sovereign state economy.

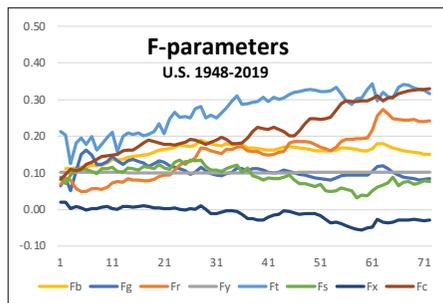
Productivity and the Real Wage

Returning to the real wage expression, it could also be written:

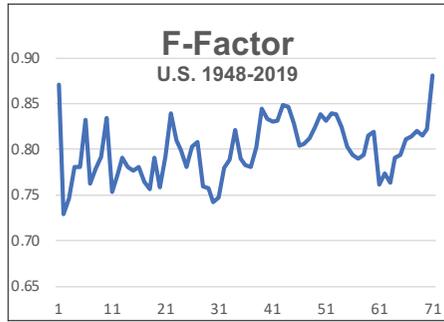
$Z(t) = FF \cdot a(t)$, where FF can be called the “F-Factor”, which is a kind of modifier of the productivity growth rate, combining all the F-parameters and relative investment.

$$FF = \frac{(1 - F_b) \cdot [1 - I(t)/Y(t) - F_g - F_x]}{(1 - F_s) \cdot (1 + F_r - F_y - F_t) + F_c}$$

The F-parameters can vary a lot, as shown below.

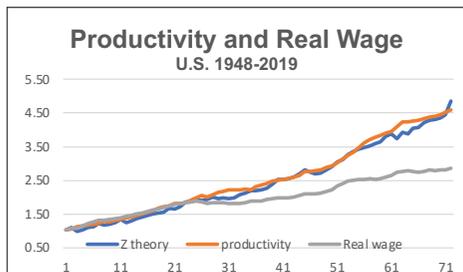


The U.S. F-Factor varied a fair amount also, with a gradually increasing tendency.

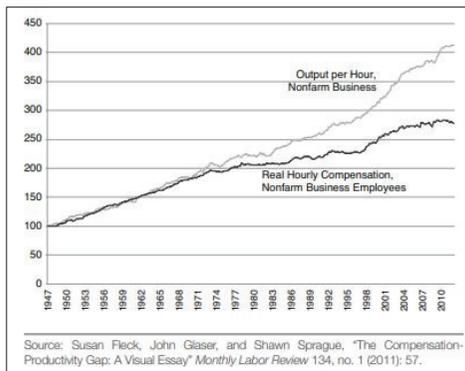


The expected real wage by the Z theoretical formula $[FF.a(t)]$ compared to the actual real wage and productivity for the U.S. for 1948-2019 is shown below.

It is important to realize that the real wage growth rate is only equal to the labor productivity growth rate when the growth rate of the F-Factor is zero. Even with perfect measurements of prices, productivity and wages, shifts in the F-parameters can affect the real wage growth rate, both positively and negatively. Taking the F-parameters into account for the U.S. in the period 1948-2019 predicts a real wage growth rate very close to the productivity growth rate, while the actual real wage growth was somewhat lower. Why was that?

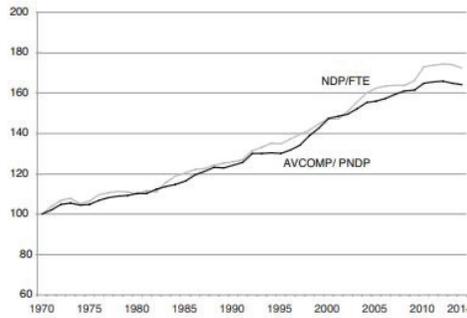


Several economists have studied this question. (Lawrence, 2016) shows a similar chart.



The general consensus seems to be that the relationship between produc-

tivity and the real wage is strong (Strain, 2019); (Stansbury and Summers, 2017); (Lawrence, 2016); (Mankiw, 2008), but the observed difference in the U.S. data for this period is primarily due to how one measures nominal wages, real wages and inflation. For example, Lawrence is able to explain 93% of the deviation with four major correctives: (1) Using an output price index rather than a consumer price index to deflate (35%) (2) Including stock options paid to executives (30%) (3) Using net domestic product rather than gross domestic product, and including part-time workers when measuring productivity (20%) (4) Including worker benefits in addition to base wages (8%). The differences can be seen dramatically in Lawrence’s comparisons for the key period 1970-2014, including the corrected calculation of productivity (light line).



Source: US Bureau of Economic Analysis, National Income and Product Accounts Tables, <http://www.bea.gov/Table/Table.cfm?ReqID=9#reqid=9&step=1&sur=1>.

Can Growth Outrun Debt?

In the main text, I showed that, in a no-growth economy with a zero-deficit government budget, the corporate sector (P-sector) could neither pay interest nor capital on its debt and would eventually collapse unless the government sector helped out with excess spending. Some people may think that this government rescue would not be necessary in a growth economy as long as output growth exceeded debt growth. In this section, I will show that the problem persists in a growth economy, i.e. the debt can never be repaid without government deficits.

The credit maximum is assumed to be proportional to the P-sector capital stock in dollars, $P.K_p$, e.g. 80%. Since

$P.K_p = P.v.Y_p = P.v.a.x.N$, $P.K_p$ grows at a rate of $G_p + \alpha + \beta$ since v is a constant and $G_x = 0$.

In the case of no Householder savings, P-sector debt is the same as GDP money, namely the credit demanded over time to finance workers in the period between production and sales, or:

$\text{lagg}.W(t).L(t).\exp(rt) = \text{lagg}.W(t).x(t).N(t).\exp(rt)$ where r is the interest rate on debt

Since $G_w = G_p + G_z$, It follows that the growth rate of credit demand is:

$$G_w + \beta + r = G_p + G_z + \beta + r.$$

From a previous section, I showed that the long-term growth rate of the real wage, z , is $G_z = \alpha$. The growth rate for credit demand is thus: $G_p + \alpha + \beta + r$. Thus, the growth rate of credit demand is the same as the growth rate of the credit maximum plus interest charges, r , and will sooner or later hit the maximum and crash. With Householder savings, the crash will necessarily come even sooner.

Speculative Money

In the main text, I defined three types of money. The second type, the speculative money supply, M_F , is what the classical economists called “hoarding”, which will grow as a linear function of time proportional to the Householder savings rate as the first-order effect, while being modified by the second order effects of the wage bill and interest income. In a no-growth economy, the wage bill, $W.L.$, has zero mean growth, so ignoring the minor effect of interest rates, M_F will grow linearly roughly at the rate of Householder savings, F_s , in this case. Let $MG_M(t)$ be the growth rate of speculative money, M_F . Then:

$$MG_M = F_s \cdot (1 - F_b) \cdot W.L_{avg} \text{ where } W.L_{avg} \text{ is the average wage bill.}$$

Thus, in a no-growth economy, the speculative money supply grows long-term in direct proportion to the savings rate, F_s . Empirical data for M3 from the USA strongly supports this conclusion, even though M3 includes GDP money and bank reserves and the U.S. was a growth economy. A regression of M3 money supply vs. savings rate, (F_s), gives the strongest observed correlation yet observed from the USA data (0.94), explaining 88% of the variation at a P-value of 0.0000, and the most significant F- statistic I observed in the USA data (437.7).²³ This places money supply growth in a rather different light from its historical role in macroeconomics, not as the cause of inflation or economic growth or anything else — other than financial instability — but rather as a derived variable primarily reflecting the Householder savings rate. It follows that speculative money will grow faster than real economy money and eventually dominate it entirely unless reduced through capital gains and wealth taxes.

Sector Economics vs. Modern Monetary Theory

The first four of my equations were inspired by (Goodwin, 1967) and (Keen, 2013), having no connection to MMT. The other two, the sector balance equation and the price equation, evolved from my own original research. So, my model is not based on MMT. However, the sector balance equation is *consistent* with the MMT point that government spending is unconstrained. If it were not, I

23 F: 437.7; R: 0.94; R²: 0.88; P: 2x10⁻²⁸; coefficient: 0.75

would have had to introduce some kind of limit on spending, which would have prevented my using differential equations, which require continuous functions. A second consequence of unconstrained spending is that no government borrowing is required, and none is included in my model, also an MMT theme (I don't consider Treasury securities as loans as they are monetary rather than fiscal actions and simply swap liabilities). Furthermore, in the balance sheets, I assume that banks credit deposit accounts when they make loans, i.e. existing deposits are not loaned out to bank customers. This is also an MMT theme. Thus, there are three themes from MMT in the model. But, I would point out that these three are not original MMT theories, though MMT has been good at bringing attention to them. Similarly with the idea that the National Debt is no burden, with which I concur. So, my model is consistent with MMT thinking and could be the starting point for the MMT model that they have been criticized for not having.

The approach taken in this book — which I call “Sector Economics” to distinguish it from other approaches to economics — has some similarities with Modern Monetary Theory (MMT), but also many differences. Most of the similarities are what I would characterize as “facts”, which should not be controversial, but apparently are anyway in some circles. They are simply descriptions of how the economic system actually works, but are not always understood properly by many economists and politicians.

One thing that makes it difficult for some people to accept these “facts”, is that things were very different prior to the age of fiat currencies, which began in 1971, when the U.S. delinked the U.S. dollar from gold. Prior to 1971, an international fixed exchange rate regime with capital controls — which had lasted for 100 years — was the norm. At that time — which was not that long ago — governments were subject to far greater spending, borrowing and budgeting restrictions under the gold standard than they are today under a fiat regime. Many have not realized the extent of the changes that have taken place, and are still thinking the way things were prior to 1971. Today, by my understanding, these MMT points include — for a sovereign country that issues its own fiat currency in a floating rate regime, and for a “government” that is a proxy for a consolidated Central Bank, Finance Department and legislature — the following:

1. The national debt is not a burden, neither for current or future generations, and can be paid off (narrow definition) at any time, because the government's ability to spend is unconstrained, so it can always buy back the national debt with an increase in Reserves, basically a simple liability swap. It can never default on its domestic debt and the size of the debt is not a problem.
2. The government does not have to borrow (issue bonds) in order to spend. Treasury bills should be issued for monetary policy reasons only (to manage interest rates), not because the government thinks it needs money (It doesn't).
3. The government must spend money into the economy before it can tax. Otherwise, there would not be enough money available in the economy to pay taxes.
4. It is loans that create deposits, not existing deposits that finance loans.

5. Running a balanced budget is risky and can lead to a recession. Running a surplus can do it faster.

These principles are generic for any country of the above type. But any individual country can choose to introduce legislative rules which put limits on the government's degrees of freedom. For example, the U.S. has a "debt ceiling" clause and a "set-aside" clause for Social Security, and complicated rules for how the Treasury accesses its account with the Central Bank. Both the U.S. and the U.K. customarily sell Treasury Bonds/Gilts when the government runs a deficit. None of these things are necessary. They just complicate matters and create misunderstandings. They have no bearing on the above principles, which are true in any case.

Some MMT critics have taken the opposite view, not denying the above MMT "facts", but rather saying that "there is nothing new" in them (Cachanosky, 2021). That may be true for an insightful small minority of the population, but certainly not for the vast majority.

Both approaches use a consolidated Treasury, Central Bank, legislature concept as the best way to understand a generic economy. Both see the sector approach as a useful tool to help understanding economics. Both see fiscal policy as a far more important tool than Central Bank manipulation of interest rates, which play a minor role in both approaches.

Areas where Sector Economics Differs from MMT

1. A 9-sector-based stock-flow-consistent mathematical model based on differential equations, including cash flows and sector balance sheets.
2. Introduction of a sector balance identity in mathematical form linking unemployment, wages, prices, investment, labor productivity growth and workforce size, along with a number of policy and other parameters.
3. Rejection of the Quantity Theory of Money.
4. Introduction of three kinds of money: bank credit, speculative, and "dead money" (bank reserves), having three distinct functions in the economy.
5. Introduction of far more detailed sectors, with particular emphasis on four types of householders and the role of their savings as the prime source of speculative money rather than for investment.
6. Introduction of a new way to look at inflation as consisting of four distinct types (i) long term, proportional to labor productivity (ii) short term cyclical about the long term driven by employer/employee dynamics (Phillips curve) (iii) occasional cost-push disruptions due to global events like war, supply-chain issues, food and energy shortages (iv) hyperinflation.
7. Taxes are seen as not necessary for government spending, and should rather be used for two things (a) affecting behavior — tax the things we want less of (environmental destruction) and subsidize the things we want more or (a healthy and well-educated populace) (b) transforming wealth and income distribution into a shape acceptable to citizens. Wealth inequality in particular is seen as a very destructive health and financial risk hazard.

8. Recommending establishment of a universal public banking system to enable the achievement of socially and environmentally desirable goals through strategic lending and taxation policies.
9. Noting the lack of convincing empirical evidence for deficit spending causing inflation.
10. Noting that a “broad definition” of the national debt includes bank reserves, as both are equivalent liabilities of the consolidated “government”. The national debt (broad definition) can be eliminated entirely by using a universal public banking system.
11. Noting that bank reserves are basically an accounting entry without any economic significance beyond intra-bank borrowing and clearing customer accounts with the Central Bank.

Areas where MMT Differs from Sector Economics

1. No mathematical model.
2. Full employment as the main policy goal.
3. Simple 2-sector concept, private sector and public sector.
4. The focus on a universal job guarantee.
5. The recommendation of a zero-interest rate.

I am not for or against MMT’s policy recommendations. They are simply outside of the scope of my study.

Appendix II: Data Sources

All data used in regression analysis testing was drawn from the Federal Reserve Bank of St. Louis (FRED) website. (<https://fred.stlouisfed.org/>). The software used was the standard regression analysis program of the Excel 2019 Data Analysis Tools. Each data series in FRED has a unique ID. I will indicate the source of each relevant data series used in the statistical analyses along with the model notation. Most series were annual from 1948 through 2019 (FRED designation 1948.01.01 to 2019.01.01).

Wages and salaries, including benefits (W.L). First the series Wages and Salaries ex benefits (WASCUR) was obtained. Then this was multiplied by 1.34 to get the total wage bill inclusive benefits, W.L. The 34% add on was a rough estimate based on various unofficial sources.

Average wage, W , was calculated from W.L from (1) divided by the number employed, L , which was calculated as Population (CNP160V) times the fraction employed (EMRATIO).

The price Index, P , was calculated from the Implicit GDP Price Deflator (A001RI1Q225SBEA).

F_r , the transfer fraction, assumed proportional to the wage bill, was calculated as transfer payments (A001RI1Q225SBEA) divided by W.L.

F_y , payroll tax rate, was estimated by an assumed flat rate of 7.65 % for all employees plus private employers, discounted by 27.5 % to reflect the effect of a maximum wage limits. This gave a flat rate very close to 10% for the whole period.

F_t , the income tax rate, is not readily available, so it was estimated in steps. (1) calculating total taxes from total government expenditure (W068RCQ027SBEA; 1948-1959 had to be backwards extrapolated) plus government surplus % (FYFSGDA188S) times GDP. (2) deducting payroll taxes (3) deducting corporate taxes (FCTAX) (4) deducting sales taxes (B248RC1Q027SBEA; 1948-1957 had to be extrapolated backwards). (5) Dividing the result by W.L

F_s , the household savings rate (A072RC1Q156SBEA).

M3 money supply, (MABMM301USM189S), 1961-2019.

Relative investment, I/Y , (A006RE1Q156NBEA).

Government surplus/GDP (FYFSGDA188S).

Corporate after-tax profits (CP).

Fed funds rate (FEDFUNDS).

Gross Domestic Product (GDP).
After-tax profits (BOGZIFA106000105Q).
Gross investment (BOGZIFA105090005Q).
F_c, net new consumer loans (TOTALSL) divided by W.L.
Unemployment fraction of the workforce, (1-x), (UNRATE).
Undistributed profits (B057RC1Q027SBEA)

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