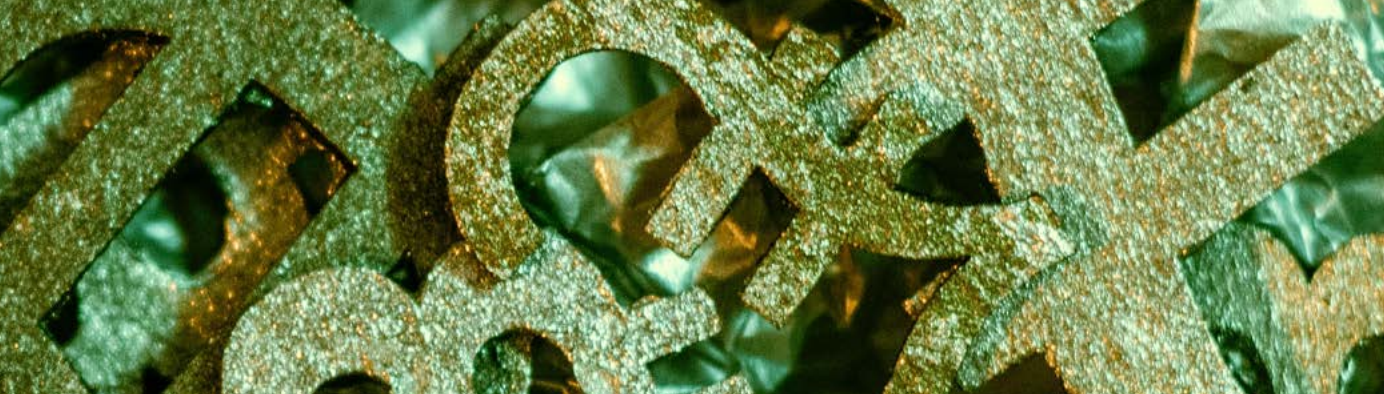


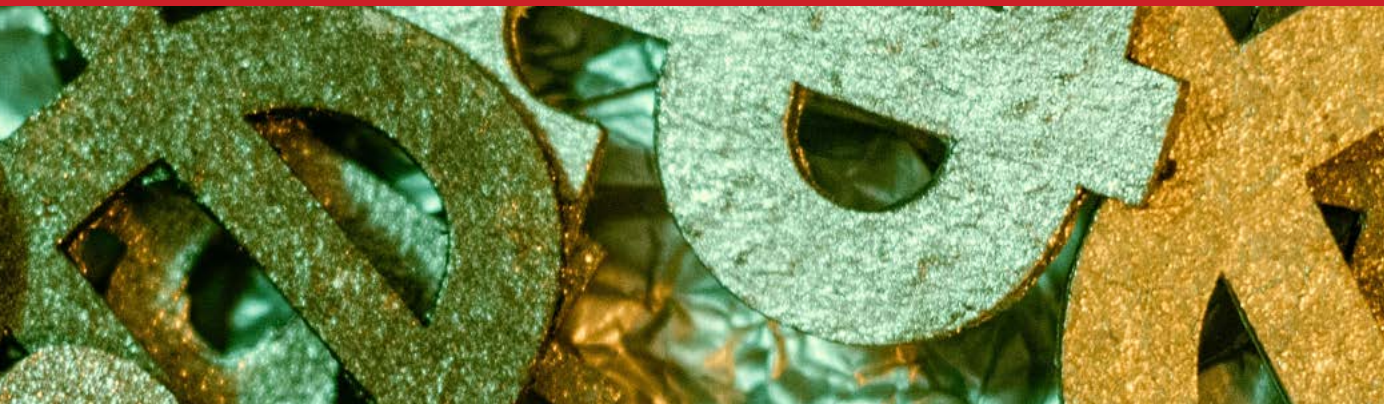


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Capitalism

Analytical and Historical Dimensions

Edited by Hardy Hanappi



Capitalism - Analytical and Historical Dimensions

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Preface

What is capitalism? This simple question has kept scientific discourse alive for several centuries and across many disciplines. As an overarching form that frames interactions in human societies, it needs further qualifications to distinguish it from the vacuous claim that the human species exists. The least one could do to give the concept 'capitalism' some character is to provide a historical starting point: a date when it emerged and left other forms of society behind. Today, economic historians agree that capitalism followed the social formations that were summarized as the Middle Ages. The age of kings and queens, also known as feudalism, prevailed in its purest form until approximately 1500. In Europe, its political structure was a twofold hierarchy: one based on the direct coercive force of the nobility, and one based on the supplementary ideological authority of the hierarchy of the Church. Direct coercive power and information power were able to stabilize local kingdoms at least temporarily, though the history of the so-called Dark Ages is mainly a history of wars, of armed conflicts that determined turning points in power disequilibria.

The economic part of society remained uniformly focused on agriculture to the point that it was no longer visible. Political economy was reduced to politics, a politics which centered on gaining land to acquire its agricultural output and the potential soldiers it carried. 'Economics' in the proper sense only appeared in human history with capitalism. Of course, it could first appear only in cooperation with politics, with the emerging global power of sea-faring empires in Holland and England. Thus, the beginning of political economy is closely bound to the emergence of capitalism. Furthermore, it was the second pillar of feudalism, its ideological information power assembled in the Church, which had to fall to allow the full flourishing of the backbone of the major force of capitalism: scientific knowledge, enabling the division of labor.

Parallel to an avalanche of new products and production techniques, science, as an essential ability of mankind, appeared. The monolithic ideological belief system of a religion was shattered by a plethora of scientific discoveries that improved human lives, educated people, and enabled them to question hierarchical feudal governance. In that sense, capitalism turned out not only to be a mode of production that expanded consumption possibilities, but also a profound change in how humans see their world and organize their society and govern themselves. This emancipation is the second epochal advance that the human species experienced during capitalism: science. From the natural sciences, which deal with the laws governing non-living matter, the knowledge moved on to the discovery of ways to organize the interactions between living entities. From Darwin's insights into biological evolution to the emergence of knowledge concerning the self-governance of human communities, to social science, to democratic mechanisms. Also, in this respect, humanity has advanced quite far: from local tribes to nation-states, towards a global community of mankind. The aspiration for self-governance has produced sophisticated frameworks

of social institutions. However, in the last century, capitalism as a mode of production was getting old; the two World Wars showed its emancipatory limits. The backlash of fascist forms of governance, of the aspirations of global racism, is a clear sign that global governance has to change gear to preserve the fruits of capitalism's historical mission. This can be the starting point for a new stage of human development, centered on the organization of democratic self-governance in the face of the planet's rapidly tightening environmental constraints. The success of this difficult task hinges on an understanding of the evolution of the global political economy. In this sense, the scientific knowledge produced during capitalism, in particular the knowledge of social science that materialized in frameworks of social institutions, is essential for a mode of organization (going beyond and including its mode of production) of mankind after capitalism.

A single small book like this must fall short of delivering satisfactory answers to the many questions that a grand theory sketched in the previous paragraph would imply. The chapters collected here are only spotlights on certain scientific fields, which promise to yield several fruitful findings that can serve as the underpinnings of a newly emerging social science of global political economy. An introductory chapter explores these questions in more detail. The next chapter starts with the analytical dimension.

It is surprising that the deep breakthrough of theoretical physics at the beginning of the 20th century - quantum theory - even 100 years later, has not been sufficiently digested by other areas of scientific research. Political economy is no exception; one promising attempt in this direction is included in this book. The aspirations of researchers fascinated by quantum theory sometimes soar, e.g., a new type of probability theory and a deeper understanding of consciousness discovered through brain research are anticipated. The latter would be particularly important for the global political economy since the scientific community will have to act as the 'central nervous system', the consciousness of the human species. More modest, down-to-earth physicists warn that too daring a hypothesis about quantum theory could be seriously misleading: There need not be too much of a connection between the microworld of particle theory and macrophenomena in the range of easily observable biology or even social science. Time will tell.

Despite the mainstream of neoclassical economics' attempts to keep its cathedral of undisputed truths on the behavior of a human individual clean, its policy recommendations are shallow, to say the least. Even its 2025 Nobel Prize winner, Daren Acemoglu, is tainted with the bad reputation of leaning too much towards 'institutionalism' - a stigma pointing in the direction of the necessary development of frameworks of social institutions, frameworks for global democracy. The evolution of theories follows a kind of *Darwinian algorithm*, too - *Darwinism*, by the way, being also a theoretical fruit of capitalism. As Herbert Simon famously formulated in his book on the sciences of the artificial, the *Darwinian algorithm* essentially consists of two elements: the generation of diversity and a test. The diversity of theories is just the result of alternative proposals aimed at overcoming the shortcomings of prevailing theories. The test then shows which alternative survives. From this evolutionary perspective, nationalism turning into fascism was a failed attempt to overcome the problems of industrial capitalism and early integrated capitalism.

The two World Wars of the 20th century were the dramatic tests proving this dead end. This thought leads directly to the next chapter of the book.

An alternative social theory, which the Frankfurt School of Sociology developed, was forced to emigrate to the USA when the NAZI regime took hold of Germany. The scholars of that school based their theory mainly on further elaboration of the dialectical methods of Hegel and Marx. The concise description of the merits of this school constitutes the content of this chapter. It is particularly important, as the 21st century seems to be leading to a revival of authoritarian regimes, recalling fascist features. The kind of absolute, global, authoritarian capitalism that appears on the horizon of humanity's fate postulates that it is the only possible social structure, that it is deeply rooted in what has to be accepted as the 'nature' of human individuals. It is not! This construct of 'human nature' is a fake. The attempted alternative described in this chapter remains a significant counterexample.

The next chapter spotlights the global character of contemporary integrated capitalism. It was written by a Brazilian author and concerns an African country under exploitation. Adam Smith, the first great economist of the school of British political economy, explained Britain's hegemony mainly by the superiority of the global division of labor, typically ignoring the slave trade and all its consequences for the concerned colonial countries. To this day, the view from below, from the perspective of the most exploited remnants of exploited territories, is rarely found in mainstream political economy, not to speak of mainstream neoclassical economic theory. This chapter seeks to fill the gap and provides part of the missing historical dimension that the evolution from colonialism to integrated financial capitalism has typically left in the most exploited parts of the world.

The final chapter on 'Global Atlantis' is an attempt to bring the many loose ends spread across the book's chapters under a common theme: the capitalist mode of production has begun to encounter insurmountable problems that emerge mainly from its once so successful economic algorithm. What economic general equilibrium theorists sometimes called a state of bliss, a paradise, which unbound capitalism would necessarily approach, this vision seems to vanish like the legendary Atlantis in the sea, in global wars and environmental collapse. However, as the preceding chapters already showed, there is a chance to overcome such a doomsday scenario. A new Atlantis can rise again; some of the fruits of the 500 years of capitalism, in a modified form, can be saved. Global division of labor and its resulting commodity production, in principle, can be made compatible with a reproducing human species. This last chapter provides a final optimistic twist. Without continuing optimism, theory building certainly cannot exist at all.

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Introductory Chapter: Capitalism – Analytical and Historical Dimensions

Hardy Hanappi

1. Capitalism running out of stream

This book aims to provide insights into the essence of the current mode of production, into capitalism. It appears at a time when capitalism has reached an unprecedented level of influence with respect to almost all areas of human life. It is *global*, meaning that the whole world, the entire territory inhabited by the human species is penetrated by capitalism. It has not only conquered the dynamics shaping the macroscopic movements of human institutions – ever-larger corporations dominating the ways in which goods are produced, with which means of production, and for whom; nation-states consolidating class struggles and leading wars, etc. – capitalism has also entered the microscopic sphere of the interpretations shaping the decision-making processes of individual human beings. The shadow of a capitalist algorithm tends to force individuals to behave like tiny ego-firms, short-term maximizers of an imagined private capital stock. In a sense, this extension into individual thought processes is a complementary process to macro dynamics; it tends to produce a kind of *absolute* capitalism.¹ In short, the success of the capitalist mode of production in spreading its message cannot be denied.

Nevertheless, the recent two decades in the new millennium were characterized by **severe crises of capitalism**: The Great Financial Crisis of 2009, the European migration crisis, the Corona pandemic, the approaching climate collapse, to name just a few. And this happened despite an exceptionally promising end to the previous millennium – at least for the proponents of the capitalist mode of production.² Communism and socialism had been given up by Russia, and China's cooperation as part of global capitalism seemed to be secured. The two World Wars of the 20th century could be explained as anomalies, and Fascism and Racism were ghosts of the past. Capitalism could be celebrated as the final, best world that history had led the human species to live in. What a harsh waking up in the 21st century!

It should not have been a surprise that mankind will not return to a heavenly paradise. Even the most successful mode of production (say, from 1,500 till now) is only an episode in the finite existence of a species. And as the philosopher Hegel already wrote, "The owl of Minerva takes flight only at dusk." Only now, when the episode of capitalism approaches its end, can we see more clearly what the essence of

¹ Compare [2].

² Compare [3].

its historical mission was and what the problems are that will mark capitalism's end. They will also be the obstacles that a possible next progressive mode of production will have to master. Of course, when the owl of Minerva starts to fly, it will first have to look around and take stock of the available different perspectives on capitalism. This is what the chapters in this book try to provide.

2. Analytical and historical sciences as reasons for hope

A major contribution of the capitalist mode of production consists in its **development of knowledge as a commonly shared treasure of mankind**. The many material conveniences that capitalism enabled usually overshadow the role of scientists, who took human understanding out of the hands of the religious darkness of the Middle Ages. There indeed is a wealth of trajectories of human knowledge that provided the necessary background for the surprising plethora of goods and services brought about by innovative firms.³ It is this often ignored analytic dimension that makes capitalism the executive force of enlightenment. We have to acknowledge how Galileo, Descartes, Euler, Gauss, Leibniz, Newton, Voltaire, Adam Smith, Karl Marx, Darwin, Maxwell, Goedel, John von Neumann, Einstein, Schrödinger, and many others made our world accessible by their analytical contributions. Only then, we – the contemporary generation of scientists – will be able to stand “on the shoulders of giants” (Isaac Newton, 1675) again. To enhance analytic foundations is an extremely difficult task. The standard trick of the capitalist era, namely the division of labour⁴, has led to an insurmountable split-up of scientific disciplines. In particular, the science of political economy, which combines the above-mentioned macroscopic sphere with the microscopic sphere of individual thought, depends on profound synthetic work across disciplines. The capitalist mode of production has led science to this state of affairs, but the remaining synthetic efforts mostly go beyond the possibilities enabled by capitalist corporations looking for profits, particularly as far as the looming environmental problems are concerned. John von Neumann and Oscar Morgenstern felt these substantial difficulties in developing an *analytical breakthrough to describe social systems* as early as 1944, when they formulated game theory. “The importance of the social phenomena, the wealth and multiplicity of their manifestations, and the complexity of their structure, are at least equal to those in physics. It is therefore to be expected – or feared – that mathematical discoveries of a stature comparable to that of calculus will be needed in order to produce decisive success in this field. . . . *A fortiori* it is unlikely that a mere repetition of the tricks which served us so well in physics will do for the social phenomena too. . . . These observations should be remembered in connection with the current overemphasis on the use of calculus, differential equations, etc., as the main tools of mathematical economics” [1]. The two fathers of game theory did not expect that such a fundamental analytical breakthrough would happen during their lifetime; in physics, the distance from the descriptive work of Tycho de Brahe (1546–1601) to the analytical revolution of Isaac Newton

² Compare [4], who produced a remarkable account of the transitions enabled by scientific progress.

⁴ At the firm level this is the topic of Taylor [5], while at the macroscopic level it is the core of Adam Smith's “The Wealth of Nations” [6].

(1643–1727) had been around hundred years. Given the backwardness of political economy, the hopes for a new pivotal *analytical* revolution still are minuscule. The contemporary hype of a marketing-initiated technological fashion labeled “Artificial Intelligence” certainly does not count as such an event. But it is significant for an earlier stage of scientific progress, which Neumann and Morgenstern describe with respect to game theory as follows: “This preliminary stage is necessarily *heuristic*, i.e. the phase of transition from unmathematical plausibility considerations to the formal procedure of mathematics. . . . At this early stage the application serves to corroborate the theory. The next stage develops when the theory is applied to somewhat more complicated situations in which it may already lead to a certain extent beyond the obvious and the familiar. Here theory and application corroborate each other mutually. Beyond this lies the field of real success: genuine prediction by theory. It is well known that all mathematized sciences have gone through these successive phases of evolution.” [1]. The analytic dimension of the capitalist mode of production with respect to its self-understanding – to understanding of the global political economy – evidently so far has not reached beyond some outdated analytical tools provided by natural sciences. What the chapters in this book can provide is only a kind of *implicit* analytical method. Eventually, it is built on the classical ideas of dialectics – on the succession of doubts, variety, creativity, and test – and eventually it is built on the emerging understanding of quantum theoretic considerations in physics. Both routes today clearly are bound to remain heuristic, pretty preliminary, and as such they point explicitly at the *historical* dimension of capitalism.

This historical dimension of the capitalist mode of production can be approached in a much more straightforward way.³ It is evident that historians, educated and working in the centers of capitalism in Europe and Northern America, usually had the bias to describe the path toward their own capitalist country as a success story. In doing so, they relegated the rest of the world to being merely *developing* countries. Note that this already includes the assumption that capitalism is a kind of goal, even an endpoint of human development. More precisely, it is assumed that the capitalist algorithm is characterized by infinite flexibility and is able to overcome any kind of impasse it encounters in the finite world inhabited by the human species. Seen from this perspective, *capitalist ideology is a religious belief*.

But religious ideologies typically include an internal enemy, which has to be repeatedly overcome to confirm the superiority of the supreme dominator. The belief in the eternally continuing survival of this supreme dominator, vulgo God, is what distinguishes religious approaches from scientific ones. Scientific historians also see and describe emerging contradictions in societies. They structure history into phases of relatively stable ages with the same form of central social mechanisms, e.g., capitalism, some shorter stages within these phases, e.g., industrial capitalism, and then rather short transition periods – sometimes called revolutions – that cut into the long-run evolution. There is no endpoint necessary, what is of interest is to describe how contradictions along each of these time frames emerge, grow stronger, and eventually explode to give room either for new creative solutions or for simple extinction. What is of utmost importance is that the direction of historically emerging contradictions – the shortest line between opposing forces – often changes and creates new opposing forces.

³ A classic contribution is [7].

It is this procedure of the scientific historian, which distinguishes her or him from the apologetic priest of capitalism, that refers back to the hope for the next breakthrough in analytical methods mentioned above. The preliminary stage of analytic scientific progress has to be filled by narratives, by heuristics stemming from the research of scientific historians. This book shall be read as a collection of selected pieces for a mosaic of a future global political economy. The owl of Minerva has just started its flight; we can only hope that it is not too late to prevent a new Middle Ages.

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Chapter 2

Perspective Chapter: Quantum Coherence in Socio-Economic Development – A Framework of Bohmian Insights for Sustainability

Milan Vemić

Abstract

This study examines how David Bohm's quantum theoretical principles, embodied in wholeness, implicate order, and holomovement provide innovative frameworks for reconceptualizing sustainable development. Current approaches remain constrained by mechanistic paradigms that fragment economic, environmental, and social systems, limiting transformative solutions to recurring global crises. Through systematic conceptual analysis and cross-disciplinary literature review, this research develops consciousness-based models that transcend fragmented thinking and separated domains by applying quantum metaphysical principles in socio-economic systems in an integrated manner. Comparative systems analysis reveals significant parallels between quantum mechanical principles and economic behavior, demonstrating how Bohm's framework addresses sustainability challenges through the epistemological and ontological transformation of information rather than mere technical optimization. Generalization and illustrative modeling show how implicate order dynamically enables economic coherence, organizational intelligence, and systemic governance. Expressions are derived for unfolding sustainable development operators and kinematic transformations evolving with quantum economics. Two central quantities emerge: active and passive information, exhibiting close analogies with gravitational pull and sustainability potential, bounded by thermodynamic laws and entropy principles. This formulation corresponds to and transcends the quantum law of syllogism, bridging information theory, quantum mechanics, and sustainability metrics. The 2025 coherence–entropy sustainable development scores findings correlatively unify Shannon entropy, Bohmian coherence, and Feynman extremals. A sustainability law of syllogism was suggested, confirming the systemic coherence of the scores. The Appendix validates Bohm's concepts, facilitating paradigm shifts from mechanistic control to participatory transformation, establishing theoretical foundations for quantum-informed economics, consciousness-based management, and holistic responses to global sustainability challenges that have become increasingly urgent since Bohm's original discoveries.

Keywords: circular economy, consciousness, David Bohm, implicate order, socio-economic implications, quantum theory, sustainable development, sustainable development goals, wholeness

1. Introduction

Contemporary approaches to sustainable development face fundamental limitations rooted in mechanistic thinking that fragments economic, environmental, and social systems into disconnected and unsustainable components. Consequently, fragmented development impacts can result when a certain, typically analogous quantum mechanical contribution to this reality – the quantum potential – is neglected. The ensuing disintegration undermines comprehensive solutions, repeats global crises, and limits innovative potential. David Bohm's quantum theoretical framework offers radically different possibilities for reconceptualizing sustainable development through the principles of wholeness, holomovement, implicate order, and ensuing consciousness-based economics. As shown in Section 4, the suggested interpretation leads to an extended sustainability approach that is inherently holistic, as it allows interconnections between different systems.

The results of this work aim to provide further insights, propose solutions, and establish comprehensive theoretical foundations for addressing contemporary sustainability challenges. Mechanistic paradigms are hereby altered to establish consciousness-based approaches that systematically transform economic theory and organizational management. The research shall first demonstrate that quantum mechanical insights, when applied through Bohmian principles, reveal new and emerging relationships between physics, economics, and management. The second aim is to enable the development of more holistic models that can address uncertainty, interdependence, and the innovative integration of environmental and social dimensions of sustainable development.

Rather than treating Bohm's work as a historical review or mere philosophical speculation, this research aspires to position Bohmian principles as an applied theoretical resource for reengineering economics, management, and sustainability. While his concepts are detailed fully in the cited works, this study focuses on practically applying his theory to contemporary sustainability challenges. Therefore, by extending attention from theory to applied concepts, the analysis develops a complex framework that demonstrates how quantum-informed perspectives can clarify systemic interconnections and inspire different pathways toward sustainable development. This orientation provides the foundation for the ensuing research. Let us first consider sustainability.

2. What is sustainability?

As is well known, sustainability relations can be regarded in several closely related ways. The three pillars – economic, social, and environmental – on which sustainability rests were first elaborated in 1987 when the UN World Commission on Environment and Development published its report "Our Common Future" (the Brundtland Report). Sustainable development was then defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [1]. Addressing the inherent interconnection

of different systems, Laszlo’s connectivity approach [2] and, most recently, Microsoft [3], reiterated holistic and scalable solutions for environmental sustainability. To transcend this concept analogously into the Bohmian language, let us analyze its sequence with three strikingly interrelated sustainability notions:

- (1) In participation, producers and organizations are encouraged to take an active role in defining public policies, delivering services, and shaping common actions. More broadly, Bohm advocated dialog as a means to attain the unlimited and the invisible, demonstrating how it should be based on self-perception or proprioception and participatory thought [4].
- (2) In reconversion, as equipment is overhauled, the organization of production becomes more efficient, products become more competitive, natural resources are conserved, and the scope of equitableness increases. Bohm paid special attention to the use of language and suggested introducing a new mode of language, which he called the rheomode (“rheo” is from a Greek verb meaning “to flow”). Translated into Bohm’s rheomode language, the sustainability term reconversion does not simply involve changing a resource from its first use to a second use, where each resource is uncoupled only as a relatively invariant aspect of sustainability. Instead, wholeness implies that reality is an unbroken, undivided whole movement [2, 5].
- (3) In institutional transformation, each sector’s institutions need to modernize their capacity to react to the demands and needs of different producers and social actors to emerge, serving as developers, managing relations, and integrating into the sustainable development framework. Bohm reserved the term “transformation” to describe a simple geometric change and instead recommended, for the broader context of implicate order, the use of the term “metamorphosis.” In sustainability, this term is profoundly more radical than changing the fixed structure of a regulatory framework, which bears a resemblance to a plain geometric position or orientation of a rigid body [5].

The evolution of many distinct sustainability initiatives is shown in **Table 1**. The method of this study will now be considered.

Sustainable development goals (SDGs)	Key agendas	Key finance aspects	Climate change initiatives	Risk reduction frameworks
1987 Brundtland Report	1992 Rio Summit Agenda 21	2001 Doha Development Agenda, WTO	1992 Rio UNFCCC 1997 Kyoto Protocol	Hyogo 2005 Framework for Action
2002 Johannesburg Plan	1998 Aarhus Convention	2002 Monterrey Consensus	2015 Paris Agreement	2015 Sendai Framework
2012 Rio + 20 “The Future We Want.”	2007 UNDRIP	2015 Addis Ababa Action Agenda	2022 Kunming-Montreal Biodiversity Framework	2023 UN Global Assessment Risk Reduction Report
2015 17 SDGs	2019 World Bank GPS	2019 Joint SDG Fund	2025 COP30	2023 ISSB Framework

Table 1.
Main multifaceted sustainable development initiatives, nonexclusive.

3. Method

3.1 Research questions

To investigate how quantum principles of wholeness, implicate order, and holomovement can be applied to reframe economics, organizational management, and sustainable development, the study addresses three interconnected research questions that move from structural analysis to practical application:

- (1) What structural parallels exist between quantum phenomena (e.g., entanglement, wave–particle duality, nonlocality) and economic or organizational behaviors?
- (2) How can Bohmian concepts of wholeness and implicate order address systemic fragmentation in current sustainability approaches?
- (3) What practical applications emerge from integrating Bohm’s framework with sustainable development, the sustainable development goals (SDGs), and financial and management practices?

3.2 Research design, literature selection, and empirical data analysis

This study employs a theoretical synthesis methodology with an empirical approach.

Validation, integrating Bohm’s quantum mechanical principles with economics and management, and sustainability studies anchored in SDG data score patterns (see **Appendix A**) established through correlation analysis. This mixed-methods design is appropriate for addressing research questions that require both conceptual innovation and empirical verification, particularly when exploring archetypal shifts in sustainability that transcend conventional disciplinary boundaries.

The first step will be to use the theoretical framework, which draws upon systematically selected literature across multiple scientific domains:

Primary sources include Bohm’s writings (1951–2003) and foundational texts by other authors on quantum theory, hidden variables, consciousness, and dialog.

Secondary sources include peer-reviewed literature in physics, economics, finance, management, systems theory, and sustainability.

Mapping and modeling accentuated: (1) direct relevance to Bohm’s principles, (2) scholarly rigor, (3) conceptual alignment with wholeness and implicate order, (4) cross-disciplinary integration of quantum mechanical findings and sustainability notions, and (5) potential for empirical SDG validation.

Secondly, in **Appendix A**, the empirical validation component utilizes the 2025 SDG performance data from the Sustainable Development Solutions Network (SDSN) SDG Index & Dashboards – Global Dashboard 2025 [6]. The dataset encompasses SDG performance across 15 regional groups, analyzed through five key metrics: (1) SDG Index Score, (2) missing values percentage, (3) spillover score, (4) SDG Index year-over-year progress (percentage points), and (5) regional SDG ranks. This data provides quantitative indicators of sustainability performance across economic, social, and environmental dimensions, enabling correlation

analysis between theoretical constructs and measurable outcomes while revealing patterns of systemic coherence and fragmentation across regional contexts.

The combination of theoretical synthesis and quantitative verification addresses the observed fragmentation in current sustainability archetypes while maintaining the flexibility necessary for paradigmatic inquiry models. The study combines three main interrelated analytical approaches:

- (1) Theoretical synthesis: Cross-disciplinary mapping, modeling, metaphor, and analogy-making establish conceptual bonds between Bohm's quantum principles and sustainability frameworks. This process involves iterative refinement through which quantum concepts – wholeness, implicate order, and holomovement – are systematically mapped onto ongoing sustainability challenges and organizational dynamics.
- (2) Statistical analysis: Correlation analysis (Pearson's r) between SDG scores and associated metrics explores systemic patterns and relationships. This research approach prioritizes conceptual integration and pattern recognition over formal hypothesis testing, reflecting the interpretive and holistic nature of the research framework. Correlation coefficients are not taken to mean a source of causality or merely statistical relationships, but as indicators of systemic coherence aligned with Bohmian principles of potential and active information.
- (3) Entropy-coherence analysis: Shannon entropy calculations, combined with coherence measures derived from SDG correlation matrices, provide a quantitative assessment of systemic integration versus fragmentation within the sustainability performance data.

The following sections present findings that emerge from this integrative approach, demonstrating how Bohmian principles of wholeness and implicate order illuminate structural coherence within sustainable development systems and reveal new pathways for transforming organizational and economic practices.

Several research results are now generalized and discussed in Section 4.

4. Results and discussion

The analysis in this study reveals significant parallels between quantum mechanical principles and economic and management theories, demonstrating how Bohm's holistic framework offers innovative perspectives on known developmental challenges. Its applicability is well-suited for the SDGs. This systems-level shift echoes Germaine's insights into the holographic principle of mind [7], where consciousness is viewed as a dynamic interface between the implicate and explicate orders of reality. This recasts sustainability not as a discrete policy goal but as an evolving expression of consciousness in a holarchical and participatory environment. On this premise, the concept of sustainability as an expression of coherent wholeness also resonates well with Laszlo's Bohmian-signified systems theory [2], which structurally links physics, life sciences, and social systems in a unified theoretical model applicable to economics and management.

4.1 Quantum entanglement and nonlocal correlations

To begin the consequent proof, it should be noted that the noncausal connection between spatially separated elements was first demonstrated in Einstein, Podolsky, and Rosen’s (EPR) 1935 thought experiment [8], and later theoretically reinterpreted and empirically validated [5, 9]. The EPR paradox determined that quantum mechanics predicts correlations between distant particles that cannot be explained through locally interacting variables. A new interpretation revealed how these particles act as projections of a higher-dimensional super-implicate order [9] in integral science [2]. Indeed, this will be very useful later in the application of the suggested sustainability model and validation of the obtained SDG scores. Quantum theory will be further described.

Quantum theory implies that spatially separated elements represent non-causally and nonlocally connected projections of a higher-dimensional reality mediated by quantum potential. Atoms separate after molecular disintegration and no longer interact causally but maintain correlations at higher implicate order levels. Moments separated in time also function as such projections, making the following quantum potential equation, derived from the Schrödinger equation, extend classical concepts and modes with new forms of physical law [5]:

$$U = -\left(\frac{\hbar^2}{2m}\right) \frac{\nabla^2 R}{R} \quad (1)$$

Eq. (1) represents a nonlinear flow with a force that depends on the entire quantum field, reflecting the activity of information [9] acting alongside the classical $V(x)$ via the quantum potential (U). The de Broglie relations and Bohm’s wave–particle coherence with matter behavior link wavelength and momentum to probability density [8]:

$$\lambda = h/p \rightarrow (|\varphi(x)|^2) \quad (2)$$

As shall be seen later, these unique properties of quantum theory will prove useful in the newly proposed sustainable development models (see Section 6).

4.2 New developmental space-time and quantum consciousness

The next important task is to discover how Bohmian interpretations of space-time entanglement differ significantly from pre-Bohmian theoretical frameworks [5, 9]. **Table 2** summarizes several shifts between classical and Bohmian notions.

Table 2 illustrates Bohmian shifts that reconfigure classical domains into implicate–explicate dynamics. Space is conceived as an enfolded substrate that enables coherence; motion is viewed as holoflux, a multidimensional flow that modifies economic activity as a participatory emergence. Cognition aligns with resonance and hybrid perception, integrating economic and ecological entanglements into systemic intelligence. Temporality is recast as quantum discontinuity, where transformation occurs through threshold leaps rather than linear aggregation. Hence, the economic process becomes a recursive enfoldment, with sustainable development emerging through bidirectional recursion between latent potential and manifest structures. Together, the shifts reorient economics, governance, and sustainability toward quantum-informed coherence, contrasting with the inflexible conventional convexity and mechanistic control (see **Table 3**).

Domain	Classical concept	Bohmian metamorphosis
Space → Dimensionality	3D → abstraction	nD implicate enfoldment
Motion	Vectorial flux	Multidimensionality and holoflux frequency
Wave function	Oscillation $\lambda = h/p \rightarrow$	Statistical $\rightarrow (\varphi ^2) \rightarrow$ hidden variables in play
Consciousness I → Cognition	Passive → reception	Active coherence and enfolded infinity
Consciousness II → Awareness	Local cognition	Hybrid grasp and resonant balance
Time I $\Delta t \rightarrow$ Temporality	Causal chain ($\rightarrow$)	Sustained implicate atemporality
Time II $\Delta t \rightarrow$ Continuity	Finite intervals	Recursive extension across different scales
Process	Linear ($\leftrightarrow$)	Recursiveness becomes enfolded–unfolded

Table 2.
Bohmian-inspired space-time consciousness.

Quantum physics concavity–convexity	Economics convexity	Management concavity– convexity
Nuclear-level interaction correlates with the macroscopic level.	Rational economists make informed micro/macro judgments using calculus, marginal analysis, and opportunity cost.	Innovation. Correlation between leading performance and concave–convex people development.
The wave function provides statistical correspondence with matter behavior.	Markets optimize activity under uncertainty, and stochastic processes for decision-making alignments.	Motivation can be unstructured, involving indeterminism and probabilistic interpretation.
Wave–particle transforms cannot explain all matter behavior.	Economic cycles show upward/downward trends, increasingly modeled via quantum computing.	Leadership can be unstructured, concave, indeterministic, and probabilistic.
ψ -potential and ψ -collapse encode latent possibility and actualization.	Governance intention unfolds into policy signals and explicates metrics which convexify.	Strategic foresight collapses into new decisions and organizational outcomes.
Entanglement reflects non-local systemic coherence.	Global interdependence and cross-border feedback loops challenge convexity.	Stakeholder alignment and distributed leadership across networks.
Holomovement as dynamic unfoldment–enfoldment	Recursive governance cycles and institutional learning are challenged by entropic reality.	Adaptive management and reflexive modulation of strategy to manage convexity.
Observer effect alters system behavior upon measurement.	Metrics and variables reshape economic behavior and policy orientation with diverging trends.	KPIs show a concave influence on organizational focus and employee behavior.

Note: Quantum ripples implicate geometric recursiveness, which enables lean sustainability management, solidifying economics as a growing system [20].

Table 3.
Major noted similarities and differences in the triad.

4.3 The new superimplicate holographic foundation

Figure 1 is comprehensive. It integrates how Bohmian energy potentially organizes itself meditatively for the benefit of the holonomic brain, representing unique ranges of metaphors, energy, and information. The concurrent existence of different energy fields and continuous enfoldment–unfoldment processes represents translated measures and actions guided by knowledge and reason. These actions are

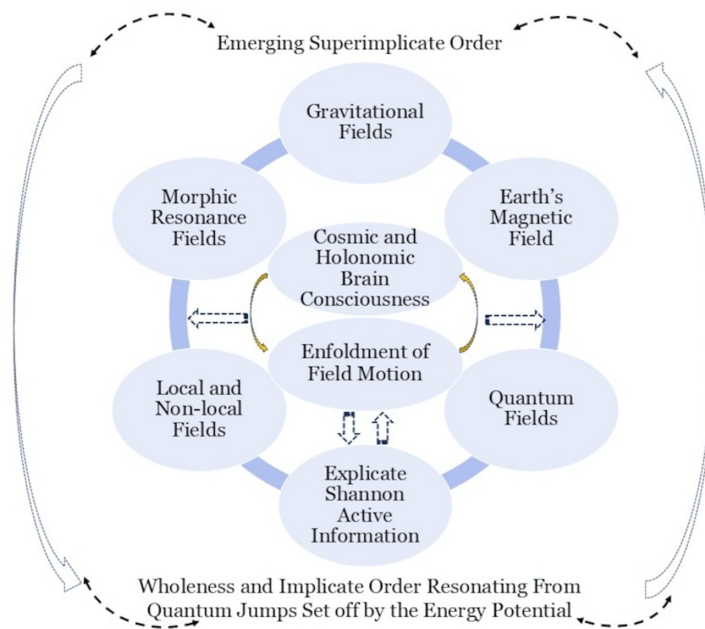


Figure 1.

Undivided wholeness from superimplicate order and flowing congruent fields. Implicate order appears as a hidden, generative structure; explicate order comes about as an observable manifestation; holomovement is an undivided flow across all domains, forming a concurrence order; active information evolves as Likert's linking pin between all fields and consciousness. Created by the author.

taken to attain what remains measureless to man [10, 11]. This implies both seen and unseen states in which the sense of separation between the self and the whole of reality disappears, representing Bohm's concept of holomovement [5], originally introduced as holism, which implies the creation of wholes in the universe [12]. The Bohmian superimplicate order encompasses nested levels, ranging from quantum potential to implicate order and ultimately to explicate manifestation. Energy flows, feedback loops, and the holonomic brain modulate access to hidden variables [13]. Quantum field fluctuations form the underlying matrix, with consciousness collapsing potential into reality. **Figure 1** highlights the concurrent, rather than sequential, nature of different kinds of field interactions.

The illustrated concepts from **Figure 1** extend to economic applications, where hidden variables in superimplicate order reveal innumerable potentialities in both natural and social sciences [13]. Domain interaction gains significance as consciousness collapses potential into reality. The conceptual space of brain knowledge centers and microelectronic domains remains vast for both the mind and AI, where consciousness, with its resonance through particle-wave properties, becomes critical, particularly when thought is interacting not only with a machine but also with morphic resonance fields – a finding that was implied in the Sheldrake–Bohm dialog [14]. **Figure 2** illustrates the new evolution of consciousness.

Future research may extend this inquiry by examining the holographic dynamics of systems [5] and the mind [7], especially where economic and management structures seem to act as distributed fields of consciousness. Such work could inform quantum-based business strategies and sustainability approaches beyond

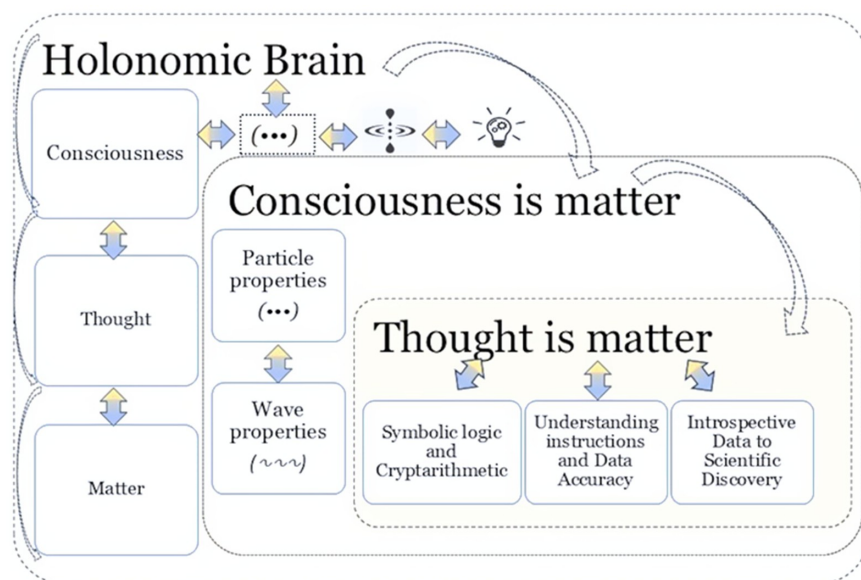


Figure 2. Integration of thought and consciousness with the holonomic brain. The diagram illustrates the transition from fragmented mechanical thought to holistic awareness, implying wave-particle duality in consciousness. Consciousness is seen not as a passive prevalence but an implicate fundament, from which governance intention, ethical modulation, and systemic coherence actively unfold. Consciousness tunes ψ -potential through intention and systemic sensitivity for innovation. Governance recursively expresses implicate coherence. Wave symbols ($\sim$) indicate distributed quantum-like awareness, while particle dots (...) represent localized states and mechanical reflexes. The integration of the holonomic brain is on the right; each neural region contains information about the entire system. Created by the author.

mechanistic models. The three key pillars – economic, social, and environmental – remain crucial analogies for proposed SDG measurements in Section 6.

4.4 Toward a sustainable development paradigm through creativity, participatory dialog, and coherence

Building on the depicted foundational concepts of wholeness, implicate order, and consciousness, this section explores how to operationalize the discussed ideas in the context of sustainable development. Drawing particularly on Bohm's work with his student Peat [13], this analysis outlines how dialog, coherence, and creative perception support adaptive, inclusive, and resilient organizational and societal structures. Their research demonstrates that wholeness principles provide theoretical foundations for sustainable development approaches that transcend fragmented thinking. Organizations operating from a wholeness perspective align more closely with SDGs through integrated approaches that consider environmental, social, and economic factors as interconnected aspects of unified systems. Hence, the wholeness and implicate order concepts introduce a framework for local actions with global implications, supporting business practices that prioritize long-term sustainability over short-term gains.

Sustainable development is often reduced to economic growth within environmental limits, yet Bohm emphasized the deeper grounding in creativity, meaning, and coherence. True creativity requires continual questioning of

assumptions [13], so sustainable societies cannot rely on fixed plans but must remain open to novelty and emergent ideas. Each act of creative perception represents “going to new orders” [13], making creativity vital not only to science and art but also to governance, education, business, and finance. Creative processes thus underpin cultural sustainability, embedded in beliefs and heritage.

According to Bohm, creative insight means suspending habitual responses and opening up to seeing “the whole field,” rather than fragmented parts [5, 9, 13]. For sustainable development to be viable, it must integrate environmental, social, and economic concerns in ways that transcend reductive, linear thinking. This approach recognizes that sustainability emerges from creative and holistic processes rather than the mechanical implementation of predetermined development strategies, producing developmental divergence among regions (see **Appendix A**).

Furthermore, creativity is not limited to exceptional individuals; it emerges as a universal capacity latent in all human beings, especially when nurtured through participatory and dialogic environments, as discussed by Peat and Bohm [13]. Such democratization of creative potential builds more inclusive approaches to sustainable socio-economic development, converges SDG progress among regions, and enables a less skewed correlation structure (see **Appendix A**).

Bohm considered dialog as a precondition of orderly life [4], and it seems that SDGs from the Sustainable Security Index gravitate significantly toward his approach. Central to this reconceptualization is the role of dialog, which is defined not as a debate but as an innovative space of shared inquiry, perception, and meaning. Dialog should become a process in which thought operates not only individually but also “collectively” [13]. This shift provides foundational support for building sustainable societies that can respond flexibly to evolving global and local challenges. Dialog, which is sustained not by agreement but by collective exploration of meaning [13], fosters coherence and mutual understanding essential for participatory learning [15]. Like ecological health, meaning must be regenerated. Bohm warned of its degeneration into disconnection and cynicism [13], which undermines sustainability when shared values collapse. Yet, meaning can be renewed through participatory dialog, creative engagement, and learning, which are vital for sustainable development.

Meaning, values, dialog, and order clearly uphold sustainable development.

4.5 Learning processes for coherent, instead of fragmented, societies

Fragmentation of knowledge, institutions, policy, and perception is a major threat to sustainability. Dividing problems into specialized structures severs them from economic, social, and environmental contexts, producing symptom-centered solutions that neglect underlying order [13]. Rigid thought systems, unable to adapt through dialog [14], undermine resilience in organizations that should be open to both order and disorder [13]. Hence, as shall be seen in the subsequent section of this work, sustainability requires structures that sustain change, not bureaucratic hierarchies, with governance, education, and policy designed to foster creative development responsive to people and ecosystems.

Bohm urged replacing fragmented, control-oriented approaches with an “order of wholeness” [13], where parts draw meaning from the economic, social, and environmental wholeness. Suppressing novelty risks stagnation and fragmentation, blocking adaptive responses to complex problems: “The society may fragment and vanish as a centre of coherence” [13]. His implicate order places relationships before

isolated parts, guiding the sustainable development of learning organizations and societies through systemic understanding rather than piecemeal fixes [13]. This is vital for institutional design, as it was observed that incomplete feedback raises costs [16], and fragmented political units undermine long-term coherence [17], which is evident in SDG outcomes (see **Appendix A**).

Sustainable development is implicitly an active learning process, open to transformation through discoveries [13, 18, 19]. Sustainability is thus not only an equilibrium but a dialogic renewal. Experimentation, feedback, and shared inquiry become the standard, with collective meaning and creative insight driving social “evolution” [14]. Echoing the implicate order, Laszlo stressed coherence and connectivity [2], while Senge’s five disciplines of personal mastery, mental models, shared vision, team learning, and systems thinking integrate Bohm’s dialog and creativity [19]. A learning-oriented approach [15, 20] recognizes that complex challenges defy static solutions, requiring adaptive systems capable of continuous evolution [11]. This resembles Kauffman’s fitness landscapes [18].

Now, the next section will consider in more detail the evolving relationships between quantum mechanical principles, economics, and management.

5. Toward a new relationship between quantum physics, economics, and management

At the quantum level, interactions in nuclear dimensions exhibit correlation with macroscopic phenomena [13], which has led to the first fundamental structural parallels between inertial systems in physics and steadily growing systems in economics [21]. Rational economists make informed micro and macro judgments by applying calculus and considering marginal and opportunity costs. In management research, leadership effectiveness, organizational performance, and people development reveal a positive and significant linear correlation; for example, see the study by Koohang et al. [22]. The newly found triadic linkage geometry is shown in **Table 3**.

The canonical derivation in **Table 3** shows Bohmian undivided wholeness [20] rationally forming supersystems, systems, and subsystems. While the reinterpretations of space, time, and consciousness are outlined in **Table 2**, **Table 3** now extends this by mapping structural correspondences across quantum physics, economics, and management disciplines. Together, the two tables trace a logical progression: from abstract conceptual shifts (see **Table 2**) to applied systemic parallels (see **Table 3**). They reveal that in curvature, dynamism, and phase-switching, quantum physics and management share structural similarity, herein termed concavity–convexity, whereas economic convexity, as such, proves disruptive. This progression illustrates how Bohmian principles offer both a philosophical reordering of reality and a practical framework for managing uncertainty, emergence, and coherence in complex socio-economic systems.

5.1 Statistical correspondence and uncertainty

At the quantum level, the wave function provides only a statistical correspondence with actual matter behavior, reflecting inherent uncertainty in quantum measurements. In economics, markets represent optimal mechanisms for performing and regulating economic activity, characterized by uncertainty,

stochastic processes, and nonlinear dynamics. At the management level, motivation, defined as the internal drive that energizes and guides behavior toward goals, can be unstructured, involving indeterminism and probabilistic interpretation [8]. Hence, it essentially needs Senge's five disciplines [19, 20].

These parallels suggest that uncertainty and probabilistic behavior represent fundamental characteristics across all three domains, rather than limitations to be rectified. It is quantum physics and management, as shown in **Table 3**, which possess both concave and convex regulation forces. As an implicate order, concavity handles multiple potentialities containing Shannon entropy, and convexity is the drive toward explicate goals. This perception aligns with Bohm's view that uncertainty implies the dynamic, creative nature of reality with hidden variables.

5.2 Transformation of cyclical patterns and integrated understanding

The transformation between wave and particle aspects of matter potentially explains all forms of behavior demonstrated by matter through what Bohm termed superimplicate transformations of processes, where fundamental reality shifts between different orders of manifestation [9]. Economic, trade, and business cycles tend to follow downward or upward trends, which are well understood through quantum computing applications and quantum finance methods [23]. In management, effective leadership requires embracing indeterminism, probabilistic interpretation, and uncertainty rather than attempting to control all variables. Stacey [18] effectively drew on Bohm's notion of undivided wholeness to rethink deterministic views in management, diverging from Aristotelian–Cartesian causality. Similarly, Senge [20] applied Bohm's theory of thought and dialog.

As shall be seen in Section 6, quantum principles offer far more than metaphorical parallels for economics and management. They may reveal structural features of complex systems, where part-whole identities are bidirectionally entangled [23]. The statistical nature of quantum mechanics, market behavior, and managerial dynamics suggests that indeterminacy serves as a generative force rather than merely a problem to be resolved. The correlation patterns identified in the triad of quantum physics, economics, and management support the thesis that fragmented approaches to understanding complex phenomena may miss essential relationships [5]. An integrated perspective that applies these cross-domain parallels could inform more creative approaches to economic policy and management practice that work with uncertainty rather than against it [17–20]. The emergence of quantum computing applications in finance [23] and the growing recognition of complexity theory in management [18] indicate that these connections are more substantial than just theoretical novelties. It can be shown that sustainable development can truly gain from this concave–convex duality. This shall be modeled in detail in the forthcoming Section 6.

6. Transcending quantum potential complexity with knowledge management and policy, resonating with sustainable development

6.1 Dimensionless to infinity versus limitless wholeness

In Bohmian sustainability, indeterminism is not a disruption to systemic coherence but a generative force that enables adaptive emergence. This first field, spanning from dimensionless to infinity, represents the structured domain of

measurable dynamics governed by classical and probabilistic rules that channel indeterminism into predictable distributions. The second field, by contrast, embodies limitless wholeness [5] – a nonlocal implicate order where consciousness, creativity, and systemic transformation emerge. The intersection of the two fields occurs at the external boundary of the spiral as a transcending membrane modulated by quantum potential and path integrals. Here, Feynman's least action principle becomes a connection not merely selecting optimal paths, but integrating all possible trajectories to allow implicate wholeness to shape explicate form. It shall be seen later how this form emerges from Eq. (16).

Within this framework, the formulation of the expected value is as follows:

$$E(V) = \sum (X_i \times P(X_i)) \quad (3)$$

This value acts as a transcending operator, multiplying measurable states by their implicate probabilities to project wholeness into structured sustainability. Bohm's extension of the Lagrangian to include hidden variables reveals that sustainable development is not merely a function of metrics but of epistemic openness to deeper, nonlocal influences. While Born's rule underpins both Feynman's amplitude modulation and Bohm's quantum potential, Bohm innovatively explored its implications for consciousness and ontological indeterminism, which allow the positioning of sustainability as a dynamic interplay between social, economic, and environmental structures and wholeness.

6.2 Extended Lagrangians transcend quantum potential to integrate multi-pathway sustainability policy design

In a new approach to sustainability, the quantum potential becomes an operator for the unseen coherence that guides systemic transformation. Just as the quantum potential reshapes classical trajectories by encoding nonlocal information from the wave function, sustainable policy design must transcend surface-level metrics to engage with deeper, often hidden variables such as cultural narratives, historical memory, and emergent values. This calls for an extended Lagrangian framework, where policy is not merely a function of position (present sustainability metrics), velocity (rate and direction of change), and time (long-term planning, urgency, and concern for new generations). Hence, it includes an implicate meaning and relational depth, which are so critical for sustainability. Relatedly, Feynman's principle of least action, reinterpreted through this lens, becomes one mechanism for transcending linear causality. Rather than selecting a single optimal path, it suggests a landscape as a sum of all possible trajectories, each shaped by the coherence of the whole. Therefore, by integrating least action and hidden variables, policy design becomes a process of navigating complexity through resonance with deeper orders. It allows sustainability to emerge not from control, but from alignment with the implicate change dynamics, which combine concavity and convexity. As shall be seen later, specific SDG progress metrics actually require that we adapt the Lagrangians to map the underlying holomovement of diverging SDG progress (see **Appendix A**).

6.3 Toward a conceptual mapping of Bohmian sustainability

Before introducing the sustainability applications, let us summarize the previous results of Bohmian-enabled evolution of the classical view in **Table 4**.

Concept	Classical view	Quantum/Bohmian view	New framework
Lagrangian	$L(x, \dot{x}, t)$	$L(x, \dot{x}, t, Q)$ with quantum potential Q	Extended to include implicate variables from field (2)
Least action	Selects one optimal path	Integrates over all paths (Feynman)	Transductive membrane between field (1) and field (2) (defined in Section 6.1)
Quantum potential	Absent	Emerges from probability density (Bohm)	Translates implicate wholeness into explicate dynamics

Table 4.
Evolution of conceptual mapping.

Deriving from **Table 4**, and to differentiate it from mere classical potential denoted by the symbol $V(x)$, Bohm formulated the time-independent quantum mechanical potential constructed from probability amplitude (R), as shown formulaically in Eqs. (1) and (2). The derived equation of motion of a particle acted upon by both potentials is given by [22]:

$$\frac{md^2x}{dt^2} = -\nabla \left\{ V(x) - \left(\frac{\hbar^2}{2m} \right) \frac{\nabla^2 R}{R} \right\} \quad (4)$$

Wave-mediated Eq. (4) extends classical theory.

This discovery was extended to the “many-body problem” under rapid and violent fluctuations [24] and in electromagnetic potential [25], proving how the movement of particles unfolds the meaning of information that is implicit in the many-dimensional quantum field [5]. Via the algorithm of Eq. (4), sustainability results from both classical and quantum potential, $V(x)$ and (U), with active information producing an analogous nonlocal interaction and a quantum type of wholeness. A quantized sustainable development field cannot be understood solely in terms of predetermined characteristics and interrelationships of individual sustainable development resources. Instead, wholeness is presupposed in the quantization of this field, and it is the active information, expressed in Eq. (14), that forms and dissolves wholes. With new information, participation in the sustainable security index, therefore, becomes analogous to quantum potential, which introduces nonlocal connections between all SDG resources of the total sustainability system, not predetermined by the properties of the system.

6.4 Knowledge management, as a transcending operator, unfolds quantum potential into systemic decision coherence

Turning knowledge management into a transcendent operator requires the perception that relevant and fitting thoughts are truly related and synchronized. It is an operation of an energy that is not mechanical and which may be called an energy of intelligence [4, 5]. As in Bohm’s method, let us first define this term, which has a Latin origin. Innate originates from the Latin word “innatus,” which means inborn and natural. The term intelligence originates from the Latin word “intelligentia,” suggesting the power to understand and reason, and it actually means the ability to have insight or to read between the lines and is therefore not a product of thought or reason, as mathematically expressed in Eq. (11).

Applying Bohm's ink-in-fluid analogy and notation [5], let us now consider, as an example, a sequential economic order in the series of economic relations among four distinct pillars, condensing the whole set of 17 SDGs:

$$A : B :: B : C :: C : D.... \quad (5)$$

$$SDGs \equiv f(A, B, C, D) \quad (6)$$

Now, instead of a simplistic ink-in-fluid analogy, let us suppose that a sustainable economy actually develops with resources set close to each other and arranged in a line (this time, differences between the types of resources are not assumed). They are labeled as A, B, C, D... The economic structure is then mixed many times, so that each of the resources gives rise to an ensemble of sustainable particles, enfolded in so large a region of economic space that particles, meaning socio-economic and ecological functions from all the sub-regions, interweave. The successive ensembles are reconverted into A', B', C', D'... Clearly, by transcending meaning, an entire linear order has been enfolded into the sustainable economy. This order may be formulated through the following relationships of Bohm's original notation:

$$A' : B' :: B' : C' :: C' : D'.... \quad (7)$$

Bohm discussed extensively how order is absent from the senses. In his vision, reality may be demonstrated by overturning the development of motion. In our model of the 'sustainable economy', the ensembles, A' : B' :: B' : C' :: C' : D' from Eq. (7) will unfold to give rise to the original linearly arranged series of sustainable development resources. The foregoing explicate order was taken, consisting of ensembles of sustainable development resources arranged along a line and metamorphosed into an order of enfolded ensembles, which are in some fundamental analogy. Through this methodology, it was actually possible to attach sustainable development to a certain type of immediate intuitive significance, which appears to demand a purely mathematical presentation.

To exercise intelligent thinking in quantum economics, the intuitive and the mathematical shall be integrated. For uniformity, the present model begins with the above notation, and it is assumed that there are four sustainable development resources, A, B, C, and D, with structural proportionality of the four expressed as $p(t')$. This model considers 'A' to be human capital, 'B' the natural resources, 'C' its renewable energy sources, and 'D' its technological resources in a circular economic model of an observed economy in line with the EU Circular Economy Action Plan [26] and the Sustainable Development Goals Report 2025 [27].

Noting human capital's primary position in knowledge management, subset A denotes Bohmian active information; B, C, and D represent the pressures of material and technological limits. To demonstrate the above-suggested SDG concepts in terms of mathematical theory, this model defines $K(T)$ as a state vector, wherein K represents the sustainable development result of the economy expressed as a sustainability index at a particular time, and T is the combined book value of listed resources. The ideas discussed in the previous paragraphs imply that the suggested initial transformation can be kinematically expressed as:

$$A : B :: B : C :: C : D \rightarrow \frac{dK}{dT} = W/K(T) / = \frac{W}{K(T)} \times \frac{1}{t'} \quad (8)$$

where w is an operator through which the sustainable economy is transformed from one state into another, the desirable state being $\frac{dK}{dT} > 0$ and $w > 0$ implying potential gravitation toward sustainability. It now becomes possible to continue the same procedure regarding specific sustainable subsets of the subsequent implied transformation in the following kinematic expression:

$$A : B :: B : C :: C : D \rightarrow \frac{dK}{dT} = W/K(T) / \rightarrow A' : B' :: B' : C' :: C' : D' = p(t') \quad (9)$$

Now, introducing the contextual concept of time (i.e., that of one moment and that of a subsequent one), a sustainable process becomes evident, inherently portraying a multitude of logical contexts containing active information that is autonomously active, as discussed in Section 6.5.

$$At : Bt :: Bt : Ct :: Ct : Dt \rightarrow \frac{dK}{dT(t)} = W/K(T)/(t') \rightarrow A't' : B't' :: B't' : C't' :: C't' : D't' \quad (10)$$

A testable hypothesis is whether the circular economy gravitates toward sustainability. As shall be seen in the next section, depending on the intensity with which the wave corresponds [7], the algebraic transformations from Eqs. (5)–(10) can evolve in conjunction with quantum economics.

The further logical treatment of this hypothesis is discussed in Section 6.5.

6.5 Evolution of entropy and active information in the dynamics of sustainable coherence

In sustainable development, the two fundamental modalities of information need to be distinguished: active and passive. This distinction mirrors the difference between quantum potential, which embeds implicate wholeness, and Shannon entropy, which quantifies uncertainty in probabilistic distributions.

Now, Shannon and Weaver expressed continuous distribution entropy as in Eq. (11) from their study [28], while thermodynamic irreversibility [7] shifts analogously.

$$H = - \int_{-\infty}^{\infty} p(x) \log p(x) dx \quad (11)$$

How, then, is sustainability analogous to thermodynamic irreversibility?

The expression in Eq. (11) captures passive information, a measure of uncertainty or “missing information” in a sustainable development system. In contrast, Bohm’s quantum potential (U) arises from the wavefunction’s form and incorporates active information, which acts as a guiding influence that shapes systemic behavior without exerting force. In the context of sustainability, this distinction becomes critical: passive information reflects statistical distributions of development indicators, while active information carries relational coherence, emergent values, and cultural memory. Integrating both, a composite form of the total sustainable development information resource activity. Eq. (12) has Bohm’s dual potential dynamics, ∇H ecological and ∇H_p institutional-participatory bits:

$$H = \nabla H_a + \nabla H_p \rightarrow \nabla H_a + \nabla H_p \equiv U(x) + V(x) \quad (12)$$

Referring to Eq. (8), we obtain:

$$H_a \equiv \frac{W}{K(T)} \times \frac{1}{t'} \rightarrow \nabla H_a = \nabla \frac{W}{K(T)} \times \frac{1}{t'} \quad (13)$$

and

$$H_p = a_A I_A + a_B I_B + a_C I_C + a_D I_D \rightarrow \nabla H_p = a_A \nabla I_A + a_B \nabla I_B + a_C \nabla I_C + a_D \nabla I_D \quad (14)$$

Here, H_a represents the gradient of active information, suggesting implicate, nonlocal patterns that guide sustainable transformation, and H_p denotes the gradient of passive information, derived from observable SDG metrics. This duality is essential for assessing the extreme limits of the sustainability potential, where both measurable and hidden systemic dynamics must be accounted for. Through H_a , the non-local various policy mixes $W/K(T)/(t')$ and locally active gradients of H_p , the dynamics of the sustainable system become governed by the sum of Bohmian implicate intelligence criteria (see **Appendix A**).

These relations are finally refined through a probabilistic sustainability lens.

Eqs. (15) and (16) relate to the inherent uncertainty of sustainability trajectories:

$$H = \log \frac{P_1}{P_0} \rightarrow H_0 : p_1 > p_0 \rightarrow H > 0 \rightarrow |\Psi| > 0 \rightarrow A, B, C, D > 0 \quad (15)$$

$$S = \int [T - V(x) - U(x) - \lambda \Phi(H)] dt \quad (16)$$

In Eq. (15), p_0 denotes the a priori probability, information inferred before holistic engagement in a circular economy, as a prior engagement, while p_1 reflects the a posteriori probability, activated through participatory processes and dialogic emergence of sustainable development, integrating ecological balance and social equity. The $|\Psi|$ from Eq. (15) denotes gravitational pull and sustainability potential derived from H . Assumed are monotone mappings from propensity to information (f), information to coherence (g), and coherence to SDG pillar activation (Φ), with time lags, thresholds, and stochastic robustness specified. H_0 mirrors Bohm's view that meaning unfolds through participation [8], and not merely through observation in sustainable development, with models of order, structures [13], and economies that grow [17, 21]. H_0 naturally aligns with the EU Green Deal and SDG strategies [26, 27]. In Eq. (16), minimal Feynman couplings [29] in sustainable paths have extremals ($\delta S = 0$) of action S ; positivity ($H, |\Psi|, A, B, C, D > 0$) ensures consistency and selects coherent paths. The classical-like potential $V(q)$ refers to hard market and macroeconomic forces, such as institutional constraints [17], while the Bohmian quantum-like potential $U(q)$ [5, 24] captures behavioral influences, including investor sentiment and cognitive resonance of SDGs. In Eq. (16), the formal algorithm integrates four real trajectories from the interplay of manifest explicate and contingent implicate fields. This approach allows consciousness-informed sustainable finance. Before concluding, several implications are discussed in the foregoing Section 7.

7. Socio-economic implications of suggested transformations

A transformative epistemological foundation reimagines sustainable development as a dynamic, consciousness-informed system, one that eschews

mechanistic aggregates. Implicate order, holomovement, participatory resonance, and ψ -potential modulate economic flows, organizational intelligence, and policies as recursive, nonlinear processes grounded in ontological coherence. Its validity and internal consistency are ensured through transdisciplinary triangulation, functional isomorphism, and domain-specific precision that complements analogical overreach. Several illustrative modeling efforts reinforce this approach. Hosseini et al. [30] developed a Bohmian-inspired potential model for non-Gaussian financial time series. They investigated the effects of rare events on the probability densities of time series from the perspective of quantum measurements. Eberle and Ardenghi [31] applied Bohmian structures to amortization systems, reframing financial commitments as emergent patterns of coherence rather than fixed schedules. Kreinovich et al. [32] proposed a Bohmian-algebraic framework for quantum econometrics that efficiently models uncertainty and systemic interdependence by reframing complex economic equations through non-classical logic. Choustova [33] applied the Bohmian pilot-wave model to interpret the psychological dynamics of financial markets. Her theory of financial behavioral waves presents price trajectories not as random walks but as guided by a dual-potential structure analogous to Bohm's quantum theory concepts. In sustainability, implicate order offers latent stakeholder values and strategic potentials, while wholeness reflects integrated governance across ecological, financial, and cultural domains. Enriching systems thinking [34], complexity theory [35], and integral theory [2], the Bohmian synthesis diverges by grounding coherence in ontological unity rather than relying solely on building complex systems with information feedback. To mitigate risks of conceptual stretching, proposals emphasize processual modeling and metaphysical clarity, ensuring that quantum principles serve as a generative structure for unfolding participatory transformation. Pilot projects in AI governance [33], sustainable finance, and urban-rural planning can benefit from the explanatory and predictive value of coherence-entropy decision-making systems (see **Appendix A**).

8. Conclusions

The Bohmian concepts for the evolution of sustainability, elaborated in previous sections, contradict the usual fragmented conceptual tools for rethinking economics, management, and sustainable development. Structural parallels between quantum phenomena, market behavior, and organizational dynamics show that uncertainty [27], entropy [28], and indeterminacy [8] do not limit but generate innovation, resilience, and sustainable development. Synchronized with Shannon's mathematical theory of communication and a new interpretation of the present model, this deductive conclusion emerges: an analogy exists, bounded by the second law of thermodynamics, the law of entropy, and the potential activation of sustainable development information. Since the quantum field cannot be understood solely in terms of predetermined traits and the interplay of particles alone, it becomes inductively apparent that the sustainable development field cannot be evaluated solely on static indicators and their interconnections. The lingering dynamic and stochastic criteria are also needed, demonstrating that the quantum structure of matter emerges only when material and radiative properties are treated as a single, inseparable system, without isolated elements [36]. Deductive reasoning from the usual sustainability triad [1] directly confirms Bohm's previously

formulated quantum law of syllogism: “The whole is presupposed in the quantum wave function, and active information in this wave function forms and dissolves wholes” [9] by acting nonlocally. A systemic sustainable development law of syllogism follows, suggested in this way: The wholeness of static, dynamic, and stochastic sustainable security index indicators is presupposed, and active information in sustainability cycles forms and dissolves sustainable wholes nonlocally.

Active information became a key element in the evolution of Bohm’s quantum theory. Now, the concept successfully links static and dynamic indicators in sustainable development as a holistic process. By applying this framework, sustainable development can be remodeled as a creative, participatory process rather than a mechanistic balancing of growth and limits. It is implied that integrating Bohm’s insights with economic and management theories provides a foundation for quantum-based SDG strategies that embrace developmental uncertainty and entropic irreversibility, foster dialog, and sustain long-term transitions in organizational and policy contexts. Econometrics and finance for sustainable development may also benefit from such systemic coherence, moving beyond linear optimization toward genuine creativity

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Appendix A. Mapping the 17 SDGs and a performance summary

Table A1 shows how the SDGs align with the four selected systemic pillars.

Note: SDGs are grouped into pillars A–D as used in Eqs. (5) and (6). Sustainable trajectories correspond to the extremals of the action functional and are admissible only when information activity, coherence amplitude, and all four systemic pillars remain positive. In the logical chain, the coherence–entropy condition appears in Eq. (15), and the corresponding action functional in Eq. (16).

To coherently apply the rules of quantum theory to the sustainability field, **Table A2** analyzes the SDG performance across 15 regional groups and 5 metrics.

Pillar	Description	Mapped SDGs
A – Human capital	Education, health, equality, labor, institutions, and social capacity	1, 2, 3, 4, 5, 8, 10, 16
B – Natural resources	Water, land, biodiversity, ecosystems	6, 14, 15
C – Renewable energy and climate	Energy transition, climate resilience, decarbonization	7, 13
D – Technology and circularity	Innovation, infrastructure, sustainable production, partnerships	9, 11, 12, 17

Table A1.
Mapping of the 17 SDGs to four systemic pillars.

Group	SDG Id. score	Missing value %	Spillover score	SDGi (p.p) progress	SDGi (p.p) rank
BRICS members	70.8	1.0	94.0	6.2	3
BRICS plus members	70.1	1.0	93.9	6.2	3
East and South Asia	69.5	0.0	94.1	6.5	1
Eastern Europe and Central Asia	72.0	5.0	89.1	5.1	6
Middle East and North Africa	65.6	3.0	89.6	4.0	8
Latin America and the Caribbean	70.3	0.0	94.5	4.3	7
Oceania	53.4	28.7	88.6	n.a.	3
Small Island Developing States	64.9	19.8	88.4	3.6	6
OECD members	78.1	0.0	70.1	3.4	7
Sub-Saharan Africa	53.9	0.0	95.5	5.4	3
Low-income countries	51.2	0.0	95.1	5.2	3
Lower-middle-income countries	64.1	0.0	95.4	6.4	1
Upper-middle-income countries	72.9	0.0	92.5	5.6	1
High-income countries	77.8	0.0	68.4	3.5	2
World	68.6	0.0	90.3	4.9	1

Table A2.
Global SDG performance and spillover metrics, SDR 2025 metric.

Note: SDG Index Scores, percentage of missing values, international spillover scores, and annual progress on headline SDG indicators (in percent, p.p.) cover 15 global country groupings [6]. SDGi ranks were computed by the author. Metrics are interpreted through the coherence–entropy framework: high SDG scores and low missing data indicate elevated information activity $H > 0$; high spillover scores reflect systemic coherence $|\Psi| > 0$, positive cross-border externalities, and alignment with global sustainability systems; positive annual progress signals admissible trajectories with $\delta S = 0$, from Eqs. (15) and (16). n.a. indicates value was unavailable. Correlations were calculated by imputing missing values (shown as “n.a.” in the dataset) as averages of neighboring group scores. In the table, “n.a.” remains, indicating values unavailable in the dataset; however, the statistical analysis incorporates the imputed values to ensure consistency across correlations. SDGi Ranks use Excel’s RANK.EQ to emphasize ordinal position, complementing elevated information activity ($H > 0$), supporting systemic coherence ($|\Psi| > 0$), and showing country alignment or divergence.

Note: The obtained Pearson correlation coefficient between SDG Index Scores and Spillover Scores ($\rho = -0.54$) indicates a moderate negative relationship, with some countries “exporting” their pollution to achieve domestic SDG goals (e.g., meeting SDG 7 for clean energy at home by importing solar panels made with high-carbon intensity abroad). The correlation between the Spillover Score and SDG Index

(SDGi) progress is strongly positive ($\rho = 0.72$), and as the only positive correlation, it confirms systemic coherence. Less advanced countries have low SDGi scores and high Spillover scores, while developed countries have high SDGi scores and moderate-to-high Spillover scores, producing a strong positive value. While GDP per capita drives both scores, these results are significant for SDGs and align with global trends. Domestic sustainable development gains come at the expense of international spillover effects, and the more “developed” a country, the harder it is to minimize negative fallouts, see for example [37]. In the present model, this represents a thermodynamic trade-off. The correlation coefficient between the SDG Index and Progress Scores ($\rho = -0.27$) is moderately negative. Least-squares trends demonstrate a strong positive correlation $R^2 \approx 0.51$, indicating Spillover scores explain about one-half of the variance in SDG progress, which is substantial, meaning regional performance is partly captured by linear modeling. While residual entropy remains, the results show trade and resource policy mixes are logically structured by spillover dynamics rather than being only contextual. Instead of selecting an optimal path, the extended Lagrangian represents regional data as a superposition of trajectories, with global coherence ($\rho = 0.72$) emerging from the interference among them. Modeling four SDG sets as information channels, and applying Eqs. (15) and (16) as formal algorithms show how active information via the coherence operator reduces the Shannon entropy of regional SDG trajectories, converting “noise” of divergence into a systemic progress “signal.”

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Chapter 3

An Analysis of the Post-Industrial Society Paradigm Through the Perspective of the Frankfurt School

Hakan Topates

Abstract

During the era of Fordist production, Baran and Sweezy characterized the prevailing economic structure as “monopoly capitalism,” while Marcuse termed it “advanced industrial society.” The transition from Fordism to post-Fordism, alongside globalization, has prompted extensive debate over the concept of post-industrial society. Pioneering thinkers such as Bell and Dahrendorf were among the first to articulate this paradigm, which is distinguished by significant transformations, including the rise of the information society, commodity-chain production, and widespread deindustrialization. In this respect, the theoretical framework of the Frankfurt School, recognized for its rigorous critique of economic and cultural domination, provides a valuable lens for analyzing the post-industrial society paradigm. The early insights of the Frankfurt School regarding post-industrial society challenge the view that individuals are primarily socialized into occupational roles, a perspective rooted in what they describe as “critical reason.” The notion of alienated, objectified, and mechanized individuals, as articulated by Adorno and Horkheimer, illustrates the erosion of “reason” within contemporary societal structures. Moreover, the Frankfurt School’s analytical framework underscores the potential for post-industrial societies to address social inequalities. Notably, Fromm’s engagement with concepts such as basic income – a topic of considerable interest across diverse political perspectives – predates discussions of post-industrial society, thereby enriching our understanding of the socio-economic landscape. This provides a critical foundation for exploring avenues of social change and pursuing equity in the evolving context of post-industrial societies.

Keywords: post-industrial society, alienation, Frankfurt School, post-Fordism, economic inequalities, relations of production

1. Introduction

The political economy of contemporary postmodern capitalism is often analyzed using conceptual frameworks such as “post-Fordism,” “advanced capitalism,” “late capitalism,” and “post-industrial society.” In this context, the concept of post-industrial society, which emerged alongside globalization during the transition from

the Fordist mode of production – described by Baran and Sweezy [1] as “monopoly capitalism” – to post-Fordism, serves as the primary reference for this study.

Fordist production relations were characterized by standardized workers, machines, and products. As Habermas [2] observes, the implementation of scientific management in production resulted in the technical dimension of production relations exerting dominance over society. This process fostered a social structure marked by excessive concentration of capital and corporations [3], in which individuals functioned as components of an “economic machine” governed by productivity and success metrics [4]. The term “economic machine” refers to the age of mechanical reproduction described by Benjamin [5], in which reproducible artificial processes became pervasive. Consequently, the rationalization of technology facilitated the rationalization of domination. At this juncture, Marcuse contends that capitalism has severed humanity from nature, resulting in widespread suppression and alienation [6]. Within this system, individuals are dominated by objects, dehumanized, standardized, and ultimately transformed into “technical instruments.” Assembly line workers, in particular, experience alienation due to the detrimental effects of scientific management. Furthermore, the relationship between concept and object has become increasingly disconnected [6].

During the Fordist era, which transitioned to post-Fordism in the 1970s and 1980s, the welfare state served as a primary mechanism for implementing social policy. This approach, representing a rational equilibrium in industrial relations among the state, workers, and employers, was particularly advanced in central capitalist countries. However, as Fordism declined, the welfare state experienced parallel challenges. Habermas [7] argues that the establishment of welfare states in Europe was contingent upon the protection provided by U.S. military power and nuclear deterrence. Adorno [8] observes that in Germany, despite the inflationary tendencies of Keynesian liberalism and comprehensive employment policies, technological unemployment persisted in the so-called “age of full automation.” Under these socio-political conditions, individuals increasingly perceive themselves as “potentially unemployed,” marginalized, and excluded from societal participation. Adorno [8] contends that the principal social risk is the objectification of individuals who identify as “potentially unemployed, social services and welfare recipients.” This phenomenon is partly attributable to the pervasive dominance of modern industrial societies over individuals, including their internal experiences. As a result, individuals may lack awareness of their own unhappiness [9]. Therefore, ensuring social solidarity within civil society is essential. Achieving public welfare requires a balance between civil society and the state; a state that fails to generate social welfare will ultimately encounter legitimacy crises. The central challenges in this context are unemployment, social class polarization, and the erosion of social solidarity [10].

The transition from the retired Fordist era to the contemporary information society, marked by commodity chain production and widespread deindustrialization, has replaced mass-producing, high-chimney factories with an economy centered on information technologies and microelectronic systems [11]. Despite these changes, prevailing ideologies continue to reinforce the dominance of production and consumption [12]. In this context, analyses by the Frankfurt School highlight the simultaneous objectification of labor and the ongoing process of industrialization under capitalism. The theoretical framework of the Frankfurt School provides a valuable perspective for examining the post-industrial society

paradigm. The School's analyses, informed by an early recognition of capitalism's variable and flexible nature, demonstrate a prescient understanding of the economic, social, and cultural dimensions of post-Fordist or post-industrial society, as evidenced in their work during the Fordist period.

The Frankfurt School analyses the contemporary phase of capitalism through concepts such as late and advanced capitalism. These frameworks indicate that a comprehensive understanding of society under new forms of capitalism requires the analysis and critique of economic, cultural, and psychological dimensions. The School's approach, grounded in early perspectives on post-industrial society, emphasizes the potential of post-industrial societies to address social inequalities. The Frankfurt School challenges the reduction of individual identity and socialization to narrowly defined roles of work and labor, recognizing culture, language, mimesis, and symbols as significant contributors to social cohesion. The alignment of individuals' perceptions of society with their compliance with governance structures is facilitated by a subordinated social division of labor. In the context of evolving post-industrial societies, the School's critical analyses offer valuable insights for identifying avenues of social change and advancing social equality. Within this scope, the following sections will review the discourse on post-industrial society, evaluate the Frankfurt School's analyses of the ontology of self-reproduction of capitalism as a socio-economic formation, and highlight the School's predictions regarding post-industrial society, conceptualized as advanced capitalism. Finally, drawing on the critique of "instrumental reason" articulated by members of the School, the concept of "instrumental economy" will be examined as an economic framework that rationalizes the fluctuating supply-demand dynamics between stagnation and dynamism inherent in contemporary capitalism.

2. Discussions on post-industrial society

The relationship between globalization and post-Fordism exemplifies the cyclical reproduction of capitalism. During this transition, the Keynesian nation-state model was replaced by a globalist monetarist economy. Fordism, characterized by its rigidity, gave way to the post-Fordist era. Consequently, a flexible accumulation regime emerged, in which the pursuit of higher wages and social rights for workers intersected with employers' objectives to maximize profit margins and minimize production costs. In contrast to Fordism, post-Fordism is defined by technology-intensive production processes and the global distribution of manufacturing through a worldwide assembly line. This shift contributed to the weakening of class-based movements and the rise of new social movements.¹ Simultaneously, worker wages and unionization rates declined, and governments increasingly neglected social policies centered on full-time employment and job security. The emergence of global factories and commodity chains paralleled the onset of deindustrialization and decentralization in core economies. As governance, restructuring, and deregulation transformed various economic sectors, the broader economic and political landscape was redefined as an industrial society.

³³ Within this framework, Arrighi, Hopkins, and Wallerstein's [59] analysis of anti-system movements identifies specific regions and systems that resist the capitalist world system, referred to as "historical capitalism," across global geography.

Academic discussions regarding post-industrial society originated in the 1950s and 1960s, preceding subsequent socio-economic developments. Daniel Bell [13] emerged as the most prominent intellectual advocate of the concept of post-industrial society. In addition to Bell, Drucker [14] and Toffler [15] also examined the post-industrial society thesis. Dahrendorf [16] and Aron [17] contributed analyses of both industrial and post-industrial society. Berle and Means [18] and Lyotard [19, 20] made further significant contributions to this discourse. Stonier [21, 22] and Masuda [23] produced utopian interpretations of the post-industrial society. In contrast, Mandel [24] rejected the post-industrial society thesis. In his 1968 speech titled “Late Capitalism or Industrial Society?”, Adorno asserted that the relations of production and productive forces had not changed [25]. Conversely, Callinicos [26] contended that a post-industrial society has never existed.

Determining whether the post-industrial society stage constitutes a distinct historical period necessitates rigorous analytical scrutiny. An intersectional approach yields significant insights into this phenomenon. The terms “post-industrial society” and “information society” are often used interchangeably to describe the same social reality. Beniger [27] argues that the information society represents a revolution in control. In a similar vein, Robins and Webster [28] maintain that the information society is not a novel development but rather a continuation of Taylorist working methods in a concealed form. The observed transformation is rooted not in the structure of Fordism but in its functions. Fromm notes that technological advancements have produced new forms of production, characterized by the coordinated efforts of blue- and white-collar workers in large-scale factories, a system known as Fordism. According to Fromm [29], this production model is defined by “centralization,” “bureaucratization,” and “manipulation.” As the centrality of the assembly line and mass production declined, the concept of a post-industrial society began to emerge. This transition was marked by several processes, including the proportion of white-collar workers surpassing that of blue-collar workers in industrial production, the spread of flexible working methods, deindustrialization, and the global movement of real and financial capital. At this juncture, Marcuse’s analysis provides an early intellectual critique of post-industrial society, formulated before its emergence. Marcuse [30] contends that in societies dominated by industry, a dual mechanism exists that enables the control of both nature and humanity. Although industrial development has advanced individual freedom, historical events such as concentration camps, massacres, world wars, and atomic bombs illustrate the persistent domination of humans over one another [12].

A thorough examination of Habermas’s analysis of industrial societies is essential to advance research in this field. According to Habermas, traditional societies differ from primitive societies due to the presence of a central power apparatus, the formation of social classes, and the legitimization of power through ideology, described as “a central image of the universe.” Capitalism was the first system of production relations to establish industrial society by creating its own regulatory mode. The institutionalization of bourgeois ideas facilitated the emergence of commodity and labor markets [2]. Over time, the typology of the capitalist state and society has evolved into a post-Fordist model, characterized by intensified production utilizing computer-assisted machines and robots, as well as a global division of labor structured through commodity chains. Capitalism is

observed to generate a flexible and adaptable economy and culture, enabling recovery from economic and social crises through processes of transformation and self-reproduction. The subsequent section will evaluate the establishment of production and power technologies that facilitate the reproduction of capitalism, using the framework of continuous critique: the Frankfurt School's analytical method.

3. The ontology of capitalism's self-reproduction

3.1 The Frankfurt School's unbounded critique as the Bird of Minerva

Founded in 1923 and officially commencing its work in 1924 [31], the Frankfurt School, also referred to as the "Critical School," established a comprehensive and sustained system of critique. The School contends that capitalism must be subjected to inherent critique to reveal the illusory values within the system as mechanisms of domination. Although the Frankfurt School's analyses were conducted during the Fordist mode of production, its intellectual legacy endures, particularly in the rational evaluation of labor relations, even as globalization and post-Fordism have redefined economic boundaries. The Frankfurt School maintains that merely defining and explaining social reality is insufficient; instead, it advocates interpreting social reality [32]. The School's primary intellectual focus is the rigorous critical analysis of all aspects of society.

The Frankfurt School rejects the notion that individuals should be defined and socialized exclusively through work. In addition to labor, elements such as culture, language, mimesis, and symbols are regarded as significant contributors to social cohesion. Consequently, the School's philosophy adopts a holistic, multidisciplinary approach that integrates economic, cultural, philosophical, sociological, historical, and psychological perspectives. The Frankfurt School effectively produced comprehensive critical analyses by emphasizing the reciprocal dynamics between culture and economics.² Through this approach, the underlying codes for the economic and cultural reproduction of advanced capitalist societies have been revealed. The School's perspective is oriented toward defending freedoms that are suppressed or concealed within society. Its primary aim is to critique the technical rationality of capitalism and to identify individuals' capacities to attain freedom. Central to this analysis is the identification of hegemonic networks embedded in the daily life of late capitalism. By exposing these networks, the Frankfurt School seeks to unveil practices of domination [33]. In this way, the School examines a capitalist system that generates latent processes of domination, objectifies individuals, and systematically shapes them in accordance with prevailing ideological norms.

² Critical Theory provides an economic and political critique of capitalism. It addresses a wide range of intersectional topics, including commodities, labor, power structures, ideologies, advertising, space and time, exploitation, domination, history, social struggle, alienation, and the moral pursuit of a just society [60]. As a result, the Frankfurt School has significantly contributed to the social sciences through its focus on praxis, its Marxist critique of capitalism, and its rejection of totalizing frameworks [61].

3.2 The cosmology of capitalist economies in the age of reproducibility

The identification of individuals through systems of domination leads to their objectification, serving as a concealed mechanism within capitalist social structures. This mechanized process, both latent and sufficiently proactive to ensure productive obedience, enables the operation of power that perpetually reproduces domination. Horkheimer and Adorno's [34] assertion that the progress of rationalization, understood as the standardization of individuals, parallels its own regression, is particularly pertinent in this context. In such a society, individuals are subordinated to the production process, contrary to their ontological nature. The intensified development of the division of labor, specialization, and mechanization, alongside social polarization, has alienated individuals and reduced them to subjugated participants within the capitalist system. As a result, individuals increasingly perceive themselves as commodities and investments within markets. According to Fromm, human existence is no longer defined by literary, artistic, or humanist qualities, but rather by the market value of one's labor [35]. This shift, accompanied by alienation and automation, has led to a diminished sense of reality and to the neglect of reasoning and love [35]. Industrial societies also tend to foster totalitarianism, which, in late industrial civilization, is closely linked to the rationalization of production and the pervasive spread of domination throughout society [12].³ The productive apparatus is deeply intertwined with ideology, and mass-produced goods contribute to the development of a false consciousness that resists recognizing its own deficiencies. In this context, brainwashing extends beyond advertising to become a pervasive way of life. The rationality embedded in the prevailing social system gives rise to a "one-dimensional mode" of thought [30]. Consequently, advanced industrial society produces a complex entanglement of unhappiness and satisfaction [30].

"Now, the ever-more-complete mechanization of labor in advanced capitalism, while sustaining exploitation, modifies the attitude and the status of the exploited. Within the technological ensemble, mechanized work, in which automatic and semiautomatic reactions fill the larger part (if not the whole) of labor time, remains, as a life-long occupation, exhausting, stupefying, inhuman slavery—even more exhausting because of increased speed-up, control of the machine operators (rather than of the product), and isolation of the workers from each other" [36].

An examination of the economic dynamics within this self-perpetuating system of domination and its structuring of labor relations demonstrates that the acquisition of commodities, enhancing individual well-being, necessitates both labor and free time [12]. Additionally, Adorno [34] contends that the dominant, dependent labor system undermines individuals' capacity to develop their own models of humanity: "The act resulting from the daily labor of the wage worker is no less significant than the act that led to the gladiator's applause and fame in antiquity" [5]. Kracauer's definition of "wage-earners" culture," describing the "white-collar proletariat threatened with job loss"⁴ [34], anticipates the contemporary concept of the

³⁶ Zellner [45] argues that Marcuse's ideas provide significant insight into the current era of technological revolution and globalization.

⁴ Adorno [46] states that business experts frame workplace camaraderie primarily to enhance productivity.

“precariat.” Fromm [35] also asserts that individuals who do not exploit others are compelled to work. He further contends that work is both a necessity and a productive activity that liberates individuals from the constraints of nature. While craftsmanship historically represented the highest form of work, the rise of capitalism diminished work’s creative function, transforming it into a duty for the middle class and a necessity for the lower classes. Consequently, work frequently becomes a source of alienation. The blue-collar industrial workers remain passive within the relations of production. Lacking control over the entire production process and being integrated into the machinery, the worker encounters the finished product only as a consumer in the marketplace [35].⁵

This societal formation is, therefore, characterized as a bureaucratic industrial society [29, 37]. Contemporary capitalist firms are structured as large bureaucracies and function as components of a “vast production machine” in which all modes of behavior are bureaucratized [38]. These giant corporations operate as undemocratic entities that possess significant power to shape the economic and political trajectories of nations [29]. Fromm contends that such an industrial society produces “organization men” (officials), who are required to be uncritical and unquestioning for organizational efficiency [39].⁶ This pervasive bureaucratic cycle reduces democracy to a mere ritual [29]. The emergence of an individual typology referred to as the “corporate person” or “robot person” further illustrates this process, with growing indifference to life identified as an inevitable consequence [37]. Reich similarly observes that a desire for authority develops among roboticized individuals, or “robot-organisms” [40].

The processes of bureaucratization and objectification fundamentally reflect the cosmology of the capitalist economy, which Benjamin characterizes as the age of reproducibility. Benjamin contends that mechanical reproduction entails the proliferation of artificiality and the integration of mechanical processes. Focusing on the phenomenon of reproduction within the arts, Benjamin argues that reproducible artworks are devalued and that exhibitability supplants cultural value [41]. To exemplify reproducibility, Benjamin notes that, in photography, a single touch on the camera can immortalize a moment, resulting in what he describes as a “post-death shock.” In the modernist phase of capitalism, automation renders factory workers’ labor, which is dependent on machines, a form of spiritual enslavement [42]. The “phantasmagoria of capitalist culture” [5] is thus mass-produced through reproduction, as works become surplus rather than unique occurrences [5]. Benjamin’s analysis of reproduction elucidates the dynamics underlying the mass-produced character of capitalist societies and markets, particularly in relation to production and consumption. These dynamics further indicate that the novel of capitalist market relations, spanning from industrial to post-industrial society, is characterized by a perpetually self-reproducing structure.

⁵ Industrial psychology becomes particularly relevant by focusing on methods to enhance productivity. Work relationships are structured to maintain sustainability and minimize social conflict. In this context, industrial psychology can be regarded as a form of human engineering [35]. “Just as one oils machines, one oils people, and especially those in the mass organizations of work. One oils them with pleasant slogans, material advantages, and with the sympathetic understanding of the psychologists” [62].

³⁷ Fromm’s concept of the organizational man aligns with the notion of organizational citizenship, which has gained prominence in contemporary work psychology.

4. The Frankfurt School's prediction: Post-industrial society or advanced industrial society?

4.1 Advanced industrial society or late capitalism

The Frankfurt School's analyses, grounded in dialectical reasoning and historical interpretation of capitalism, enabled the early identification of the post-industrial society phenomenon that emerged after 1980. This identification was achieved through concepts such as "advanced industrial society," "late capitalism," "culture industry," and "consumer society." The School's intellectual approach also facilitated a rational understanding of the developmental dynamics inherent in self-reproducing capitalist socio-economic structures. For instance, Habermas [7], one of the School's last prominent representatives, argues that the world is progressing toward a post-national stage. Habermas's classification of societal history, which traces the evolution from primitive to post-capitalist formations [43], outlines this trajectory. In the late capitalist era, characterized by the "scientification of technology" [2], the influence of Marx's theories on class struggle and ideology has diminished [2]. Late capitalism legitimizes itself through processes of depoliticization [2], raising questions about the validity of a "depoliticized public sphere" [2]. In this context, the nature of class conflict has shifted [2], and societies are no longer defined primarily by their means of labor, as Marx originally theorized [2].

Habermas [44] highlights the collapse of the public sphere in post-industrial society, indicating an incompatibility between the concept of freedom and the structures of the capitalist economy and society. At this juncture, the Frankfurt School, which seeks to uncover humanity's potential for achieving freedom, centers its critique on the technical rationality inherent in capitalism [33]. Critical theory fundamentally aims to identify hegemonic networks embedded in the everyday life of late capitalism [33]. Within this framework, the Frankfurt School provides a critical approach to interpreting the codes that structure the hegemonic networks of the capitalist economy and society across both public and private spheres. Accordingly, the present analysis will utilize the School's key conceptual frameworks: "late capitalism," "advanced industrial society," "culture industry," and "consumer society."

Marcuse employs the concept of advanced industrial society to examine the dynamics of domination within contemporary social structures [45]. He argues that advanced industrial societies generate false needs, foster one-dimensionality, and promote a passive model of human behavior. Despite possessing the industrial capacity to alleviate poverty and suffering, these societies fail to enact meaningful reforms [45]. In such contexts, productive forces have expanded, control over nature has been achieved, basic human needs have been satisfied, and new needs have arisen [30]. Capitalism alienates humanity from nature, leading to dehumanization and homogenization as individuals become subsumed by commodities. As a result, humanity is reduced to a "technical instrument." Assembly line workers, in particular, experience self-alienation due to the detrimental effects of scientific management practices. Furthermore, the separation between concept and object has intensified [6]. This phenomenon originates from the prevailing form of governance, which is intrinsically linked to the rationalization of production and the distribution of power throughout society [12].

According to Marcuse, industrial society under these conditions generates totalitarianism. He states this social reality, asserting that “totalitarianism spreads over late industrial civilization” [12]. Consequently, the production apparatus determines not only professions, skills, and individual attitudes but also the needs and desires of individuals. Marcuse contends that new forms of control have enveloped society [30]. Furthermore, freedom has been transformed into an instrument of domination, and irrationality has been rationalized [30].⁷ Advanced industrial society, therefore, represents a democratic lack of freedom [30]. The emergence of the one-dimensional human being is characterized by technology overshadowing freedom and originality, as well as the widespread use of consumer goods [43]. At this stage, the culture industry produces practices of cultural commodification analogous to the commodification of labor, resulting in a social formation in which both infrastructure and superstructure are managed.

4.2 The relationship between labor and consumption in the culture industry

The social reality that Adorno calls the culture industry is a distinct part of the superstructure of advanced industrial society, or late capitalism. Adorno’s analysis of late capitalism also includes the entertainment practices produced by the culture industry. According to Adorno [46], in late capitalism, entertainment is an extension of work operating within the mechanized labor process: “Entertainment is the prolongation of work under late capitalism. It is sought by those who want to escape the mechanized labor process so that they can cope with it again” [47].

Individuals participate in the entertainment network of the culture industry to escape the monotonous rhythm of office or factory labor. The culture industry operates through constant repetition and exhibits a holistic structure. Within this system, factory-like rules prevail, characterized by a sophisticated division of labor, reliance on machinery, and the separation of workers from the means of production, paralleling the conditions found in factories [46]. Consequently, individuals tend to adopt conformist behaviors rather than develop critical consciousness [46].

Adorno’s analysis of the culture industry serves as a preliminary examination and early prediction of the practices characteristic of contemporary consumer society. Within this framework, Jameson [42] observes that, in the post-industrial capitalist era, individuals’ participation in consumption practices leads to a rapid loss of subjectivity and unintentional integration into dominant power structures. These processes merge with market relations, where the sale of products mediates all production relations. According to Adorno, such conditions give rise to a pervasive sense of meaninglessness among individuals. Leisure time, ostensibly offered as a benefit distinct from working life, ultimately results in a loss of freedom because it perpetuates production relations. This sense of meaninglessness is, therefore, a defining feature of the “late bourgeois period” [34].

Adorno [48] addresses the problems arising from individuals’ lack of control over the forces that govern societies, emphasizing the atomization of individual consciousness [34]. Adorno’s analysis of the culture industry aligns with Fromm’s concept of consumer society. Similarly, Fromm contends that workers, particularly

³⁹ Marcuse [51] contends that, under these conditions, the agent of social change is determined by class, specifically the working class in advanced industrial societies.

those engaged in the labor process, experience powerlessness and isolation. At the same time, consumption becomes associated with artificial needs [49]. Fromm further argues that the bureaucratic and mechanical structure of society, along with the consumerism promoted by the entertainment industry, prevents individuals from recognizing their loneliness and isolation. Consumer society manufactures individual desires, positioning individuals as economic machines within its framework [3]. Adorno's analysis of the culture industry aligns with Fromm's concept of consumer society. According to Fromm, industrial societies inevitably objectify individuals, allowing them to participate in the social sphere only as customers [49]. In these circumstances, individuals are manipulated in both production and consumption. The ever-increasing desire for consumption perpetuates the industry's profitable expansion. Individuals are continuously directed toward new pleasures, with their desires managed through calculated manipulations [29]. Consequently, consumerism produces powerless individuals who lack influence within the institutions where they are employed. The consumer's right to choose products generates only an illusory sense of freedom [35].

Marcuse, building upon the analyses of Adorno and Fromm, contends that class conflict has lost its efficacy in the post-industrial phase of capitalism. The rise of consumer society coincided with the working class, especially in core countries, assimilating into the bourgeoisie as incomes increased [42]. From a Freudian perspective, Marcuse [12] asserts that commodities function as objects of libido. Moreover, the presentation of the human body in the workplace has acquired market value within advanced industrial civilization [30]. Marcuse [50] argues that this commodification is deceptive, as the freedom promised by consumer society ultimately serves as a mechanism of domination. This transformation is attributed to consumer society, which is shaped by networks of interests that control production and represent the most advanced stage of monopolistic state capitalism. The expansion of products and consumption, along with increased social mobility and welfare-state provisions such as education and housing, signals a growing dependence on those who govern the socio-economic system. Furthermore, the development of sophisticated manipulation techniques in thought control, along with the declining significance of spiritual and intellectual life, further defines this process [42]. The needs produced by consumer society generate a form of conservatism fundamentally opposed to freedom, as these needs function to maintain the existing social order [51].

5. The validity of “instrumental reason” and “instrumental economy” in post-industrial societies

5.1 Instrumental reason, Odysseus's solitude, and the weary sailors

According to Horkheimer and Adorno, as can be seen from the similarities in the mythological story of Odysseus's adventure, in the mechanized, objectified world of capitalism, the power of the machine and the archaic instincts of humanity intertwine:

“Humanity, whose skills and knowledge become differentiated with the division of labor, is thereby forced back to more primitive anthropological stages, since, with the technical facilitation of existence, the continuance of domination demands the fixation of instincts by greater repression. Fantasy withers. The calamity is not that individuals have fallen behind society or its material production. Where the development of the machine has become that of the machinery of control, so that technical and social tendencies, always intertwined, converge in the total encompassing of human beings, those who have lagged behind represent not only untruth. Adaptation to the power of progress furthers the progress of power, constantly renewing the degenerations which prove successful progress—not failed progress—to be its own antithesis. The curse of irresistible progress is irresistible regression” [47].

Horkheimer and Adorno [47] argue that Enlightenment thought ultimately reproduced relations of domination. Although the Enlightenment represented an intellectual advance toward human freedom, the underlying economic structures of capitalism persisted, leading to the emergence of instrumental reason.⁸ Horkheimer and Adorno [47] illustrate this dynamic by drawing parallels with the myth of Odysseus. In their analysis, Odysseus prevents his sailors, who are likened to modern factory workers, from hearing the sirens’ songs of freedom by sealing their ears with beeswax. Meanwhile, Odysseus, representing the capitalist employer, has himself tied to the mast so that he can hear the sirens’ songs but cannot act upon them. At this juncture, Enlightenment thought and mythology intertwine, as Enlightenment ideals lose their emancipatory potential and are mythologized.

The core of mythological thought, which explains phenomena through irrational means, perpetuated itself over time. Humanity asserted dominance over nature through technological advancement; however, reason became instrumentalized by the very technical tools it created. This objectification of nature led to the rise of “instrumental reason.” As Assoun [41] observes, the Frankfurt School, in its critique of bourgeois modernity, traced the historical development of reason and examined its subsequent decline. Mythology, in this context, is equated with reason itself. Furthermore, the evolution of reason parallels the increasing domination over nature. While reason transforms nature by commodifying it, the emergence of instrumental reason represents a profoundly negative outcome.

The Frankfurt School’s concept of instrumental reason highlights that, rather than fostering free thought and action, individuals are stripped of originality, subjectivity, and autonomy, ultimately becoming objectified and reduced to mere instruments. The most pronounced form of this instrumentalization occurs within advanced industrial societies. Under capitalism, the boundaries imposed on individual thought, coupled with the rise of automation and uniformity, result in the replacement of “critical reason” with “instrumental reason.” Instrumental reason contributes to the objectification of individuals through its function of standardizing labor and permeating daily life with consumerist practices. Therefore, a critical theory must move beyond traditional associations with the proletariat and the assumption that science and technology inherently lead to happiness, instead

⁴¹ Habermas attributes the initial use of the concept of instrumental reason to Horkheimer, whereas Marcuse credits Weber [63]. Löwy [63] contends that the Frankfurt School’s analyses of instrumental reason and objectification, particularly in the context of rationality and the quantification of society, constitute the analytical framework most closely aligned with Weber’s approach.

focusing its critique on instrumental reason [52]. The critical approach of the Frankfurt School seeks to analyze and expose the workings of instrumental reason within capitalist systems.

5.2 The instrumental economy as a pantheon of objectified individuals

Contemporary real and financial capitalism is characterized by the predominance of instrumental reason, which shapes new production relations. These relations include the integration of firms of various sizes into complex commodity chains, the expansion of global labor forces and factories, and the widespread implementation of advanced post-Fordist production methods. As a result, the global economy increasingly operates as an extensive assembly line. The bureaucracy of globalization, marked by relatively stable labor and highly mobile capital, coordinates production and consumption through global market mechanisms. Instrumental reason remains embedded within these structures. However, a distinction must be made between “instrumental reason” and the concept of the “instrumental economy”. This social formation can be defined as an instrumental economy in which cultural norms and social relations are subordinated to market imperatives. The term “instrumental economy” refers to a network of economic and political relations governed by deregulated markets and rigid corporate bureaucracies that marginalize civic and democratic values, neglect social welfare and policy, and foster widespread objectification. To further analyze this phenomenon, Habermas’s examination of the relationships among democracy, the economy, and communication offers a valuable framework.

Habermas [53], the last living representative of the Frankfurt School, critiqued modernity while embracing its positive aspects. Modernity achieved historical progress but failed to attain liberation. Therefore, the Enlightenment project remained incomplete. Indeed, modern societies have fallen under the sway of the media, corporations, and nation-states.⁹ What needs to be done is the re-establishment of the rationalist aspect of Enlightenment thought. This act can be achieved through “communicative reason” and “communicative action,” which are the opposites of instrumental reason. For Habermas, social formations correspond to systems and lifeworlds. Systems and lifeworlds are grounded in different rationalities. The system consists of subsystems of the economy/market and the state/bureaucracy. The typology of reason upon which it is based is the famous instrumental reason. The lifeworld, on the other hand, is based on communicative reason. The current negativity is the colonization of communicative reason by instrumental reason [43]. In contrast to the instrumental rationality characteristic of markets, the state, and bureaucracy, communicative rationality and the lifeworld serve as foundational principles of democracy. The relationship between the lifeworld and communicative action, and between both and democracy, is also significant. Indeed, Habermas [2] considers democracy as the safeguarding of public communication.

Contemporary post-industrial societies are characterized by the decline of the welfare state, the weakening of social rights and job security, the rise of authoritarian tendencies in global governance, and a relative erosion of trust in democracies.

⁴² Habermas [44] argues that the contemporary information age parallels the hunter-gatherer era. In both the information society and hunter-gatherer societies, individuals are not tied to a specific region and experience unrestricted mobility.

Within this period, instrumental reason has become more dominant than Habermas's communicative reason and, more broadly, the critical reason of the Frankfurt School. This instrumental reason underpins an "instrumental economy," in which all aspects of economic organization are subject to market rules. Within this framework, as Marcuse observes, interpersonal relationships are increasingly objectified, becoming analogous to relationships between objects. Labor itself is subjected to instrumentalization by the rationality of post-industrial society. Marcuse [30] further notes that both the practices of mechanized factory systems and the development of scientific management literature have intensified these processes of objectification.

Particularly, Horkheimer and Adorno's conceptualizations of labor provide illustrative examples for this discussion. They argue that work, which is necessary to overcome life's challenges, has historically ensured the reproduction of the human species. However, this process has primarily benefited those who persuade others to work, rather than the workers themselves. Humanity has so extensively glorified work that the concept has become reified, and the process of civilization has been fetishized [54]. They further contend that contemporary forms of work resemble a concentration camp [54]. Within this framework, Horkheimer and Adorno interpret work through the striking analogy of a pagan sacrificial ritual:

"The reshaping of the heathen ritual of sacrifice not only took place in worship and in the mind but also determined the form of the labor process. In providing the schema for the latter, sacrifice becomes rational. The taboo is transformed into the rational organization of the work process. It regulates administration in war and peace, sowing and harvesting, food preparation, and slaughter. Although the rules may not arise from rational reflection, rationality arises from them." [47].

Within this process, in which the antithesis of work is constructed through consumption [54], the overarching social objective becomes the elevation of the work ethos [55]. The integration of "mechanized humans" and "humanized machines" [49] into work organization has led to the near-total alienation of labor. Adorno [56] contends that, as contemporary societies are increasingly structured around organizations, the internal dynamics of these organizations foster alienation and reification. He further asserts that the very concept of organization is inherently problematic, as individuals within organizations function merely as instruments or satellites of the organizational structure. Each organization constitutes a secondary group for its members, characterized by a mediating relationship. This dynamic underpins a network of impersonal, inflexible, and coercive relationships between organizations and individuals. Marcuse also observes that Taylorist scientific management reduces individuals to objects that can be exchanged within labor relations. The assembly line, the repetitive nature of office work, and the ritualized processes of market transactions illustrate how a logic of domination has supplanted the logos of classical philosophy [12]. In a similar vein, Horkheimer and Adorno maintain that official philosophy serves as an eclectic instrument within capitalist systems:

"Official philosophy serves the science which functions in this way. It is supposed, like a kind of intellectual Taylorism, to improve scientific production methods, rationalize the accumulation of knowledge, and prevent the waste of mental energy" [47].

This flawed rationalization closely aligns with the concept of post-industrial or advanced industrial society. Within this framework, Marcuse argues that the working class has been divided, thereby giving rise to a “new working class.” The proportion of blue-collar workers is declining, while the number of white-collar workers, engineers, and technicians is increasing. This transformation is gradual, involving the replacement of physical labor that produces material goods with “technical and mental energy.” Consequently, the new working class is more educated than previous generations [51]. Additionally, there is a psychological dimension to this issue. The social division of labor suppresses individual instincts, and the “actual principle” and “social moral principles” function as external supplements to individuals’ working hours. As social labor becomes increasingly hierarchical, relations of domination are rationalized, and human freedoms become contingent upon the demands of these power structures. Although industrialized society generates significant surplus value and wealth, it also instrumentalizes individuals within the market’s exchange relations [12]. Horkheimer and Adorno further argue that the true meaning of automation has become a flawed production practice of capitalism, rather than simply assisting people, distributing goods equitably, or preventing disease: “Only by subordinating all branches of intellectual production equally to the single purpose of imposing on the senses of human beings, from the time they leave the factory in the evening to the time they clock on in the morning, the imprint of the work routine which they must sustain throughout the day” [47].

6. Conclusion and proposed solutions to the challenges of post-industrial society

In an epoch distinguished by “instrumental reason” and “instrumental economics”, the transformation and self-reproduction trajectories of post-industrial society, as well as its capacity to address the issue of freedom, remain vital questions. Within this context, the Frankfurt School’s proposed solutions to the socio-economic and political challenges resulting from instrumentalized economic relations in post-industrial society are groundbreaking. The Frankfurt School, also known as the Critical School for its foundation in continuous critique, has itself been the subject of frequent criticism. Critics argue that the School primarily offers critique without advancing substantive proposals to promote equality, justice, or the realization of a better society. To clarify these criticisms, it is necessary to examine the Frankfurt School’s specific proposals for achieving a freer society.

Primarily, Marcuse’s notion of freedom warrants careful examination. He argues that, throughout history, servitude has often been presented as freedom. This lack of genuine freedom is perpetuated by ignorance and powerlessness. Over time, individuals have become “voluntary slaves.” According to Marcuse, poverty and exploitation are consequences of economic freedom in capitalism. He further contends that “oppressive productivity,” defined as economic rationality, functions not as a legitimate form of governance but as the imposition of external laws [12]. Marcuse questions whether escaping voluntary slavery and poverty is possible. He asserts that the rational use of resources, facilitated by technology, can eliminate poverty and scarcity. Specifically, he claims that full automation could bring happiness to humanity:

“Automation, once it became the process of material production, would revolutionize the whole society. The reification of human labor power, driven to perfection, would shatter the reified form by cutting the chain that ties the individual to the machinery—the mechanism through which his own labor enslaves him. Complete automation in the realm of necessity would open the dimension of free time, in which man’s private and societal existence would constitute itself. This would be the historical transcendence toward a new civilization.” [36]

On the other hand, Marcuse introduces a political caveat, arguing that bureaucratic, repressive mechanisms may readily develop even within systems that present themselves as welfare states or socialism [51].

Fromm, like Marcuse, offers concrete, practical solutions to the challenges faced by post-industrial society. For instance, Fromm [49] advocates a “guaranteed income” to protect individuals from poverty and excessive working hours in an era characterized by overproduction driven by automation. He argues that guaranteed income is feasible if maximum consumption is reduced to optimal levels. In this context, a consumption tax may be implemented. Fromm contends that guaranteed income is attainable under two conditions: the consumer must also become a producer, and a new spirituality grounded in humanism must be established [49].

Fromm advocates “humanist socialism,” defined as political and industrial democracy aimed at achieving genuine freedom. He contends that the primary social objective should be the maximization of human productivity rather than economic output. Contemporary economic models, according to Fromm, foster a form of idolatry in which production and success are revered above all else [3]. Fromm [37] calls for a transition from bureaucratic industrialism to humanist industrialism, from centralized systems to decentralized ones, and from the archetype of the corporate individual to that of the responsible and participatory citizen. The foundation of humanist socialism rests on principles such as self-respect, personal initiative, social responsibility, and individual pride [29]. He further questions the feasibility of humanist industrialism as an alternative to bureaucratic industrialism. Fromm argues that modern individuals, having been commodified, perceive themselves as investment tools in the marketplace, seek to market their “personality package” for profit, and devote themselves exclusively to consumption [57]. In response, he proposes shifting from the consumption of superfluous private goods to socially beneficial goods. This transition from private consumerism to new forms of public consumption is essential. To facilitate this change, Fromm recommends increasing taxes on high-income individuals [35].

Reich’s concept of “labor democracy” also provides an alternative framework for understanding the foundations of a just society. Reich [40] defines labor democracy as encompassing love, work, and knowledge, each established through rational interpersonal relationships. As a model of social self-governance [58], labor democracy delineates natural labor relations [40] and stands in direct opposition to totalitarianism and mysticism [40].¹⁰ Reich argues that nationalizing the means of production does not inherently ensure freedom [40]. Instead, he advocates for measures such as job security, reduced working hours, diversification of work, and fostering a direct connection between work and its product [40]. Many of these recommendations are used in contemporary post-Fordist production and management practices.

⁴⁵ Reich [58] characterizes a matriarchal society as a form of labor democracy.

Reich's concept of labor democracy becomes a stronger argument when considered alongside Fromm's principles of democracy. Fromm [29] identifies the criteria for a democracy as a multi-party system, free elections, individual freedoms, economic democracy (a financial system that benefits the entire society), and social democracy. The social and political power of large corporations should be reduced, and citizens should control the state [49]. In the context of democracy and citizenship, Habermas's arguments about democratic processes also carry significant weight.

Habermas [53] contends that practices of mutual understanding among individuals should be established and developed through communicative reason and communicative action. He argues for the validity of reason and law, asserting that the rationality of democratic outcomes is inherent and originates in the democratic constitution. In such societies, democratic practices generate distinct political dynamics, thereby connecting society through the democratic process. The state is, therefore, required to promote public debate to safeguard both negative freedoms rooted in social welfare and citizens' freedom of communication. The concept of constitutional patriotism becomes central within the democratic process. Nevertheless, in democratic societies shaped by modern methods, globalization has produced adverse effects. From this point of view, there is a risk that individuals may become isolated monads, exercising their subjective rights in ways that are detrimental to social welfare [10].

Habermas contends that state intervention in economic markets fundamentally contradicts the core principles of bourgeois ideology. Nevertheless, the survival of the capitalist socio-economic system depends on state intervention and social regulation. Consequently, corrective programs are established to address market failures and provide income, employment, and minimum welfare security, which are hallmarks of the social welfare state [2]. In capitalist societies, overcoming social injustices and ensuring equal rights for diverse cultural lifestyles within a pluralistic framework are imperative. Corporatist bargaining systems further illustrate the necessity of state mediation in social welfare services. However, under globalization and neoliberalism, the legitimacy boundaries of the nation-state concerning social welfare have been surpassed [10]. In response, Habermas analyses transnational administrations, such as the European Union, and advocates for nation-states to form supranational structures akin to the European Union [7]. Historically, the social welfare regimes of the European Union have served as exemplary models. Therefore, the regulatory domains of social welfare states, particularly in relation to social justice, represent critical boundaries in confronting unrestrained global capitalism [7].

Habermas advocates for completing the unfinished project of modernity by further democratizing existing democracies through communicative action and establishing economic structures that ensure social justice. These arguments are particularly significant in contemporary societies shaped by the imperatives of financial markets, where individual ontology increasingly resembles a monad-like construction. Adorno's [46] identification of the separation between intellectual and manual labor as a fundamental social rupture, resulting from the division of material life and culture, is especially relevant in this context. When Adorno [48] asserts that "the whole is wrong," he critiques a social reality that has lost its originality, autonomy, and freedom. In the current post-Fordist and postmodernist era, where individuals may be voluntarily returning to Plato's Cave, particularly amid global

turmoil driven by ethnic identities and religious fundamentalisms, the analysis of the Frankfurt School is more stimulating as a critical approach. Engaging in critical analysis with the recognition that "the whole is wrong" is essential for rediscovering the logos of ancient philosophy, understood as the construction of reason within societies that foster social justice and democracy, free from the dominance of instrumental economics and instrumental reason.

Conflict of Interest

The author declares no conflict of interest.

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Chapter 4

Perspective Chapter: Violence and Politics in the Great Lakes Region – Rwanda's Integration into Global Capitalism

Danilo Ferreira da Fonseca

Abstract

This present research aims to problematize the different ways in which violence was (and still is) used as a political and economic tool by the Rwandan state, mainly in relation to its insertion into global capitalism in the contemporary world. To this end, it starts with an analysis of the twentieth and twenty-first centuries, encompassing different temporalities of Rwandan history, such as Belgian colonization (1922–1962), the independent period of the First Republic (1962–1973) under Gregoire Kayibanda and the Second Republic (1973–1994) under General Juvenal Habyarimana, and the post-genocide government of General Paul Kagame in 1994. Based on the proposed analysis, elements such as authoritarianism and the concentration of power are central in Rwandan politics and involve the development of coffee production during colonization, which continued during independence period, with policies involving mandatory cultivation, commercial monopolies, and severe punishments for workers who violated the strict rules established to optimize production. In any case, in recent decades following the rise of the Rwandan Patriotic Front, Rwanda has shifted from being a coffee exporter to an exporter of valuable minerals, such as coltan, mainly sourced from conflict zones in the eastern Democratic Republic of Congo, primarily the Kivu region. In this way, this chapter seeks to demonstrate how a history that, at first glance, seems to be full of upheavals, ends up possessing a series of continuities that span different temporalities, so that its authoritarian policies and economic proposals insert this small country in the African Great Lakes region into global capitalism.

Keywords: Rwanda, Great Lakes, violence, authoritarianism, development

1. Introduction

In 1994, Rwanda experienced one of the most brutal genocides of the twentieth century. In just over 100 days, around 800,000 Rwandans, identified as Tutsis and moderate Hutus, were murdered by their radical compatriots. The genocide significantly expanded scholarly attention to the country, which had previously been

more restricted to specialist scholars, despite it being from Rwanda that Alexis Kagame formulated the idea of ethnophilosophy, and where Jan Vansina conducted part of his studies on oral history, which would later spread and influence research throughout the world.

This chapter aims to reflect on Rwandan history, focusing on Rwanda's insertion into global capitalism and problematizing this process throughout the twentieth century. To this end, the study is divided into three distinct temporalities: (I) Belgian colonialism (1921–1962); (II) the Rwandan Republics (1962–1994); and (III) Post-1994 Genocide. The first two parts problematize the ways in which the insertion and export of coffee production occurred violently in relation to the local population, despite their significant differences. The third part reflects on the shift the country underwent after the genocide, during which, also through political violence, it entered the international market for rare minerals. A reflection on the 1994 genocide itself is not undertaken here, although some observations are necessary regarding how this process significantly changed the way Rwanda integrated into global capitalism.

This chapter argues that Rwanda's integration into global capitalism has historically relied on the coercive restructuring of land, labor, and production systems, and that violence – whether colonial, developmentalist, or neoliberal – has functioned as a structural mechanism of economic incorporation.

Despite the ideological differences between these regimes – colonial paternalism, republican developmentalism, and post-conflict neoliberal restructuring – a pattern of continuity emerges. Each phase involved the reconfiguration of social relations in order to secure Rwanda's position as a supplier of primary commodities to international markets. Each relied on varying combinations of coercion, legal restructuring, ideological mobilization, and state centralization. And in each case, the burden of integration fell disproportionately on rural producers and workers.

2. Belgian colonialism and the production of coffee

The society inhabiting present-day Rwanda (the Banyarwanda) encountered Europeans only in the nineteenth century. While several African regions and peoples already had contact with European peoples, establishing complex political and economic relations, the society that lived in what is now Rwanda (the Banyarwanda) had its first contact with white men only in the nineteenth century, that is, at a time when European colonial imperialism was becoming increasingly established throughout the world [1].

Following the Berlin Conference in 1883–1884, Rwanda was destined to be a German colony, integrated into German East Africa, along with Burundi and Tanganyika. Nevertheless, the new colonizers invested little in the region, focusing more on resolving political succession and regional conflicts, intervening violently in “rebellious” regions. With Germany's defeat in the First World War (1914–1918), Rwanda was transferred to Belgium, which, in turn, was more active in the region. The way Belgian colonialism was constituted in Rwanda, the relations between the colonial power and the Rwandan monarchy, added to the way the population viewed this process, profoundly marked the formation of the country and the way Rwanda became integrated into international capital.

The racialization of Rwandan society is of fundamental importance in this process, as its population begins to be understood and gradually assumes a social

practice partially based on hereditary and phenotypic issues, since, supposedly, such points are directly linked to the social positions within Banyarwanda society [2].

A racist and racist perception of the world was sustained by anthropometric and eugenic studies from the late nineteenth and early twentieth centuries, conducted by European doctors and anthropologists who traveled the world measuring skulls and other body parts with the purpose of scientifically self-proclaiming (or at least within the scientific conception of the period) the European as biologically superior to men from other regions, in order to legitimize imperialism and colonialism.

In addition to the spread of a racialized society that divides Rwandan society, colonialism also corroborates the insertion of Catholic religiosity within Rwanda, so much so that this territory becomes the second country with the highest proportion of Catholics in its population [3]. This insertion of Catholicism also constitutes a perception of religious and cultural superiority on the part of the Europeans, while also bringing the Rwandan elites of the colonial period closer to the Western way of life and religiosity.

It is interesting to note that in Rwanda, colonialism occurred with the domination and imposition of values from a racialized perspective of society and through a Catholic lens. In the Rwandan case, both religious and biological domination were widely present and were decisive in consolidating the identities and social practices of the Rwandan population, with both forms of domination being intimately linked and even supporting each other, proclaiming the superiority of the Tutsi over the Hutu.

The construction of Catholic domination in Rwanda is expressed through the various missions built by Germans and, mainly, Belgians. Even more important is the integration that these missions achieved within Rwandan society, especially given that these missions included hospitals and schools where the catechization and conversion to Catholicism of the local population took place [3]. Religious teaching and catechization also served to reinforce a supposed superiority on the part of Europeans and to associate this superiority with the Tutsis; thus, priests and bishops in Rwanda spread the message that the Tutsi population was superior and more favored by God. This discourse pleased the Rwandan monarchy, which was increasingly aligning toward with Catholicism [1].

The construction of such an assertion was based on the metaphor built between the Rwandan population and the Hamitic myth of the Bible, drawing a parallel between Tutsis and Hutus and the brothers Cain and Abel. This understanding placed the Hutus as descendants of Cain and the Tutsis as descendants of Abel. This parallel is based on the fact that the vast majority of Tutsis were herders, like Abel, and the vast majority of Hutus were farmers, like Cain. Given the Tutsi dominance in Banyarwanda society, this was considered a kind of divine blessing, since Abel was preferred by God, while Cain was overlooked, which, in the Hamitic myth, causes Cain to murder Abel [4].

Based on the vision of the Hamitic myth, Catholic missions disseminated this perception to the Rwandans, proclaiming the superiority and legitimacy of Tutsi domination. However, this perception of Tutsi superiority also stemmed from biological factors, thereby further supporting Belgian colonialism in Rwanda.

Belgian colonialism widely disseminated the perception that Tutsis and Hutus belonged to distinct races and that Tutsis were superior to Hutus, which attracted part of the Tutsi Rwandan monarchy despite the resistance of Mwami Musinga. We

can reflect on this perception through the following excerpt from an official document from 1925, produced by the Belgian colonization: “The Tutsis are a different people. Physically, they bear no resemblance to the Hutus, except, of course, for some ‘declassés’ (outcasts) whose blood is no longer pure. But the Tutsis of good race possess, besides their color, nothing of a black person. [. . .]. The Tutsis were destined to rule” [1].

It is possible to perceive in the passage above that Belgian colonialism observed a supposed phenotypic differentiation between Tutsis and Hutus, in which the Tutsis are placed as “another people” who do not share similarities with the Hutus. On the other hand, the source also indicates that there is miscegenation among Rwandan “ethnic groups,” given the existence of “declassés” Rwandans, “whose blood was no longer pure.” The vision of blood purity carries a typical racist notion of society, in which subjects hereditarily inherit the characteristics of their racial group, and, in the case of miscegenation, this blood would supposedly be contaminated.

Yet, one of the most intriguing passages in the source is that the “Tutsi of good race,” that is, the Tutsi who do not have miscegenation in their family, are portrayed by the colonizers almost as if they were white, because, if it were not for the black color of their skin, they could be classified as white.

This approximation of the Tutsis with white Europeans had the purpose, within a colonialist society, of legitimizing colonial domination and Tutsi domination, as well as structuring the relations between the Tutsi monarchy and colonial power. This becomes even clearer when the raciality of the Tutsis is reflected in political matters, since, based on their supposed superiority, the Tutsis were considered “conquerors” who “were destined to govern.”

It is important to highlight that, within a racialized worldview of the first half of the twentieth century, races were not limited to physical differences between different human groups but also carried within them a distinction of skills and abilities that were reflected in the intellect of individuals, as well as in their own social and political actions, which would also lead people to occupy different places in society given their racial capabilities.

Within this racist perception, Tutsis and Hutus would not be distinguished only by matters of appearance but also by their racial capabilities. Such issues are perceptible in the work *Agricultural Monograph of Ruanda-Urundi* by the Belgian E. Everaerts (1947), in which the author classifies the Tutsis as being naturally “[. . .] intelligent, ambitious, diplomatic [. . .]” [5], while the Hutus would be “[. . .] timid, obedient, brutish.” [5]

A racial division between Tutsis and Hutus, also implying differences in their capabilities, significantly contributed to the power of the Tutsi monarchy, as the former were understood to be naturally diplomatic and more intelligent, leading them to government roles and their articulation with Belgian colonialism. The Hutus, on the other hand, given their perceived rusticity and brutality, were relegated to manual labor and the harsh exploitation of the colonial system.

This differentiation and division between Tutsis and Hutus, with the Tutsi elite becoming closer to colonial power, became more evident from the 1930s onwards, when the new Mwami Rudahigwa implemented a series of political, economic, and social changes. The Mwami himself significantly changed his image, converting to Catholicism and altering various behaviors, abandoning his old traditional official attire to adopt a gala military uniform with traditional accessories [2].

These changes on the part of the Mwami demonstrate how far he was moving away from traditional Banyarwanda values to adopt Western issues and stances, becoming almost the spearhead of the “modernization” of his society, getting closer to the colonists than to the colonized. This split between local power and the population itself means that, little by little, the Tutsis are increasingly understood as foreign usurpers of the country; that is, they begin to be seen almost as the colonizers themselves, given their proximity to Belgian colonial power.

It is also from the 1930s onwards that Rwanda began to have a new economic direction, focusing on the large-scale production of agricultural goods, mainly coffee, for the Belgian metropolis. In the mid-1930s, coffee production in Rwanda underwent significant growth, increasing from 450 tons to an impressive 10,000 tons of coffee per year in 1943, meaning production grew more than 20 times in a seven-year period [5], marking the beginning of Rwanda’s integration into international capital.

This large-scale agricultural production stemmed from a colonial system of exploitation, in which labor and land were almost exclusively dedicated to the production of goods for the metropolis. Yet, this was only possible due to a significant shift in how land and labor were understood, and this change cannot be seen solely as a colonial imposition but also as stemming from the historical experience of the Rwandans themselves.

The imposition of compulsory labor and the reservation of the best lands to produce goods for export were only possible through a reinterpretation of traditional Banyarwanda practices, mainly regarding the relationship between *ubukonde* and *igikingi* and the practice of *ubureetwa* [2].

The link between Rwandan monarchical power and Belgian colonialism led Rwandan aristocrats to increasingly expand the number of *igikingis* (lands designated for Tutsis) to plant more coffee, but also to maintain their precious livestock. On the other hand, the increase in *igikingis* led to a decrease in *ubukondes* (lands intended for the rest of the population), where a large part of the food was grown [6], which broke the tenuous and age-old balance in the relationship between these two ways of using the land.

The progressive increase in lands exclusively for Tutsi aristocrats near Mwami also meant that they needed more Hutu labor, which resulted in a large increase in the practice of *ubureetwa*, that is, the agricultural work that Hutus did on their lords’ lands, leaving aside other traditional relationships, such as *ubuhake*.

The issue of labor in Colonial Rwanda is of enormous importance, considering that the Belgians, linked mainly to the local Rwandan elites to sustain their coffee export projects, made extensive use of labor, which led to compulsory and mandatory work [7] and, more than that, a paradigmatic shift regarding what work was and what its place and function were in society, since work offered a growing supply of surplus products for commercialization (even more so internationally), which was something new for such societies.

From the 1950s onwards, Belgian colonialism in Rwanda changed radically, entering a phase of valorization colonialism. This valorization of the colony would initially come from a demand by the local elite themselves, who wanted to increase their gains, stating that “Belgian tutelage had already been sufficient,” as indicated in the document *Dixième Session du Conseil Supérieur du Pays* du 16 au 22 Février 1957, produced by the Rwandan Higher Council, composed mainly of representatives of the Rwandan aristocracy.

Nevertheless, the rural population and the nascent Rwandan cities also began to demand more rights and gains from the colonial system. Unlike other territories, where protests became increasingly directed against colonial power and settlers, in Rwanda, the criticism focused more on the local elite tied to the Mwami – and not without reason, since they did much of the work that would have been done by the settlers.

The protests and demonstrations in search of greater rights and social gains are expressed more clearly in the Hutu Manifesto of 1957 and its materialization with the Hutu Revolution of 1959, during which the Rwandan population took to the streets to end the monarchy of the Mwami and the colonial system that sustained him, using violence to do so, invading the homes and properties of the elite, appropriating their possessions and livestock, as well as assaulting and even murdering those who ruled the country [1]. At the same time, during this period, the Belgian colonial power sought to support the popular demonstrations that had a Hutu majority, even supporting the Rwandan independence process itself. Rwanda would remain dependent on Belgian power, especially in terms of economic development.

To a certain extent, the position put forth by Fanon was challenged by the Rwandans, since even after independence, Rwanda remained an exporter of primary products (mainly coffee) to Belgium, thus occupying a very similar place to the one it held during its colonial period. However, the way in which the first two Rwandan republics constructed the relationship between access to land, labor, and coffee production had its own specific characteristics.

3. Developmentalism and coffee: International integration in independent Rwanda

The Rwandan Republics (1962–1973 and 1973–1994) failed to break the logic of a mono-export society based on coffee, but they did significantly change the locations of coffee production. With the social revolution, thousands of smallholdings were distributed, occupying lands that were previously exclusive to the local elite. Yet, these properties were obliged to produce coffee according to the demands of the state.

The change of government in 1973 represented more issues of regional conflicts in Rwanda than an effective economic rupture, causing more substantial changes in local politics. The coup d'état carried out by General Juvenal Habyarimana in 1973 highlights a new division in Rwandan sociability and way of life, which would last until the beginning of the 1990s with the political opening resulting from the Civil War, and definitively ended with Habyarimana's death in April 1994, marking the end of 21 years of the Second Republic and the beginning of the 100 days of genocide. This period, also called the republican period, was, in fact, a dictatorship based on its single party, the National Republican Movement for Democracy (MRND), which was centered on the figure of General Habyarimana.

While in the period called the First Rwandan Republic, President Kayibanda sought to align himself with urban social sectors and popular segments, particularly rural workers, to whom he provided access to land through agrarian reform, with Habyarimana, the emphasis remained on production. However, the liberal professionals of small Rwandan cities were isolated. Habyarimana highlights this

centralization of the countryside to the detriment of urban areas in one of his pronouncements: “Manual labor, especially agricultural labor, is the basis of our economy. We want to repeat that agriculture will remain the essential base of our economic system for the years to come. (. . .) Remember that this is the way we want to fight this form of intellectual bourgeoisie and give all kinds of physical labor its value back” [8].

In his speech, by placing and valuing physical labor and agriculture above other forms of production, Habyarimana criticizes the opposition and the previous government of Kayibanda, portraying them as an “intellectual bourgeoisie” that supposedly did not give due value to the Rwandan peasants, who made up most of the population. The emphasis on peasant labor is visible in several speeches and pronouncements by President Habyarimana.

Thus, faced with unemployment and food shortages plaguing the country, aggravated by the lack of financial gains to balance the trade balance, the political strategy was to encourage people from urban areas to return to the countryside, as we can see in the following presidential statement: “If it is true that the first objective of a national economy is to be able to feed the country at the service of the ones it works for and is organized for, and if it is true that the priority of Rwanda is just to build the national economy around this major imperative, meaning to give it a solid base to allow it to respond to this fundamental demand, one must absolutely be able to clearly identify the key factors our economy needs in order to achieve the objective of a well-understood food self-reliance” [8]. In this speech, Habyarimana places agriculture as responsible for the “first objective of a national economy”, which would be to feed the population that serves the country, once again valuing the work and role of farmers in Rwanda, associating the need for development with an altruistic ideal, because it would be aimed at saving the homeland, making it self-sufficient.

Even other economic factors would be subject to the farmers’ production, going beyond their basic function of guaranteeing the country’s subsistence, as we can see in the following presidential statement: “In its policy of promoting and managing export industries, the government always takes care of peasant families, the essential productive forces of our country, by providing a guaranteed and certain income to improve their standard of living regularly” [8].

On the one hand, the reforms promoted by the previous government had broken a productive chain that generated foreign exchange through exports of coffee and other secondary products, which were used to import basic goods for the population. With agrarian reform and other measures, there was a drop in production for export and, therefore, a decrease in foreign exchange earnings, while the urgency of increasing imports of food and basic goods for domestic consumption intensified with the growth of the urban population. The maintenance of this order of factors, which had, in fact, caused the fall of the previous government, leads the new government to try to transfer to small producers the social function of revitalizing the country’s economy.

It was also expected that smallholdings would be able to generate sufficient coffee production for export, as Habyarimana himself points out above, thus revitalizing the previous cycle of foreign exchange inflows capable of covering import costs. In this logic, the responsibility for reactivating the national economy would now fall to the owners of small plots of land, who, during the colonial period, had been reduced to the condition of super-exploited rural workers. For the development of

this policy, Habyarimana fundamentally relied on commercial sectors of Rwandan society, for which export production was essential.

Nevertheless, the lack of incentives and the need for production for the immediate consumption of small landowners lead them to prioritize traditional subsistence crops, such as vegetables, cereals, cassava, and tubers in general, relegating coffee production to a secondary role. In other words, conditions for export are not viable, exacerbating the chronic crisis affecting the general population. If, under the regime prior to independence, rural and urban workers did not benefit from the proceeds of exports, given the concentration of resources and the costs of colonial status, now there is no wealth to be shared or to cover basic needs, despite producing tons of food products, mainly bananas [8].

Even so, the main export product continued to be coffee, representing almost 80% of the country's exports in the 1980s and being produced on 55% of small Rwandan farms, although not all of them had the natural conditions for such production. Thus, despite not having a production in tons equivalent to the production of bananas, the price that a kilo of coffee reached on the international market compensated for this difference in the gross weight of the two products, since a kilo of bananas varied between 4.00 and 8.00 FRw, while a kilo of coffee varied between 100.00 and 120.00 FRw. This high price of the product and its production for export show why Habyarimana points to coffee as fundamental to the Rwandan economy, which results in a series of special attitudes and actions on the part of the government aimed at expanding this production.

Indeed, during the period in which Habyarimana governed Rwanda, the state's participation in coffee production increased significantly. Properties capable of producing it received subsidies to invest in this production, either to ensure the price for the export of this product on the international market or by providing pesticides and other products to produce a better bean. From 1973 onwards, the government significantly increased the subsidy for this production, even more so at the end of the 1980s, when the sharp international devaluation of coffee forced them to make an unprecedented government investment to maintain production, the cost of exports, and the competitiveness of Rwandan production in the world market [9]. However, it wasn't only through financial subsidies that Habyarimana's government sought to maintain stable coffee production – which he had previously referred to as a “guaranteed delivery of certain incomes.”

Farmers who cut down, destroyed, or neglected coffee trees on their own property were punished according to the Rwandan penal code. Peasants were also legally prohibited from cultivating certain types of crops, required to use specific methods in their production, and restricted from moving freely around the country, being forbidden from changing regions or traveling to cities outside their own. In addition, they were required to sell their coffee production at a fixed price to monopolistic export companies [8].

The obligations and functions that the Rwandan farmer had with coffee production went beyond legal coercion, also extending to the ideological co-optation of small producers. As we saw earlier in Habyarimana's pronouncements, there was an emphasis on transmitting a message that constantly valued and encouraged work and production; anyone who did not participate in this logic was considered “harmful to society.” This ideology of labor in Rwanda – that the country should be built “with the sweat of one's brow and not with useless speculation,” as President Habyarimana said – with work and not with political discussions – meant that the

peasant was expected to produce more on their own land. This discourse was strongly supported by political institutions and by the Catholic Church. This social logic led Rwanda to experience gigantic economic growth, reflected in the subsequent economic expansion after Habyarimana's coup, increasing in just 15 years from an economy of just under 300 million dollars to around two and a half billion dollars – an 800% growth in less than two decades.

However, the appalling living conditions of the Rwandan population persisted during this period, and General Habyarimana's words of encouragement for production did not translate into a better quality of life for the peasants. Those who ultimately benefited from this state-led incentive to work were the sectors that commercialized the surplus of rural producers, mainly coffee. Nevertheless, the fall in the price of coffee on the international market at the end of the 1980s led Habyarimana's government to increase subsidies for coffee production, guaranteeing profits for traders while decreasing direct investment in the population. All these measures only served to exacerbate internal conflicts in Rwanda, as they were insufficient to sustain the way of life proposed by the Second Rwandan Republic. In any case, due to significant ideological co-optation, most peasants remained tied to Habyarimana, seeing him as a defender of their interests as rural groups; it is no coincidence that the genocide began shortly after the presidential plane was shot down in April 1994.

4. The Rwanda post-genocide: Structural adjustment, access to land, and labor reform

Almost 30 years after that process, Rwanda is now governed by those who ended the genocide, defeating genocidal militias and the army of the then-local government. Under the leadership of General Paul Kagame, the Rwandan Patriotic Front (RPF) won the civil war that took place between 1990 and 1994, which culminated in the genocide. Thus, the RPF was responsible for the reconstruction of the country, adopting new economic, social, and political models in which the opposition has little room for maneuver and is persecuted through legislation that prohibits any division or dissenting opinions [10].

This authoritarian stance of the Rwandan government is linked to, and is an important pillar of, its neoliberal-inspired economic policy. The RPF government took over the country in 2000 with a commitment to carrying out a rigid structural adjustment, promoting the regulation of private property, the reform of the state structure, and the reform of labor laws. Guided by the neoliberal playbook and with broad support from the World Bank, the Rwandan government deeply challenged the way the Rwandan population itself understood access to land, the functions of the state, and local work, promoting a series of difficulties for Rwandan workers.

Regarding access to land, it is important to bear in mind that the conflicts of the 1990s significantly disrupted agricultural production and the territorial organization of plots held by Rwandan rural workers. With the murder of hundreds of thousands of Tutsis and moderate Hutus, in addition to the flight of millions of other Rwandans to neighboring countries, thousands of apparently abandoned or ownerless plots of land – and many others – were protected from the violence of war and genocide, which was evidently outside the law and customs of the Rwandans.

To regularize land ownership throughout the territory, the government of General Paul Kagame undertook a series of efforts and launched legislation to create a new understanding of what constituted property, its possession, and its social function, with a greater focus on production.

Of this legislation, the National Land Policy of 2004 stands out, as it clearly expresses its purpose: “Apart from a few scattered land regulations, most of which date back to the colonial period, Rwanda has never had a proper land policy, nor has it ever had a land law, a situation that enhances the existing duality between the very restrictive written law and the widely practiced customary law, giving rise to insecurity, instability, and precariousness of land tenure. The Rwandan Government, therefore, found it compelling and necessary to establish a national land policy that would guarantee a safe and stable form of land tenure and bring about a rational and planned use of land while ensuring sound land management and an efficient land administration” [11].

Following the implementation of the National Land Policy, efforts have been made to regularize Rwandan properties, primarily through the Land Tenure Regularization Program of 2010, with the goal of regularizing over 10 million properties [12]. This regularization of properties significantly changes how land is understood and managed in Rwanda, as the central focus of this process was on guaranteeing private property and consolidating supposed productive security for the owner, to the detriment of collective issues such as the country’s food security, customary access to land, and the customary law that sustains it.

This land regularization process, according to Moyo, Tsikata, and Diop [13], is a trend that permeates other African territories and is not exclusive to Rwanda. According to the authors, since 2004, more than 20 African countries have undergone processes of regularizing access to land as private property, leaving them at the mercy of the international market. Land regularization on the African continent is part of a series of pressures that come mainly from international financing bodies and aligns with the orthodox economic vision held by the World Bank. In this economic conception: “it remains that the absence of clear, tradeable landed property rights limits ‘tenure security’ and constitutes a fundamental barrier to investment and development. [...] It has been argued that the absence of private property rights in land means that Africa is sitting on dead capital” [13].

The result of such a process has been catastrophic for rural workers in many countries, and Rwanda is no different. As “the meaning of land in Rwanda has changed from being a basic way of life and continuous subsistence to a developing market commodity” [12], access to land for younger people has become difficult, causing an increase in unemployment as well as disorderly urban growth.

On the other hand, the RPF government understood that the regularization of property would be a fundamental element for increasing productivity and economic development in the country, which is clear in the Economic Development and Poverty Reduction Strategy II (EDPRS2), a document that follows the recommendations of the World Bank, understanding that the security of private property and its rights would be central elements for Rwanda to become qualified in a free market world. For EDPRS2 [14], in its preface signed by the President of the Republic of Rwanda himself, Paul Kagame: “The EDPRS 2 period is the time when our private sector is expected to take the driving seat in economic growth and poverty reduction. Through this strategy, we will focus government efforts on

transforming the economy, the private sector, and alleviating constraints to the growth of investment.” [14]

We can observe that, with this liberal economic conception, the private sector (national or otherwise) is enabled to participate in and direct the country’s economic development, wherein the market would be responsible for combating and regulating poverty, food security, women’s empowerment, and good governance [14], leaving the State out of such sensitive points in contemporary society. Yet, the social impacts and consequences of such measures in Rwanda are quite significant.

We also need to highlight the measures taken by the RPF government, which carried out a profound labor reform in the country. Labor legislation was reformed in two phases: first in 2009 with Law 13/2009, and then with Law 66/2018, the Regulation of Labor in Rwanda [15]. The new Rwandan labor legislation, despite some advances regarding discrimination based on origin and gender, is heavily inspired by neoliberalism, allowing for labor flexibility through supposedly free negotiation between employers and workers. This negotiation occurs individually, not collectively, weakening labor organizations and consequently leaving workers more subject to the needs of employers. The flexibility of labor contracts is so great in Rwanda that it is possible to enter into verbal employment contracts for a period of 90 days, without any job security for workers. Furthermore, instability also occurs in the case of contracts signed between employers and workers, insofar as employers have the right to alter contracts and suspend payments in a variety of cases, such as strikes (legal or not), financial difficulties, and other situations that are even left open to interpretation in the legislation [15].

4.1 The RPF’s economic model: Agricultural production goals and the plunder of valuable minerals

The structural adjustment promoted by the Rwandan government, with the change in understanding and legislation regarding access to and work on land, as well as new meanings for the world of work and the State, is linked to the economic development model proposed by the RPF, which has as its two pillars the export of coffee and valuable minerals.

As we saw earlier, coffee production and export were the main products making up Rwanda’s GDP between the 1930s and 2000s, spanning the colonial period dominated by the Belgians (1921–1962), the First Rwandan Republic (1962–1973), and the Second Rwandan Republic (1973–1994), with coffee production accounting for more than 80% of the exports during the latter period. This coffee production, in the pre-genocide independent period, was based on thousands of small plots, where rural workers had the usufruct of the land, without an understanding of private property, as in many African countries. In this usufruct of the land, workers could produce their subsistence but were obliged to produce coffee and sell it to the State.

For the RPF government, this model of production and access to land was understood as inefficient and should combat customary access to land. Thus, a political direction occurs for the restructuring of agricultural development and production, which, according to Ansoms [16], would involve three main axes: (1) forced and artificial modernization of the Rwandan rural environment; (2) transformation of the Rwandan agricultural sector into a professionalized engine of economic growth, mainly centered on competitiveness and commercial farm units; and (3) agricultural production carried out based on strict targets.

To combat what the RPF perceived as backwardness in the Rwandan countryside, the government sought to promote more mechanized agricultural production, understood as a modernization process for the country's development. However, this modernization occurs in a forced manner, where Rwandan rural workers are obliged to produce according to the standards demanded by the government, with the "imposition of preferential market-oriented crops per region" [17], in which smallholder farmers need to meet production targets, losing their own autonomy and often being unable to keep up with the pace demanded by the government [17].

For this forced modernization process in the countryside, in addition to the government seeking greater efficiency and agricultural productivity through mechanization and targets, the diagnosis produced by the RPF is that it would be necessary to increase the size of agricultural properties, with the understanding that Rwanda is a country with many people and little land, which causes rural workers to focus on their own subsistence. This diagnosis is quite present in the Land National Policy (2004) and is used to justify its reform aims, wherein it would be necessary to increase Rwandan properties and offer non-agricultural jobs to the population displaced from the countryside. This perception is reinforced in the words of an official from the Rwandan Ministry of Agriculture and Animal Resources: "They say that agriculture is the productive sector, but it isn't in Rwanda. In fact, we should stop calling it the productive sector; it is, at this point, the survival sector. At this point, most people are not earning because the pieces of land they have access to are too small. We must get more people off the land, as we cannot continue a system with small pieces of land. When people get off the land, there will be more land in the hands of fewer people, which will allow better planning of the system" [16].

Based on this discourse on the need for increased productivity, with an increase in land ownership in Rwandan rural areas through a reorganization of land access, the government of Paul Kagame launched an agricultural village program called Imidugudu in 2000. This program has some expensive implementation requirements that end up expelling rural workers who cannot meet the minimum standards and conditions to participate in the plan. According to Hilhorst and Van Leeuwen [18], the agricultural villages of the Imidugudu program: "was a blueprint policy for the whole country, disregarding local diversity, implemented in a top-down fashion and with little space for popular participation. In the Rwandan case, it seems that the opposite of what was intended was achieved: development was not integrated into relief, but the pitfalls of relief invaded development" [18].

With the aim of forcing cultural, technical, and productive changes, the RPF government devised a very rigorous production control system, which, as we have seen, removes the autonomy of workers with the intention of imposing greater competition among them. From this, the government seeks to integrate Rwandan rural workers and their smallholdings into global value networks, in which these workers are subject to transnational corporations that distribute seeds, fertilizers, and other products, determining the values involved both in the acquisition of raw materials and in the sale of products. This makes rural workers in Rwanda, and throughout the world, hostages to debt and exhausting work with high targets.

Those who suffer most from all this are the workers with smaller landholdings and who are poorer, unable to meet the demands of the forced modernization of the countryside, needing to meet difficult production targets to be better paid and to pay off their debts for inputs, and who often have to sell their land to competitors who already have a greater accumulation of land [16].

Nevertheless, during Paul Kagame's government, agricultural production and coffee exports gradually ceased to be the country's main export products, giving way to the export of valuable minerals such as gold, tantalum, and tungsten, with Rwanda becoming the world's largest producer of tantalum in 2017. Rwanda's political stability has become a major attraction for international mining companies, which have viewed the small country as a more stable route for exporting minerals. There are many controversies surrounding this mining, as some of these products are acquired illegally in the border region with Congo, which is made possible by conflicts in the neighboring country and gives rise to so-called conflict minerals [19].

It is unclear how much of this mineral production occurs and by whom it is exported, since its controversial origin leads to front companies establishing themselves in Rwanda to plunder this raw material, where the working conditions of the miners are quite precarious, many of whom are the young people we mentioned earlier who can no longer find land to carry out agricultural production and also cannot find employment in Rwandan cities, leaving them with the option of mining and/or plundering valuable minerals in conflict zones or areas with little labor regulation.

5. Conclusion(s)

Rwanda's twentieth- and twenty-first-century trajectory reveals less a story of abrupt ruptures than one of structural reconfiguration. From colonial coffee regimes to post-genocide mineral exports, the country's integration into global capitalism has consistently depended on the reorganization of land, labor, and authority. While the ideological languages have shifted – from the civilizing mission to rural developmentalism to technocratic neoliberal reform – the underlying logic of export-oriented incorporation has remained remarkably stable.

Under Belgian colonial rule, racialized hierarchies and missionary networks facilitated the violent restructuring of customary institutions in order to expand coffee production for metropolitan markets. During the republican era, developmentalist authoritarianism preserved the mono-export structure of the economy while transferring responsibility for national stabilization onto smallholder producers, subjecting them to price controls, coercive production requirements, and ideological mobilization. In the post-1994 period, the RPF redefined property rights, labor relations, and agricultural organization through a market-oriented framework that sought to position Rwanda competitively within global value chains. Although framed as modernization and reconstruction, these reforms have similarly entailed dispossession, labor flexibilization, and heightened integration into volatile international commodity markets.

What connects these historical moments is not simply the persistence of primary commodity dependence, but the recurring use of coercive state power to discipline rural populations and reorganize productive life. Violence in Rwanda has functioned not only as physical repression but also as legal restructuring, ideological normalization, and enforced economic transformation. In this sense, the 1994 genocide should not be understood as a historical rupture, but rather – drawing on Walter Benjamin – as part of a historical continuum that accumulates ruins and debris, a continuum in which

struggles over land, labor, and export revenues were central to the constitution of political authority.

Today, Rwanda is often celebrated as a model of post-conflict recovery and developmental efficiency. Yet, beneath this narrative lies a deeper historical continuity: the consolidation of a centralized state capable of rapidly transforming land tenure, labor regimes, and production systems in order to secure its place in global circuits of accumulation. The durability of this model raises broader questions about the relationship between authoritarian governance, export dependency, and economic modernization in postcolonial Africa.

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Perspective Chapter: Global Atlantis Science-Based Pragmatics to Survive

Hardy Hanappi

Abstract

During different stages of the capitalist mode of production, the evolution of the human species has led to an outstanding ability of our species to master dangerous crises, to grow in numbers and to develop a stock of knowledge that increases our capacity for flexible response. Nevertheless, we are currently confronted with an accumulation of impasses for the omnipresent capital algorithm (in brains as well as in larger social entities), which leads to seemingly hard-to-prevent environmental disasters and continuously more severe local wars. This sinister general outlook underscores the need for some optimistic pragmatism: There are ways to safeguard human survival by *replacing* the capital algorithm that governs most current decisions with different decision-making mechanisms. Contrary to the seemingly universal applicability of the capitalist algorithm¹, these mechanisms have to be tailored differently to fit the respective field of application, which they shall cope with. Above all, they have to combine the global dimension of human reproduction (we still plan to live in a global Atlantis built on the global division of labor) with the locally visible and manageable cultural environments, which are still the prime origins for the motivations of human individuals. This task concerns, e.g., institution-building to achieve a democratically organized, generally accepted global governance, as well as a transparent yet creative mechanism to allocate the surplus achieved in different production spheres. In the background of all the urgent flexible responses to the upcoming problems, there has to be a globally organized class of scientists, of organic intellectuals².

Keywords: global governance, mechanism design, cultural diversity, evolutionary humanism, democracy design

⁶⁹ A concise definition of the capitalist algorithm can be found in [8, 10].

² The concept of organic intellectuals has originally been introduced by Antonio Gramsci [11] and has been extended in [12, 13].

1. Introduction

All human practice starts with the anticipation of what will happen in the future. It combines three elements: (1) What is to be achieved? (2) What are our tools? (3) Who are we and what is surrounding us? The less we can answer these questions, the more we have to rely on intuition, which does not necessarily reduce our chances of succeeding. All practice relies on some kind of theory; intuition is just the extreme case of a theory we are not aware of. The relation between theory and practice is scalable; it ranges from completely inadequate, useless theories to more successful, more adequate theories.

The development of knowledge – the movement from inadequate to more adequate theories – rests on their repeated use. Failures and successes of their application have to be remembered and recorded³ to weed out bad theories and to spur new ideas as candidates.

This chapter sets out to improve the understanding of capitalism, more precisely, of the capitalist mode of production. For that purpose, it proceeds in three main steps: The first section identifies capitalism's positive contributions to the development of human societies. The second section puts the accompanying, socially negative elements of capitalism into focus. In the course of its development, in particular during the last decades the negative elements became global and omnipresent. After some 500 years of capitalism, it now appears rather evident that this mode of production – like every previous mode of production (e.g. slavery mode of production, feudalism) – will prevail only finite period of time. In other words, it will approach its end if its “historical mission”, detected by scientists towards the end of this mission, is exhausted. As soon as the consequences of capitalism's former successes are starting to threat the very existence of the human species, there has to be either an evolutionary jump into a new mode of production, or the final stage of humanity is near. Like all life forms the existence of the human species is a finite episode.

The way in which these dangers, these basic facts of the finiteness of all life on earth, will manifest themselves probably as the accelerating dynamics of climate catastrophes. But before these developments might take place, there is also the dangerous transition from the military and economic battles of a handful of military-industrial capitalist complexes (e.g. USA, China, Russia) into one truly global capitalist regime. This transition will at least be the major challenge for mankind for the next ten years⁴. And even if the capitalist mode of production can master it, it has to be doubted that its essential ingredient, the capitalist algorithm, can overcome the environmental catastrophes. The third section finally provides some ideas on what can be learned from the problem areas, which remained unsurmountable for the capitalist mode of production. If mankind survives the end of capitalism and masters the challenges of environmental sustainability, then a new mode of production might be labelled “*Global Atlantis*”, the blessings of capitalism – the fruits of its historical mission, e.g. globally changing division of labor and dynamic commodity production – will be made available to a democratically self-governed cooperating human population.

⁷⁰ n this sense all science rests on recorded history.

⁴ There are two opposing possible outcomes for this mid-run challenge: global racism and global humanism [14, 15].

As the described task of this chapter is much too aspiring, what indeed follows is necessarily only sketchy. To introduce the methodological background, next some preliminary methodological remarks are provided.

2. Preliminary methodological remarks

There is a long and ongoing debate on what can be considered as *scientific* method. Following Descartes, there are two stages to be followed [1]. First, the dynamics of an observed object of investigation have to be analyzed, i.e. disassembled into the parts that are thought to be essential. In the second stage, they are recombined again to form a thought model, a synthesis, which is able to provide a better understanding and anticipation of the behavior of the object of investigation; compare also [2]. The scientific activity to determine which elements are essential and how to observe their dynamic behaviour is just one process. The distinction between “*qualitative* research method” and “*quantitative* research method”, proposed by some sociologists, is therefore only meaningless pseudo-scientific jargon. Science always is a synthesis of both. The same has to be said about the necessity to locate a scientific paper as part of a certain school, e.g. being Keynesian, Walrasian, Marxist, or the like. The very root of scientific activity is that it is not a pseudo-religious belief system that follows the dogma of a mastermind, but rather a conglomerate of interdependent, preliminary hypotheses. A declaration of belief, therefore, is completely superfluous and, in the sense of Descartes, should be replaced by a “declaration of recurring doubt”.

Thus, the starting point for scientific activity is doubt: It is the contradiction between what is observed and how these dynamics of an object of investigation are currently reproduced in a theoretical model. With respect to the concept at the center of this text, capitalism, many proposals of what it is have been around for a long time already – and have to be doubted. They range from the view that this mode of production is a representation of the ultimately best form of social arrangement, which will prevail for eternity, to the opposing view that capitalism brings to bear the worst of human incentives, which will bring the human species, lacking its moral underpinnings, soon to a bitter end. The hypothesis put forward in the text that follows is that capitalism is an episode in the development of the human species⁵, which has a starting point and will have an end. It has brought about specific progress in overcoming existing contradictions of pre-capitalist societies, but it also developed new contradictions, which are now leading to an approaching end of capitalism.

Since *contradictions*, including smaller contradictions occurring and overcome in the age of capitalism, are the central concept for this article, the text draws on parts of the work of three important scholars: Schumpeter, Keynes, and Marx. Schumpeter insisted on the importance of disequilibrating creativity; Keynes constructed institutional frameworks allowing for the stabilization of the destructive overshooting of capitalism’s disequilibrating force; Marx had unified the aspirations of the French Enlightenment – Hegel’s heritage – with the knowledge of classical

⁷¹ The timing of this episode is controversial. For most scholars, capitalism started with merchant capitalism around 1500. When it will end is even more doubtful. There are signs that capitalism will not be able to survive the global climate catastrophe it produces, which means that its demise might fall in the second half of this century.

British political economy, which embodied some of the dynamics that this school had derived from observing the hegemonic England. For Marx, contradictions were rooted in exploitative relations between social classes. Schumpeter saw the potential of contradictions to advance technological progress. Keynes anticipated how, on an aggregate level (national and global), the implicit contradictions produced by the financial capitalism of the 20th century can lead to collapsing societies⁶. Of course, reasonable doubt can never fully subscribe to one of the great thinkers of the past. It can only take what it finds useful to propose its own set of hypotheses.

3. Fruits of the historical mission of capitalism

Since its early days in merchant capitalism, the capitalist mode of production has brought about a substantial advance in living standards for the average human individual. The problem is that the average human individual does not exist. This concept is only a theoretical concept, which hides the important internal dynamics that have caused the proclaimed advance of living standards. First of all, three questions arise: (1) Whose living standards? (2) How can the living standard of a population be measured? (3) What have been the essential mechanisms with which the capitalist mode of production was able to achieve its historical mission? Starting with (2), the measurement question, it can easily be seen that the rise in living standards of different parts of the global mankind has followed stupefying different trajectories. An obvious biological measure of the standard of living is how many individuals can live in a geographical region for which (average) life span⁷. The divergence of life expectations between the rich North and the poor South shows how unequal the long-run trend towards increasing overall life expectations (the success of capitalism) proceeded. This is a first hint at a common property of capitalism: It proceeds by producing and *amplifying inequality* and *shifting contradictions*. It has to be understood that, as a mode of production, this basic property produces pulsations of the system – locally and globally – but also has the merit to imply a long-run improvement of the overall biological success⁸. The number of human individuals has been increasing sharply. Around 8,000 years BC, when the agricultural revolution set in, the number of human individuals is estimated to have been a modest four million. During the era of capitalism⁹, starting with merchant capitalism around 1,500, it exploded to a level of more than 8 billion people in 2025.

In **Figure 1**, the life expectancy at birth since 1950 is shown (right-hand vertical axis), too, which makes it plausible that even on a global scale, the lifetime of individuals will approach an upper limit.¹⁰ But, as a glance at the difference between

⁶ Keynes was involved in a prominent position in the disasters of both World Wars of the 20th century. He recognized the dangers of nationalism and fascism as pathological excrescences of capitalism, which had to be avoided by governance intervention.

⁷ An extended description of the so-called demographic transition during capitalism can be found in [16].

⁸ Joseph Schumpeter's catchy description of this property as "creative destruction" summarizes the violent turbulences produced by reoccurring disequilibrating forces in political economy, compare [17]. Of course, Schumpeter as an apologist of capitalism underlined the positive trend of increasing welfare, of activity overcompensating destruction in the longer run.

⁷² For the structure of different stages of the capitalist mode of production compare [18].

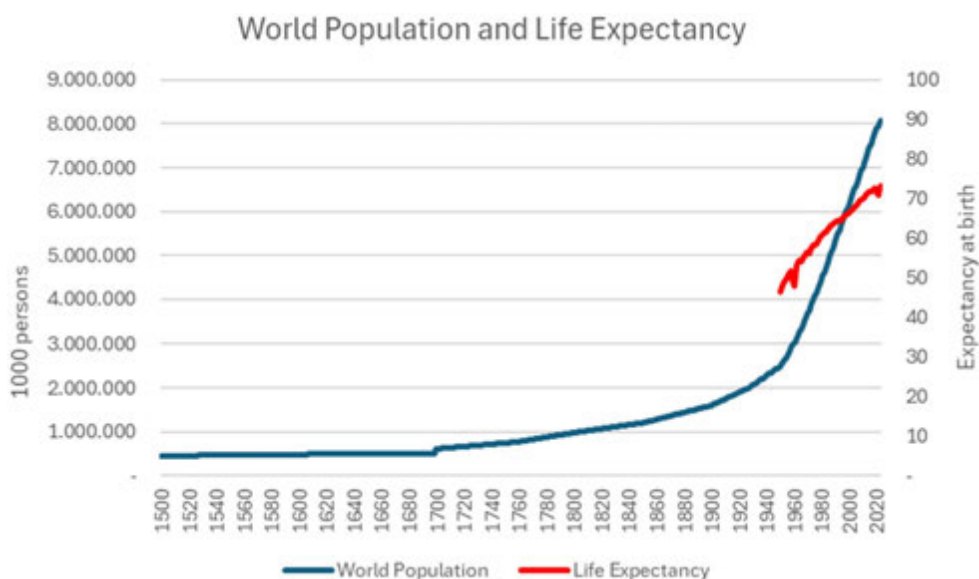


Figure 1.
 World Population and Life Expectancy. Source: United Nations, department of economic and social affairs, population division.

rich and poor countries immediately reveals, this upper limit of the global average will be reached in high-income countries much faster than in low-income countries.

Following the split between high-income and low-income countries proposed by the World Bank, **Figure 2** shows that since 1950, the number of people living in low-income countries has risen much faster than that in high-income countries. During the past 75 years of globalizing exploitation in capitalism, a fast-increasing share of poor individuals is confronted with a slower-increasing share of rich individuals. In that sense, global inequality is rising. The good news is that despite this bad news, life expectancy at birth in the poor part of the world is slowly approaching the levels of the rich part (right-hand scale).

The biological success of capitalism is clearly bought by its implicit disequilibrium dynamics. It is interesting to consider the inner dynamics of this mode of production along the lines of two eminent economists: Schumpeter and Keynes.

The common wisdom of learned economists has it that Schumpeter saw capitalism as economically stable, but politically unstable, while Keynes thought that it is politically stable, but for economic stability needs intervention by state action. Though this contradiction contains a grain of truth concerning the attitudes of the two economists, it is somewhat misleading.

Keynes' intellectual merit was to reintroduce the macroeconomic point of view into economic theory⁷³, which enabled him to consider the full circuit of monetary exchanges within a larger political-economic entity. To stabilize the aggregate working of a nation's capitalist system, the demand side had to be supported

⁷³ Current estimates indicate that such a biological limit for human individuals will be between 120 and 130 years.

⁷⁴ Classical British political economists of the 19th century already had been "macroeconomists", but the marginalist school of 1874 (Walras, Jevons, and Menger) had destroyed their heritage.

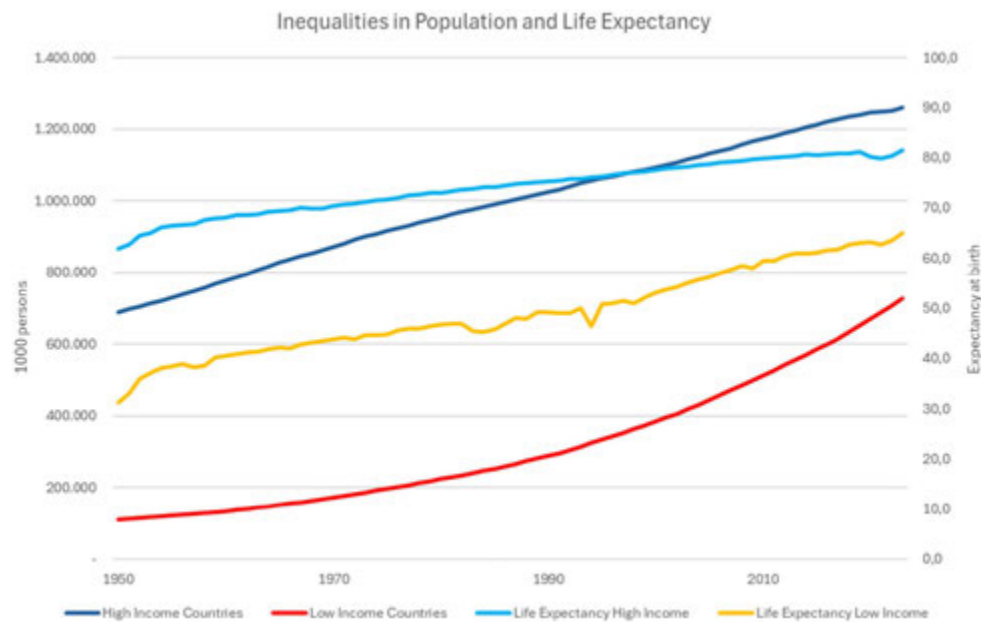


Figure 2.

Inequalities in Population and Life Expectancy. Source: United Nations, department of economic and social affairs, population division.

repeatedly by additional public demand. No single production unit could escape the prisoners' dilemma situation of generally lacking effective demand; only an entity representing the complete exploiting class, the government of a capitalist country,¹² could step in to solve the crisis. As a consequence, public debt had to become a regular element of macroeconomics. With this simple extension that added a political instrument to the seemingly perfect market equilibrium of Walras, the stability of *financial* capitalism could eventually be saved. In the same vein, Keynes initiated the installation of an *International Monetary Fund* for the case of problems of national funds – if a certain nation's public debt would reach its limit – to act as a lender of the global capitalist class. Evidently, this was Keynes' reaction to the Great Depression of 1928. Repeatedly occurring disequilibria between national accounts of capitalist countries¹³ had to be politically corrected by a globally acting capitalist institution, the IMF. The most remarkable property of Keynes's theoretical innovation is its method: Disequilibria at the lower level of economic units (e.g. firms, nation states) can be stabilized by intervention of an institution at the next higher level (e.g. the nation state, a global institution), which can represent the common intentions of all the units at the lower level. Moreover, Keynes was not only proposing a theoretical extension of economics, Keynes also *acted as a politician*, initiating the installation of statistical offices and other more universal institutions of the global capitalist class. In this sense, Keynes's approach basically proposes

¹² It was Marx who had anticipated this role of a government of a capitalist state in financial capitalism by dubbing such a state the "executive committee" (in German: "geschäftsführender Ausschuss") of the capitalist class.

¹⁴ Disequilibria between capitalist countries show up by different variables, public debt, trade, exchange rates, migration, and the like.

stepwise, extensive **growth** of the capitalist system. These steps, the limits of a capitalist system at a certain geographical extension,¹⁴ are the mystery behind the connection between Keynes and Schumpeter. Each break is a point where escalating Schumpeterian disequilibrium provokes a new Keynesian institutional framework.

Schumpeter is famous for his concept of interdependent cyclical behavior of different wave lengths of pulsating economic activity, compare [3]. Each of the three waves he stylized as “inventory cycles”, “business cycle, and Kondratieff cycle; each describes a different economic disequilibrium process. Later, Schumpeter’s follower Richard Goodwin was the first to provide a mathematical framework which united Schumpeter’s ideas [4]. The essence of Schumpeter’s innovation in economic theory is that he insists on the importance of the disequilibrating force of a subset of actors in the dynamics of a society’s political economy. He calls this subset of all firm owners in a capitalist country the *entrepreneurs*. In the jargon of the marginalist schools of Schumpeter’s times, they do not produce along a production function, they rather *shift* the production function to a new, unknown position.¹⁵ Along the waves of economic activity in such a permanently disturbed economy, specific market equilibrium positions occur only rarely. General equilibrium – the mantra of contemporary mainstream economists – is an unknown phenomenon. What drives capitalist evolution is the creativity of a limited set of outstanding socioeconomic characters at the level of production units, of firms. Note that the empirical data available to Schumpeter in 1911, in principle, were the success stories of firms during the 19th century. His abstract “entrepreneur” indeed was framed in the sight of successful role models in 19th century’s real life.

With Schumpeter’s idea of a class subject that continuously – though stepwise – disequilibrates capitalism, a seemingly contradictory element to Keynes’ growth of ever larger political units with a steadily growing institutional setup had been introduced. But the contradiction does not exist: Schumpeter and Keynes only put different spotlights on the *same* capitalist process. For **Keynes**, the **growth of the units of political economy**, growth or at least keeping of the national territory, combined with the growth of the richness of its institutional backup, is the core of his stability program. For **Schumpeter**, the justification for the existence of capitalism is its **capacity to introduce new products and new production technologies**. The surprising fact is that neoclassical economic theory, as it emerged out of the marginalist school of Walras, Menger and Jevons, had ignored both types of pivotal elements of capitalism just mentioned. Neither Keynes’s idea of **growth with an adjusting institutional setup**, nor Schumpeter’s **growing labour productivity with a growing set of products and techniques**, was dealt with. As a consequence, neoclassical economic theory retreated into a mathematical ivory tower, desperately trying to adjust its role model of Newtonian mechanics to the needs of a qualitatively different environment of human societies.¹⁶

¹⁴ David Gordon introduced a broader concept for these steps. He framed them as a sequence of “Social Structures of Accumulation” [19].

¹⁵ Remember, that this function describes how a whole set of products emerges. Therefore, such a shift, i.e. innovation, consists of both: introduction of new products as well as introduction of new production methods.

¹⁶ This explains why John von Neumann in the first chapter of his path-breaking book on game-theory complains about the pitiful state of economic theory [20]. His game-theory was meant to provide a new language to tackle political economy and social science in general.

Returning to the fruits of capitalism's historical mission, it is nevertheless evident that technological innovation, growth of labor productivity, growth of institutional setup, and growth of political units go hand-in-hand. Schumpeter's characterization as a stepwise progression has become visible on Keynes's larger scale of growing state units when a fallback to an imperialist world war occurred in 1914, as well as in 1939. In both cases, groups of countries built a military alliance – a step towards a united political-economic entity – to gain global hegemony. With WW1, the death knell for the political role of the feudal class had sounded. But soon, the new system of financial capitalism ran into the catastrophe of the Great Depression of 1928. Fascist movements under the lead of an imperialist and nationalist "strong man" dragged finance capitalism back into a war-leading command economy.¹⁷ After WW2, a bipolar global system had been established. In Western Europe, under the influence of the social democratic variety of the labor movement, the European Social Model had been established, which was a first step towards a general institutional framework to enhance the living standards of all social strata. This European Social Model indeed can be interpreted as an example for how far capitalism can fulfil its promise of advancing labor productivity, generating new products and services, and at the same time keeping exploitation and unemployment at bay.

Taking a look at the increase of labor productivity (an essential fruit of capitalism), it is useful to start with the ratio between *quantitative output* and *labor time* needed to produce it. But this is only possible for a well-defined specific product or service: How much time is needed to produce a pair of shoes? This type of consideration in fact contradicts the basic feature of capitalism, namely that it is a socially embedded *commodity* production system. The increase in labor productivity stems from specialization of workers to produce certain outputs *and the following exchange of these outputs as commodities*. Division of labor is the mystery behind the increase of labor productivity!¹⁸ The total output produced by the labor time of the species is always a *social* product of specialized labor mediated by exchanges that use a form of money.

To take this difficulty for empirical issues concerning labor productivity into account, three important issues have to be mentioned: (1) Not all economically relevant labor time appears as an amount of money at a market exchange. The outstanding two examples are the family work done by housewives and the many activities in the poor South that also never imply monetary exchanges. (2) The monetary equivalent of a creditor's cost of granting a credit is always a very rough estimate, which in the current era of highly developed finance-capitalism can heavily distort the overall picture of the state of the economy.¹⁹ Given these two caveats, the gross domestic product in real terms nevertheless seems to be the best guess for the size of human output per year. (3) All illegal activities as well as activities performed outside the control of the state are not included in GDP. Since illegal activities often use bitcoins to escape state control or taxes, the growing importance of that field is not reflected in GDP. But alas, GDP in constant terms

¹⁷ In [21] a comparison of the interwar period and the current geopolitical situation is provided.

¹⁸ Compare the two classics on this topic: At the macroeconomic level Adam Smith explained the wealth of Great Britain [22], and at the microeconomic level Frederic Taylor [23] explained the emergence of fits.

¹⁹ *imputed banking costs* are never measured by market exchanges but are simply assumed by estimating the gain, which other investment opportunities would have provided.

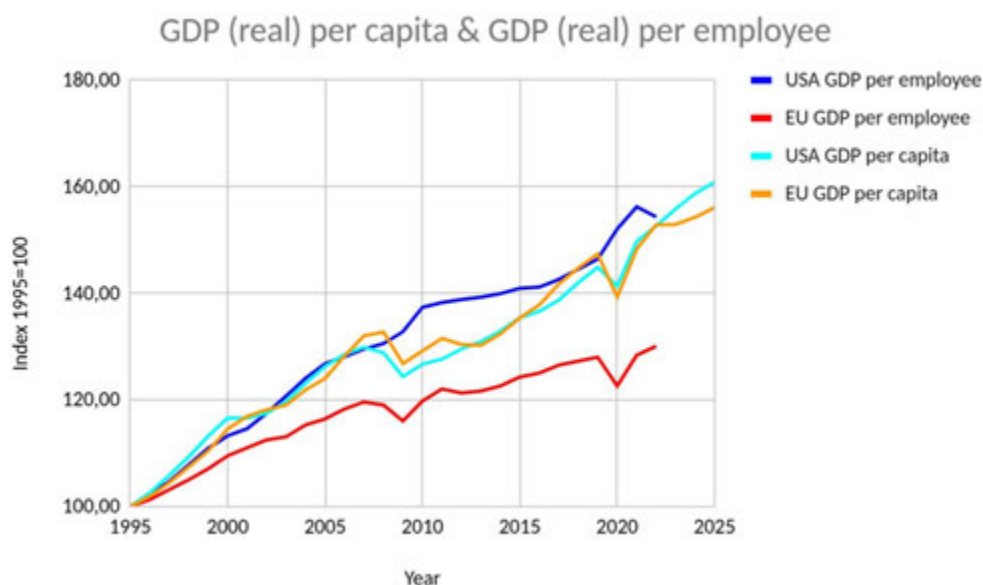


Figure 3.
 GDP (real) per capita & GDP (real) per employee. Source: AMECO database.

seems to be the best we can get in the moment as an index for overall economic activity of a country. Therefore, when Keynesian macroeconomics emerged after the Great Depression and led to the systematic monitoring of economic aggregates by statistical offices, the GDP numbers quickly started to play a central role in a state's economic policy. On the other hand, the size of the population of a country also has an alternative measure for labor time input, namely the number of persons employed via official labor markets. In this case, the two distortions of GDP figures by unemployed (but labor time spending) housewives, and the officially unemployed workers who partly participate in black labor markets, play a role.

Despite its shortcomings, GDP is still the best empirically available number to measure economic activity mediated in a society by commodity production. As shown in **Figure 3**, for the USA (the hegemonic capitalist economy), from 1995 to 2025 the development of GDP per capita and GDP per employee is predominantly parallel.

The comparison to the development in the European Union reveals an interesting additional insight: While the GDP per capita of the EU largely follows the trend in the USA,⁷⁰ the GDP per employee in Europe demonstrates an important characteristic of the European Social Model. Since 1995, the enlarging EU has kept more workers in employment and has enabled less GDP growth than the USA. Thus, capitalism in Europe favored European employees with respect to job security, but it was less attractive for capital accumulation. Of course, the steadily increasing share of financial services in GDP, which is now monopolized in the US financial markets, plays an important role in this dynamic too.

⁷⁷ Note the two parallel crises in 2009 (Great Financial Crisis) and 2021 (Corona pandemic).

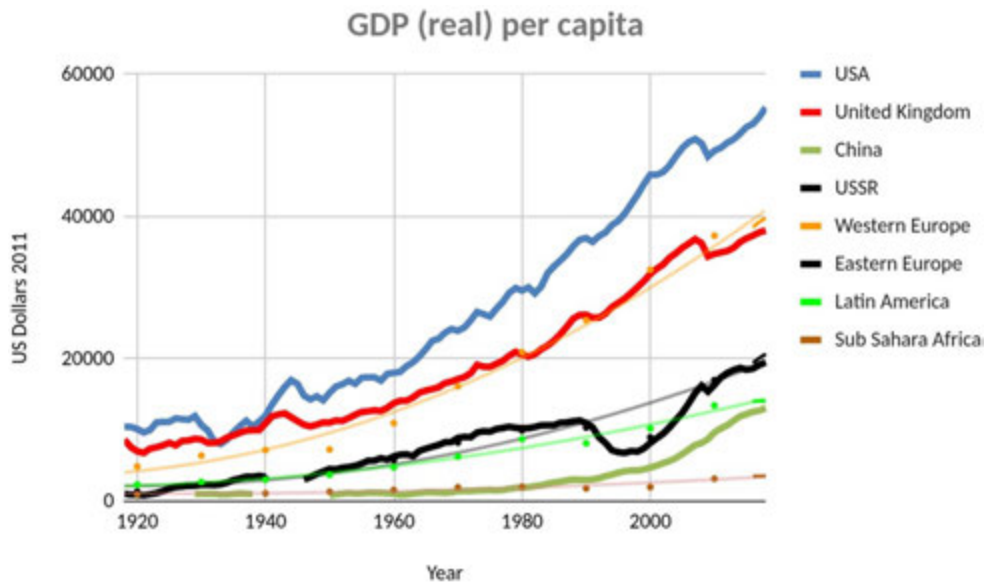


Figure 4.

GDP (real) per capita. Source: Maddison Project Database (MPD) 2020, University of Groningen.

The global drawback of the still flourishing dynamism of US capitalism in the last three decades can be seen if the longer run perspective since 1918, the end of World War 1, is considered, compare **Figure 4**.

With finance capitalism the old hegemon (the United Kingdom) was replaced by the new hegemon (the United States) and this is also reflected by the average of the GDP per capita of US citizens. The UK after WW2 also lost its advantage over the rest of Western Europe and now both follow similar trajectories. The most interesting – and disturbing – fact is that with **financial capitalism, exploitation** now mainly **takes place at the global level**. The rest of the world (excluding the USA and the EU), where a large majority of human individuals live, earns a permanently slower-growing per capita GDP. The two minor exceptions are Russia (the former USSR), now due to its oil and gas reserves, and China. They now both seem to manage to be included as *necessary intermediaries* in the global financial capitalist production system. Clearly, China's average GDP per capita has caught up remarkably, but is still way lower than in the Rich North.

The **first fruit of capitalism's historical mission**, increased **labor productivity** and the accompanying variety of commodities, does exist, but it came at the price of a **globally polarized exploitation regime**.

The **second fruit of capitalism's historical mission** is harder to grasp and less visible to the unscientific observer: It is the development of an institutional framework, which sometimes is summarized by the notion of "**democracy**". This concept is remarkably self-contradictory, since it proclaims that, instead of the exploitation of one class by another class, the whole species turns its self-exploitation into self-governance. That is, the concept of "exploitation" itself is revolutionized by the emergence of an all-embracing **consciousness of the species**. On the way towards this consciousness, a kind of central nervous system of the species, connecting this conscious core with the different parts of the species, has to

be developed. And this is exactly where the role of *the development of democratic mechanisms* enters.

Schumpeter had explained the growth of labor productivity (fruit 1) by the recurring, disequilibrating activities of entrepreneurs. The processes he used as empirical templates for his narrative were the activities of firm owners in the 19th century. In their totality, these innovations and their links via production chains and communication produced pulsations of economic activities at different wave lengths.²¹ In the 20th century, with an emerging full-fledged financial backbone of capitalism and an enormous drive towards larger production units and more fluid financial transfers, these pulsations erupted in the years of the Great Depression, 1928 to 1932. The main agents controlling capitalism now were the members of a conglomerate that was later dubbed by President Eisenhower the “military-industrial complex”. The leader of such a complex now was typically the leader of a nation-state, a representative of its government. With the disaster of the Great Depression in front of his eyes, John Maynard Keynes realized that it needed interventions from this governing institution to stabilize Schumpeter’s ever larger waves of downturns, which had drawn the whole of financial capitalism into the abyss. To introduce such stabilizing policies, it needed an aggregate accounting system of a whole nation-state, statistical offices and macroeconomic modelling. And to implement policies, it also needed national class compromises. The pivotal impact that Keynes provided thus was an entire package of theory, macroeconomic theory,²² plus a practical toolbox of institutions, which enabled the nation state to turn *short-term* economic advices into effective, real-world policy. It is the latter **institutional framework**, which spans from the choice and collection of meaningful aggregate variables to the design of regulating social institutions, which has to be considered as the **“second fruit” of capitalism’s historical mission**. It offered a nation-wide regulating device to tame the exploding forces of Schumpeter’s innovation dynamics. The main threat of accelerating economic downturns, of self-defeating speculation spirals, could be found in two properties of the advanced innovation process in finance capitalism: (1) The drive towards ever decreasing unit cost favors larger and larger production units, oligopolisation speeds up. (2) Capital in its form of finance capital becomes extremely fluid and fast. It can leave whole production spheres as well as geographical locations often very quickly – leaving less mobile production elements as ruins behind.

With his analysis, Keynes saw that these evils that endanger a capitalist nation state had become a global monster during the Great Depression. As a consequence, in the 40-ties he proposed elements of a global institutional framework needed to save global capitalism: The International Monetary Fund and the World Bank. Soon both global institutions became dominated by the new hegemonic capitalist nation state of Western capitalism:²³ the USA. Nevertheless, parts of their design reflect long-run necessities of democratic global governance. The IMF has been designed to react on short-term imbalances in some countries that easily can occur if the dynamics of a global currency, at the time the US Dollar

²¹ Compare [3].

²² The celebrated mathematical Keynesian macroeconomic model indeed stems mainly from his colleague Sir John Hicks [24]. Keynes himself was one of the last economists working almost exclusively with plain text.

²³ To characterize the details of the varieties of capitalism that emerged in Russia and China goes beyond the scope of this paper.

bound to the new hegemon's policy, are running wild. The World Bank was designed for long-run intervention. It should ameliorate the increasing divergence between poor and rich parts of the world. It exemplified Keynes' awareness of the necessity of effective demand for a long-run survival of capitalism: One has to assure that the cow one wants to milk should not be starved to death prematurely.

Parallel to Keynes' institutions, which meant to save integrated capitalism,²⁴ another democratic global institution was revived, the United Nations. Despite the disappointing results of a similar institution dedicated to prevent a world war in the interwar period – the League of Nations – the UN was established in 1945. Currently, in its general assembly the heads of state of 193 countries are gathering (each country has one vote) and its security council includes five permanent members (China, France, Russian Federation, the United Kingdom, and the United States) and ten non-permanent members. Since it also includes members from Russia and China in the security council, its main setup is more general and points more directly towards democratic global governance even beyond capitalism's survival. Unfortunately, its main deficiency, which recently became only too visible, is that it lacks a strong military force to implement its decisions.

Schumpeter's disequilibrium approach during the age of finance capitalism, after WW1, evidently took hold of larger entities of *political economy*, namely of nation states. The concept "political economy" does not only cover *economic* entities like firms, which try make extra profits by innovations, economies of scale or unfriendly take-overs of competitors. There also always exists the possibility to use pure coercive power (political science is the science of power relations) to dispossess weaker entities. Larger political agents, like nation states, can fall back on this crude exertion of coercive power to acquire more territory and a larger capital stock. In short, they can choose to lead disequilibrating wars.²⁵ If due to ongoing oligopolisation only few large capitalist political entities are remaining (USA, China and Russia), then the emergence of local wars at their borderlines can be expected as far as the military elites inside each military-industrial complex are stronger than then the economically minded industry leaders. If the latter prevail, steps towards an organized global exploitation of the richly populated rest of the world, might be a solution without another world war.²⁶

These last ideas already show how the fruits of capitalism's historical mission might turn into a catastrophic end of this mission. Keynes stabilizing institutional framework typically has to grow to accommodate the growing reach of oligopolistic corporations. Institutionalized global governance is a precondition for the full blossoming of a global democracy, which can serve the goals of a surviving human species. Seen from this perspective, the development of Keynesian macroeconomic frameworks indeed is a step towards a mode of production that can overcome the impasse of the capitalist algorithm. Maybe the possible next step would be to turn

²⁴ For a clear description of *integrated capitalism* compare [25].

²⁵ In [21] the classical example of such a social step backwards – the takeover of Fascism in Germany in the 1930-ties – is described in more detail. The necessary and sufficient conditions for a fascist turn of capitalism have changed somewhat since then, but the underlying logic has survived to a frightening extent.

²⁶ Such a solution still is prone to develop into global racism: A governing elite of *superhumans* exploiting the currently powerless fourth global agent of workers living in the vassal states of the three leading empires.

useful privately owned global corporations like Amazon or Wikipedia into publicly owned units? In total, the interplay between Schumpeterian disequilibrium processes and Keynesian accommodation of capitalist growth by growing institutional frameworks was the source of the two highlights that capitalism gave to the development of mankind. Given the accelerating *dangers of environmental collapse*, these achievements can only endure if some of their basic characteristics are radically inverted. Schumpeter's force of disequilibrating innovation has to be redirected: Away from the search of maximum expected profit guided by the capitalist algorithm, and towards technology and products, which are compatible – but necessary – innovation possibilities its monetary evaluation system must be migrated towards a measurement system that follows the rules of democratic global governance.²⁷ The state of affairs that the Keynesian attempt to establish democratic survival of capitalism was meant to head for, is much more difficult to develop. Cum grano salis it is the quest for a democratic global governance framework. From an evolutionary perspective it is straight forward to assume that the democratic mechanisms, which will build its core should emerge out of the battle against the radical fascist tendencies, which capitalism in its death throes produces.²⁸

4. Toxic capitalism at the end of its mission

Capitalism has left its mark not only on the global production system it has produced. But the globalized production sphere is itself the clearest example of a hierarchical system that prevents the development of full-fledged democratic mechanisms. The decisions on what is produced, and where and at which price it is sold, today usually are made by *central* agents – humans, usually supported by electronic devices – applying the capitalist algorithm. An enormous apparatus of marketing machinery then is added to adjust demand – in particular in the rich North – to the needs of industry. As 19th century political economists would have argued: The owners of the means of production own the products and, in the sequel, have to sell them to whomever to transform products into money, which then can be used to increase their stock of means of production. In the end, it is the imperative of maximum capital accumulation – the command of the “dead labor” capital over the “living labor” of human individuals – that determines all economic and political details involved in this process. As in the case of oligopolisation its reach becomes global, there are ever fewer and larger firm agglomerations, hierarchical command necessarily becomes stronger. The corresponding political units, the nation states, also are concentrating. Today there are three capitalist hubs, China, USA and Russia, and a reservoir of potential vassal states, which could be considered as a pivotal fourth power center.²⁹ This is the global macroeconomic setting the human species currently is confronted with. Parallel to this crude picture of the evolution of the global macroeconomic state,

²⁷ See [26] for some ideas on a complex future world money.

²⁸ Though some revolutionaries involved in the Russian revolution did mistake the events of 1918 as the end of capitalism, the following seventy years of Stalinism showed clearly that Stalin's concept of “socialism in one country” was not a democracy enhancing project.

²⁹ The formation of the BRIC group is the attempt of Russia and China to give this fourth power center a *progressive* role, which they still can control.

capitalism also has transformed the way in which *human individuals experience themselves*. Individual experience always is local, the working of the globalized production system remains necessarily beyond the capacity of perception of a single human individual. In fact, this total alienation of the awareness of the material conditions of the existence of the human species – as a species – produces the individually growing illusion that a human individual is in essence the nucleus of a capitalist firm. Of course, the wannabe one-person firms are still stuck within their local environments, even if these environments in the last decades have been enlarged by electronic devices, electronic echo chambers. The indicators of pain and lust are still bound to their local cultures. The interplay of these indicators manifests itself in a *mood*, a mood that is amplified via communication as the mood of a local culture and mostly remains unrelated to, alienated from, its material basics. If global macro-dynamics happen to throw a local culture on a particularly dire material trajectory, then the ideological superstructure of such a local cultural community shows how vulnerable its alienated nature has made it. The *non-existence of universal humanism*, which would need a fulfilment of the aspirations of general enlightenment, will turn into a retrograde renaissance of religious leadership.³⁰ Or, if a local culture is technologically further developed, it may lead to the ascent of a local nationalist, even fascist, political dictator. The followers of such a strong leader then have to be quickly ideologically streamlined – a process, which needs a strictly supervised military command, a police state. The classical forerunner of this currently reviving scenario evidently has been Hitler's Nazi regime.

It can be expected that – with a somewhat less aspiring territorial reach and eventually mixed with religious traits – such processes soon will also be found in vassal states. Leaders of vassal states will have to be loyal followers to the leader of the respective super power, but they will also need a tough management of their subordinated gentry leaders, which must secure that the workers down the line do their jobs.³¹

It is evident that with the capitalist algorithm still being the central motivation for actions at all levels, from the core of an empire via high nobility vassals down to the lower gentry at the factory level, the approaching climate collapse cannot be prevented. In the short term some forms of neo-fascism in some vassal states might be able ascent to state power, and it even might be possible that a unifying absolute global authoritarian capitalism emerges, which carries features of neo-fascism. But history does not repeat itself, it only rhymes. Feudalism will not experience a second life. The last toxic phase of capitalism will be rather short, profits generated by robbery within a closed global system without continuing labor productivity increase, will vanish. After universal confusion resistance can quickly become overwhelming. The historical mission of capitalism will be over.

It is clear where the subject, the social class, carrying the resistance will be located: the so-called “Global South”, referring to the globally exploited new slaves. It is also clear that this part of the global population will need a *highly educated complementary class* – call it the *global class of organic intellectuals*³² – which is able to partly preserve and to transform the fruits of capitalism (high labor productivity and sophisticated institutional framework) into the ingredients

³⁰ This explains, why in particular in parts of the poor South religious belief, e.g. Islam, is surging.

³² Yanis Varoufakis has a point, when he calls this new development “technofeudalism” [27]. It is indeed a return to power structures known from feudalism. See also [28].

³² Compare [13].

necessary to build the **central nervous system** of **democratic global governance of the whole human species**.

5. Lessons for the Survival of the Human Species

Five hundred years of capitalism have been a long way to teach mankind a long series of lessons. In particular, the 20th century saw two World Wars: The first marking the end of political leadership of the feudal class and simultaneous blossoming of nationalism within Europe; the second showing how with collapsing financial capitalism nationalism turns into the catastrophe of fascism with its imperialist aspirations. From 1945 onwards a long period of the hegemony of the USA in the West, embedded in a mainly bipolar world order saw the emergence of the nucleus of a *global* institutional framework. It still was a mode of production built on capitalist exploitation, though it has transformed a major part of the extraction of surplus value to the global exchange rate mechanisms.

The step towards a global production system has not been followed by an accompanying turn towards global governance. The acquisition of the surplus value mainly remains in the hands of one of the three superpowers (China, USA, and Russia). What is next on the agenda of the evolution of the human species thus is to advance to a **Global Atlantis**, to a self-governing entity of human political economy. Contrary to Thomas More's vision in 1,516 this time not as an imagination with no place in reality – Utopia – but this time as the next step of the human species.

Europe, the peninsular military outpost of the USA, served mainly as important demand component to transform material and service surplus into monetary profit. To enable this function a sophisticated credit system built on household, firm and government debts had been established. In the shadow of this “welfare” evolution the *European Social Model*, a blueprint for an institutional framework promising soft exploitation without escalating class struggles, has been established. Keynes' dream of a capitalism tamed by institutionalized compromises seemed to emerge. As John Roemer, a leading proponent of mathematically oriented Marxism [5, 6], as well as more recently Daron Acemoglu, the figurehead that tries to bring back institutionalism to mainstream economics, seem to assert, this European Social Model was the most of class compromise that so far was possible under a still capitalist regime [7]. But from 2000 onwards, starting with the rise of Putin in Russia and continued by the election of Trump in the USA in 2016, a new type of nationalist surge became visible in global politics. It reminded on a question that had been posed many years earlier.

“Is socialism in one country possible?”, was an intensively debated issue in the early years of the Soviet Union. Stalin's answer was a clear “*yes*”, which sharply contradicted the view of Karl Marx, the poster boy of Marxism-Leninism, which Lenin and Stalin always used to justify their bolshevist strategies. At the same time a parallel question popped up in the West: “How is capitalism possible in one country?”. The new hegemon, the USA, together with a Europe devastated by the war, was confronted with the Great Depression – a signal that financial capitalism does lead to global crisis. Hitler's answer to the question also was radical:

Yes, the capitalism of national industrialists is possible if it is supported by a hierarchically organized military police state! Instead of household-demand-oriented market processes a warfare-oriented command economy aiming on the conquest of global dominance has to be envisaged. Despite the many differences between Stalinism and Fascism, the common denominator of over boarding nationalism cannot be ignored. What is frightening is that the question of nationalism, including the answers of possible military dictatorship, nowadays is on the agenda again. History rhymes.

Even if a compromise between the ruling classes of the three national superpowers becomes feasible during the coming decade, the deeper question if capitalism can overcome the limits set by natural finiteness (compare the opening paragraphs), remains. Will absolute global authoritarian capitalism (labelled “AGA capitalism” in [8]) be able to handle the accelerating climate catastrophe? Its authoritarian as well as its global character might be helpful, but its *absolute* motivational reliance on the capitalist algorithm – aligning everything on all decision levels according to short-term profit maximization – assures complete failure with respect to environmental sustainability of the human species. As an example, consider one of the most remarkable properties of capital, its high mobility, its fluidity: When class struggles in advanced countries started to become nasty, capital could escape to exploitation on a global level, “Rich North” exploits “Poor South”. But now the exploitable terrain is all taken, finiteness strikes. The capitalist algorithm does not work anymore, its promoters become visible enemies of humanities survival.³³

It might be the case that this visibility is undermined by the growing possibilities of mass media manipulation, in particular in the Rich North. The confusion of alienated populations, of people who indeed are threatened to lose part of their welfare to the Poor South, might turn great enough to seduce them to support fascist leaders. In this respect Europe again – sadly – will be an experimental laboratory: Europe’s nationalist right-wing movements so far have not achieved to combine into a unique successful party able to govern. Which nationalist leader should be the ultimate leader still is a fierce competitive process. For the logical candidate, for US president Donald Trump, Europe so far is only a side issue on his way to global supremacy. And mass manipulation in all of Europe is more difficult than in the USA due to the many different languages, which still are the basis of communication (and the individuals’ thoughts) in Europe.

The deeper question hidden by this critique of the capitalist algorithm is, if the latter somehow is inscribed in the human DNA. Is there indeed an alternative to the capitalist algorithm at all? The most prominent supporter of the speculation that there is no alternative is biologist Richard Dawkins³⁴ [9]. If he is correct, then all efforts to overcome capitalism are obsolete; mankind then will

³³ The substitutes for the money-based maximization imperative of the capitalist algorithm will have to be diverse, adaptive flexible responses to quantitative limits encountered the earth’s environment. It is only the second step to embed them in the monetary framework of global governance, which still will be necessary to maintain *commodity* production, i.e. global division of labor. In this context it has to be noted that the often-misused term “market economy” is *not* a synonym of “capitalism”. The *diversity* of market *mechanisms*, which are needed to distribute commodities in any production system with global division of labor are to be distinguished from the capitalist algorithm. For a mathematical treatment compare [29].

³⁴ Apart from this speculation, Dawkins is a staunch representative of atheism condemning all forms of mysticism and religion.

vanish rather soon due to its inborn “capitalist” property. But as long as this is just a speculation, it makes sense that scientists work on all the mechanisms that could help to maintain the survival of the human species for a world after capitalism – for a possible global Atlantis.

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What is capitalism? This book attempts to sketch some important answers to this question. The chapters combine insights into the historical development of capitalism with the analytical advances and insights it enabled. The impasse into which absolute global authoritarian capitalism currently seems to be running is analyzed from several perspectives. The major obstacle, which capitalism in its latest form probably will not be able to master, is identified as the rapidly approaching environmental collapse, combined with multiple local wars and general economic downturn. Nevertheless, the book ends on an optimistic note: the human species, in principle, can secure its survival. 500 years of capitalism were also 500 years of scientific development. We do already have most of the tools we need. What is missing is a new form of social organization, a framework of social institutions for self-governance; in short, global democracy. This is a book on capitalism, but it also points beyond capitalism, as the apparent shortcomings of this mode of production threaten the survival of the human species.

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