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Technological Solutions to Hayek's Knowledge Problem
Project Cybersyn

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Zusammenfassung

Diese Arbeit bewertet das Projekt Cybersyn als Lösung für Friedrich Hayeks Wissensproblem. Das Projekt Cybersyn war ein kybernetisches Computersystem, das vom britischen Kybernetiker Stafford Beer zur Organisation der chilenischen Wirtschaft entworfen und gebaut wurde. Das System basierte auf kybernetischen Prinzipien, um die Produktion unabhängig von einem Wettbewerbsmarkt und ohne Rücksicht auf ein Preissystem zu organisieren und zu koordinieren. Das Projekt Cybersyn stellt eine direkte Herausforderung für Hayeks Wissensproblem dar, demzufolge Preise, die auf Wettbewerbsmärkten gebildet werden, die einzige Möglichkeit sind, die Wirtschaft effektiv zu koordinieren. Die Grundlage für Hayeks Formulierung des Wissensproblems liegt in seiner Epistemologie der freien Marktpreise und ihrer Macht, wirtschaftliche Aktivitäten zu koordinieren. Die Arbeit beginnt mit der Einbettung des Wissensproblems in den Kontext von Hayeks Epistemologie und sozialer Ontologie. Indem ich Hayeks Gedanken auf eine grundlegendere Ebene heruntergebrochen habe, habe ich allgemeine Kriterien zur Lösung des Wissensproblems entwickelt. Dieses allgemeine Kriterium betont die Fähigkeit einer Volkswirtschaft, die Koordination zu replizieren, die Hayek zufolge (nur/ just?) der Markt hervorbringen kann. Diese Kriterien werden dann verwendet, um das Projekt Cybersyn als Lösung zu bewerten. Aufgrund der begrenzten Implementierung des Projekts Cybersyn wird die Bewertung hauptsächlich theoretischer Natur sein. Das Produkt dieser Arbeit sind allgemeine Kriterien zur Lösung des Wissensproblems und eine Fallstudie, in der diese Kriterien auf das Projekt Cybersyn angewendet werden.

Abstract

This thesis evaluates Project Cybersyn as a solution to Frederich Hayek's knowledge problem. Project Cybersyn was a cybernetic computer system designed and built by British Cybernetician Stafford Beer to organize the Chilean economy. The system relied on cybernetic principles to organize and coordinate production independently of a competitive market and without concern for a price system. Project Cybersyn represents a direct challenge to Hayek's knowledge problem, which claimed that prices formed within competitive markets are the only way to effectively coordinate the economy. The basis for Hayek's formulation of the knowledge problem lies within his epistemology of free market prices and their emergent power to coordinate economic activity. The thesis will begin by framing the knowledge problem in the context of Hayek's epistemology and social ontology. By breaking down Hayek's thoughts to a more basic level, I developed general criteria for solving the knowledge problem. This general criterion emphasizes an economy's ability to replicate the emergent coordination that

Hayek believes the market can produce. These criteria are then used to evaluate Project Cybersyn as a solution. Due to Project Cybersyn's limited implementation, the evaluation will be primarily theoretical. The product of this thesis is a general set of criteria for solving the knowledge problem and a case study applying these criteria to Project Cybersyn.

1 Introduction

This thesis analyzes the philosophy of Frederich Hayek in selected works to develop broader criteria for potential solutions to his knowledge problem. Briefly, the idea that local knowledge and rapid decision making is essential to the economy and that the free market and its price system is best suited to allowing this activity. The criterion developed for the knowledge problem is then applied to the specific case of the cybernetic socialist economic planning mechanism known as Project Cybersyn. Developed in Chile by British cybernetician Stafford Beer, Project Cybersyn was an early experiment in non-market economic planning. Despite the project's limited implementation, I maintain that applying criteria for a theoretical economic system is sufficient to show that such a system could potentially solve the knowledge problem. The first chapter of the thesis begins by deconstructing Hayek's epistemology and social ontology in *The Use of Knowledge in Society* and related works. The chapter's primary intervention is to graft the cybernetic concept of "performative epistemology" onto Hayek's understanding of tacit knowledge. These epistemological concepts lie at the heart of both Beer's and Hayek's social ontologies, as both Beer and Hayek believed that society is composed of individuals whose free actions produce emergent coordination. This chapter avoids any direct mention of Beer or Project Cybersyn as the aim is not yet to draw a comparison but to develop a new understanding of Hayek's epistemology and social ontology.

The second chapter explains the knowledge problem and the criteria needed to solve it. Hayek would have never submitted to the fact that a socialist economic organization could ever feasibly solve the knowledge problem. *The Use of Knowledge in Society* is, in many ways, a political diatribe against hubristic socialist economists who thought they could find a rational solution to a problem Hayek believed only the free market could solve. Unfortunately for Hayek, his work is rich enough to allow multiple readings. Having already deconstructed his arguments to their lowest epistemological and ontological levels, we can begin to build a set of criteria. This criterion is extrapolated to its broadest form, including the normative values of individual freedom, social coordination, and other positive aspects mentioned in *The Use of Knowledge in Society*. The chapter draws heavily on the epistemic and ontological ideas found in the first chapter. General criteria for the knowledge problem are one of the primary products of this thesis. The chapter then continues with an evaluation of potential alternatives using the criteria to demonstrate its use. Finally, Chapter Two concludes with a description of Hayek's broader theories on spontaneous order and how they relate to the free market and the knowledge problem.

Chapter Three introduces Stafford Beer, Chilean socialism, and Project Cybersyn. I deconstruct these systems of thought without much reference to Hayek or the knowledge problem. Though the parallels are abundantly obvious, these different projects and systems of thought are analyzed on their own terms. This chapter builds the necessary context needed to interpret and effectively understand the evaluation of Chapter Four. The last chapter answers the

question: Could Project Cybersyn have successfully solved the knowledge problem? Given its deep relationship with Chilean socialism, Project Cybersyn is evaluated alongside Chilean socialism. Project Cybersyn would have never existed without the support of the Chilean government, but the two had different ideologies and visions for social coordination. Evaluating them independently of one another yields different results for their ability to solve the knowledge problem. The thesis then concludes by evaluating the state of the calculation debate and looking at ways to overcome the language of the knowledge problem.

This thesis aims to demonstrate that prices determined by the free market are not the only mechanism for social coordination. Hayek could have accepted Project Cybersyn as an alternate solution to his knowledge problem. Despite the absence of prices, Project Cybersyn fulfills both the positive and normative criteria for social coordination. What holds Hayek back from accepting alternate economic organizations is his disdain for intentionally designed social systems. This thesis attempts to conform to Hayek's philosophy in every respect except for this one. Hayek's notion that rationally designed social or economic systems are inferior is mistaken and based on the ethically fraught conception of societal Darwinism. By adhering to a theory of the spontaneous evolution of social order, Hayek dismissed the potential for intelligently designed systems to achieve similar or superior outcomes. He thereby overlooked the ethical and practical benefits of intentional social planning. This thesis argues that with the right principles, purposefully crafted systems like Project Cybersyn can address the same challenges of information and coordination that Hayek deemed insurmountable without market mechanisms. In doing so, it seeks to reconcile Hayek's insights on knowledge and coordination with a more inclusive approach to economic organization that embraces non-market solutions.

2 Epistemic and Ontological Emergence in Hayekian Thought

Frederich Hayek's belief in the emergent power of free market prices to coordinate society underpins his challenge to socialist economics, known as the knowledge problem. Hayek's knowledge problem was a variation on the longstanding calculation debate that suggested that local knowledge (tacit knowledge) can not be meaningfully appropriated by central planners, and thus, rational central planning is not possible. He believed that one of the primary advantages of the free market is its price system, which acts to quickly and succinctly communicate relevant (local) information to market participants (individuals and firms), allowing them to rapidly adjust their plans to achieve social coordination or compatibility of individuals' plans with one another.¹ This chapter analyzes how individuals in a market achieve social coordination through the price system. In the first section, I examine Hayek's epistemology and identify social coordination in the economy as dependent on an emergent social intelligence, which in turn is based on individuals' tacit knowledge, knowledge of a shared valuation structure, and knowledge of prices. In section two, I retrace Paul Lewis' analysis of ontological emergence in Hayek's thought. Lewis identifies the social ontological elements of Hayek's model as the individual, the market structure, and the price mechanism. I then map Lewis' ontological emergence in Hayek onto my own epistemological emergence to create a more complete philosophy of Hayekian social coordination. I argue that Andrew Pickering's concept of performative epistemology unites the epistemic and ontological frameworks, which are inseparable. Individuals holding and freely acting on tacit, inexpressible knowledge form the base of Hayekian emergence, giving rise to social coordination.

2.1 Epistemology of Social Coordination

In this section, I analyze the epistemological foundations of the coordinative power of free market prices in Hayek's model of the economy. This will require unifying three ideas of knowledge: tacit knowledge, shared valuations, and prices. Hayek himself unites all these ideas in *The Use of Knowledge in Society*, stating: "Fundamentally, in a system in which the knowledge of the relevant facts is dispersed among many people, prices can act to coordinate the separate actions of different people in the same way as subjective values help the individual to coordinate the parts of his plan."² What is missing from this quote is an explicit reference to tacit knowledge. I argue that Hayek's references to dispersed knowledge of relevant facts are references to his belief in the essentially dispersed nature of tacit knowledge. In light of

1. Hayek, „The Use of Knowledge in Society“, 528.

2. Ibid, 524.

this interpretation, I further argue that knowledge of a shared value framework is crucial for how individuals form their plans. Finally, I combine these aspects of Hayek's model to paint a fuller epistemic picture of Hayek's price system. I show that the actions of individuals with tacit knowledge and knowledge of a shared value framework produce price changes that communicate relevant information to other individuals, thereby allowing for social coordination.

2.1.1 Tacit Knowledge

The term knowledge is often unclear and contradictory throughout Hayek's work. A reading of *The Use of Knowledge in Society* can produce one interpretation, a reading of *Economics and Knowledge* a slightly different one, and a reading of *The Sensory Order* will produce still another.³ Here, I rely primarily on Hayek's use of the term before he changed his views on the term in the 1950s.⁴ In *The Use of Knowledge in Society*, Hayek states that individuals have private knowledge about people, local conditions, and special circumstances.⁵ Peter Boettke and Kyle O'Donnell take this to mean "knowledge of the objective facts about the 'things' being priced —facts such as the uses of, or substitutes for, these things."⁶ This interpretation frames the knowledge problem as a problem of dispersed rather than tacit knowledge. Others, such as Fuat Oğuz, similarly suggest that the knowledge Hayek refers to in *The Use of Knowledge in Society* is essentially codifiable and not tacit.⁷ I disagree with this interpretation and argue in favor of alternate interpretations that suggest that knowledge in *The Use of Knowledge in Society* refers to essentially tacit knowledge, which I define as an active, contextually dependent, tacit understanding of how to best utilize the factors of production. While the concept of tacit knowledge did not exist in 1945 when *The Use of Knowledge in Society* was published, Hayek quickly adopted the term when Micheal Polanyi later coined it.⁸ Interpreting Hayek as referring to tacit knowledge instead of dispersed knowledge changes completely how one interprets Hayek's economic model and understanding of the knowledge problem.

A literal reading of Hayek's work will promote an interpretation of non-tacit knowledge and the knowledge problem as a "problem of the utilization of knowledge not given to anyone in its totality."⁹ However, an interpretation privileging dispersed traditional knowledge over essentially tacit knowledge runs into problems when considering other passages in *The Use of Knowledge in Society*. Hayek implicitly references tacit knowledge throughout the text by describing local conditions as a form of inexpressible knowledge. In one section, Hayek gives examples of arbitrageurs and estate agents who hold "knowledge of facilities of communication or transport" and uniquely know how to take advantage of this knowledge.¹⁰ One might argue that these circumstances could theoretically be expressed in some kind of representation. However, this interpretation makes little sense in the broader context of *The Use of Knowledge*

3. Friedman, 281.

4. Oğuz, „Hayek on tacit knowledge“ 144.

5. Hayek, „The Use of Knowledge in Society“, 522.

6. Boettke und O'Donnell, „The Failed Appropriation of F. A. Hayek by Formalist Economics“, 308.

7. Oğuz, „Hayek on tacit knowledge“153.

8. Oğuz, 150.

9. Hayek, 520.

10. Ibid, 525.

in *Society*. Hayek believed that central planners cannot capture or use the knowledge that he refers to. He states, “The sort of knowledge with which I have been concerned is knowledge of the kind which by its nature cannot enter into statistics and therefore cannot be conveyed to any central authority in statistical form.”¹¹ The only limitation to central planning would be data collection if knowledge were traditional and dispersed rather than essentially tacit and therefore dispersed, but this is not how Hayek sees the issue. Hayek believes that no data collection should be able to capture the knowledge of the “man on the spot.” He says further: “It follows from this that central planning based on statistical information by its nature cannot take direct account of these circumstances of time and place and that the central planner will have to find some way or other in which the decisions depending on them can be left to the man on the spot.”¹² The dispersed nature of knowledge is an important aspect in *The Use of Knowledge in Society*; but Hayek believes that knowledge is dispersed only because it is the tacit knowledge of the man on the spot.

Micheal Polyani defined the term tacit knowledge much later than Hayek hinted at it in *The Use of Knowledge in Society*. Polyani describes it as a phenomenon where ‘we can know more than we can tell.’¹³ Hayek was later influenced by this definition, but in 1945, it describes well what he refers to in *The Use of Knowledge in Society*. There, Hayek uses phrases like “knowledge of particular circumstances of time and place” and “intimate knowledge of the facts of his immediate surroundings.”¹⁴ We might call this an intuitive ability or an active and tacit knowledge about when, where, and how to utilize the factors of production in a particular context. Hayek scholars writing on the subject of tacit knowledge often emphasize this know-how or ability aspect of tacit knowledge.¹⁵ Hayek stresses that this ability is used primarily in cases of “rapid adaptation”. In *The Use of Knowledge in Society*, Hayek says: “...the economic problem of society is mainly one of rapid adaptation to changes in the particular circumstances of time and place...”¹⁶ Traditional forms of representable knowledge, such as statistics, models, or written descriptions, also exist in Hayek’s model of the economy. These forms of knowledge are how people make long-term plans, but Hayek is less concerned with this knowledge as it is easily assimilated into the central planner’s plan. Hayek sought to emphasize the rapid decisions made using tacit knowledge to a status on par with long-term decisions. He believed both decisions are equally necessary to facilitate social coordination. The unique epistemology of tacit knowledge is worth exploring as it offers insight into how the knowledge problem is solved in the Hayekian framework.

Knowing its use in rapid decision-making, we can begin to understand the epistemology of tacit knowledge by looking at the classic economic fable of Robinson Crusoe. Crusoe and his companion, Friday, each hold different knowledge about the items found on their island. Crusoe knows that coconut fiber can be used to make twine needed to catch fish on his side of the island. If he believes the conditions for fishing are poor, he will not gather and utilize coconuts. Crusoe’s tacit knowledge is his ability to identify how, when, and where to utilize the

11. Ibid, 524.

12. Ibid.

13. Polanyi und Sen, *The tacit dimension*, 14.

14. Hayek, „The Use of Knowledge in Society“, 525.

15. Oğuz, „Hayek on tacit knowledge“ 155.

16. Ibid.

factors of production(coconuts). Crusoe's knowledge of coconuts is tacit; therefore, it cannot be meaningfully articulated to Friday. Friday might wish to develop the same fishing ability as Crusoe; to do so, he must learn and develop his own know-how and tacit knowledge. He must experience Crusoe's context and develop the active ability to detect the conditions that will allow him to utilize the factors of production effectively. Tacit knowledge has an epistemology of anti-representation. It is concerned with rapid sub-conscious processes that avoid direct analysis or representation.

In many ways, this is an epistemology of reaction. Hayek's primary objective in *The Use of Knowledge in Society* is to suggest a type of knowledge that a central planner cannot use. If Crusoe's knowledge could be represented in some qualitative form, say, a text, a map, diagrams, or symbols, it could still be used by a central planner to guide planning. Therefore, the tacit knowledge of the man on the spot can not be represented either quantitatively or qualitatively. A consequence of this is the importance of mental states for coordinating society, an importance that Hayek recognized and what partly drove him to write his book *The Sensory Order*.¹⁷ With this importance in mind, tacit knowledge can be defined as an active and tacit understanding of the means of production that exist in relation to a particular context. It is knowledge meant to be directly and rapidly applied to a specific situation based on an individual's unique mental state and understanding. The rapid use of tacit knowledge is something Hayek believes is essential to the functioning of social coordination and, further, something that he believes is only allowed by the decentralized free market.

The epistemology of Hayekian tacit knowledge is similar to Andrew Pickering's definition of performative epistemology. Performative epistemology is "a vision of knowledge as part of performance rather than as an external controller of it." The term performance is best understood through the example that Pickering offers:

...imagine a highly sophisticated thermostat that integrated sensor readings to form a representation of the thermal environment and then transmitted instructions to the heating system based upon computational transformations of that representation. But my thermostat at home does no such thing. It simply reacts directly and performatively to its own ambient temperature, turning the heat down if the temperature goes up and vice versa.

This epistemology concerns "performance as performance, not as a pale shadow of representation."¹⁸ It is an epistemology of anti-representation. Tacit knowledge's active, contextually dependent, and tacit nature is nearly identical to a description of performative epistemology, especially when we know its application is in circumstances that necessitate rapid decisions. Hayek's rapid decisions are the manifestation of a performative epistemology. The ability to make rapid decisions using tacit knowledge is nearly identical to Pickering's notion of performance and performative epistemology.

To illustrate the symmetry between tacit knowledge and performative epistemology, we return to Crusoe and Friday. A flick of intuition or a reminder of a past experience constitutes Crusoe's tacit knowledge of coconuts. Like a thermostat, Crusoe reacts rapidly and instinctively to the conditions that allow the best use of coconuts. Crusoe will recognize that he should

17. Oliva, *The Road to Servomechanisms*, 23-25.

18. Pickering, *The Cybernetic Brain*, 21.

gather or trade for coconuts if there is an abundance of fish at that instant. His knowledge of coconuts exists to be utilized, to be acted upon. It is knowledge directly geared towards performance, knowledge that can never be feasibly put into a representation or used by a central planner. His tacit knowledge is often combined with traditional or representable knowledge, but distinguishing where tacit knowledge stops and traditional knowledge begins is difficult or near impossible. His tacit knowledge cannot be extracted and otherwise used. The results of Crusoe's behavior can be measured, but these measurements cannot capture the unique mental state that led Crusoe to act and make decisions. These decisions are the manifestation of a performative epistemology within an individual's decision-making process.

Hayek's emphasis on short-term decisions based on tacit knowledge is an argument that these in-the-moment decisions made by the 'man on the spot' are as critical for coordination as long-term industrial planning. An economy must allow for both types of decisions. The price system exists to register the effects of these decisions on the scarcity of a commodity. Changes in relative prices are communicated quickly to all individuals, like a telecommunications system that allows everyone to receive a numerical representation of scarcity.¹⁹ Using this information, individuals can react either performatively to make rapid, short-term decisions or non-performatively to make long-term decisions. This leads to a circular process where decisions that change prices are made in response to price changes. Social coordination in the market is a process of action and reaction that drive one another toward a final state of equilibrium that is never quite reached. The beauty of the price system is that the decisions and actions that caused an initial price change are irrelevant to an individual's ability to achieve social coordination. However, Hayek did not think that prices alone were enough information to coordinate society. To act effectively on price information, individuals need their own tacit (and non-tacit knowledge) as well as an additional piece of social knowledge, which can be called a shared valuation framework.

2.1.2 Shared Valuation Framework

A shared value framework is a commonly understood standard that allows individuals to rapidly judge the effectiveness of their own actions as well as to interpret the actions of other individuals and firms. These two properties of the shared value framework reflect short-term and long-term decision-making. In the short term, individuals rapidly judge the effectiveness of their own actions, while in the long term, they seek to interpret the actions of individuals and firms; however, the two can often intermingle. The shared valuation framework of the market is one of profit. This allows individuals to understand what they should be doing as well as to interpret the relationship between a price change and the actions that caused a price to change. Hayek's tin example provides evidence that he believed individuals should have a profit-based shared valuation framework when interacting with the market. He states: 'All that the users of tin need to know is that some of the tin they used to consume is now more profitably employed elsewhere and that, in consequence, they must economize tin.'²⁰ This passage suggests that individuals have more than just their tacit/non-tacit knowledge and knowledge of

19. Hayek, „The Use of Knowledge in Society“, 525.

20. Hayek, 524.

prices; it suggests that they know that firms value profit and that price changes reflect actions that maximize a firm's profit. The most clear evidence, however, is in his essay *Competition as Discovery Procedure*, where he states that: "The most important function of prices, however, is that they tell us what we should accomplish, not how much." Profit constitutes the market's shared value framework, just as survival is the shared value framework for Crusoe and Friday. All actors in a given environment know this shared valuation framework, which allows them to understand what they should pursue and the actions of others in relation to the same shared valuation.

The shared value framework is critical for individuals to make rapid and long-term decisions in an effective manner. As Hayek says, the main economic problem for society is rapid adaptation. But adaptation for what? Like the thermostat, individuals must adapt with a purpose; in the market, this purpose is to increase profit. In cases of short-term decisions, individuals use the shared value framework to react performatively to price changes. The estate agent or arbitrageur uses their tacit knowledge, specific to their time, place, and conditions, to make a rapid decision to increase profit for themselves or their firms. When this decision is based on false knowledge, the individual will understand this by losing money and having themselves or their business go bankrupt. In the long term, individuals can take a more interpretive approach and try to understand the hints of knowledge behind price changes. If all market participants make decisions based on knowledge related to profit maximization, then it is possible to interpret price changes as hints of this knowledge. A firm acting in the long term might try to interpret price changes as a reflection of profit-maximizing behavior based on some kind of knowledge. Hayek seems to suggest that firms react strategically in the tin example as they interpret the increase in the price of tin as related to profit maximization elsewhere in the world. Market participants can adapt to price changes either performatively or strategically. Using tacit knowledge, individuals can instantly adapt to price changes and take advantage of their given surroundings. Alternatively, they can rely on traditional knowledge or even a mixture of traditional and tacit knowledge to interpret price changes as hints of knowledge. In this way, a shared value framework is a form of knowledge that ensures individuals and firms use price information to properly interpret the actions of others and gauge the effectiveness of their own actions.

Recently, many works have been published on shared value frameworks under different headings. Notably, Soren Mau's work on Marx's use of the phrase "mute compulsion" has received wide attention. The mute compulsion of capitalism is "an impersonal and abstract form of domination which is immediately embedded *in* the economic processes themselves rather than tacked onto them in an external manner." The compulsion dominates across and among class lines through social relations and a set of dynamics. It dominates across class lines through the domination of the proletarian class by the capitalist class and among class lines through impersonal market forces. Contrary to Hayek, Mau argues that the market does not transmit information but the commands of capital.²¹ The concept of a shared value framework captures a similar idea in that individuals understand only through market forces that they should pursue profit. This idea is widely understood without ever having to be articulated. In their article *Cyber-Physical Decentralized Planning for Communizing*, Pedro Nardelli et al.

21. Mau, „The Mute Compulsion of Economic Relations“, 8-14.

use the term social-force field, which again captures the way in which we are compelled by the structures of the economy to act in ways we might otherwise not.²² Mute compulsion, social-force field, and shared value framework capture the idea of impersonal economic coercion toward a specific end. In *Competition as Discovery Procedure*, Hayek explicitly states that “competition represents a kind of impersonal coercion” and further that “all members of such a genuine economy must serve the uniform hierarchy of objectives in all their actions.”²³ But while concepts like mute compulsion and social-force field emphasize the external, almost unconscious pressures exerted by economic structures, the shared value framework points to the internalized understanding of these pressures. It underscores that individuals not only feel compelled to act in certain ways by the market forces but also consciously interpret these actions within a specific value system, profit in this case.

To better understand how a shared valuation framework constitutes a form of knowledge for individuals and how this framework helps facilitate social coordination, we can return to the example of Crusoe and Friday. When Crusoe and Friday wish to exchange goods, they will do so based on their subjective valuations of goods. Stranded on a resource barren island Crusoe and Friday have a shared value framework of survival. During their exchanges, the relative abilities of items to help Crusoe or Friday survive (the item’s subjective values) are represented in a ratio of goods. Crusoe knows under which conditions he should utilize coconuts to help him survive. He interprets an abundance of fish as a sign that he should now gather large amounts of coconuts to make coconut fiber fish nets. When Crusoe sets his price as 1 banana for 3 coconuts, he indicates the consequences of his actions for the scarcity of coconuts (as he has gathered coconuts) and hints at the knowledge (his tacit knowledge to use coconuts for survival) used to decide on those actions. Friday utilizes his knowledge of Crusoe’s prices and immediately adjusts his expectations about the availability of coconuts and how he can best achieve his goal of survival. He is not sure what exact knowledge led Crusoe to value coconuts, but because they share a valuation framework, he knows that Crusoe must be able to use coconuts to help him survive. Friday brings knowledge of this shared valuation framework to every exchange with Crusoe. In the long term, this framework lets Friday reflect and interpret price changes as reflections of actions based on knowledge related to survival. The shared valuation framework ensures that items are priced based on a common goal. This does not mean that individuals all share the same goals; it merely suggests that firms, the price setters in the market, share the same goal in any given market transaction.

Relations in a free market economy can help further our understanding of how a shared valuation framework helps individuals interpret price changes in the long term and adapt rapidly to price changes in the immediate short term. In the market, firms set prices to maximize profit. Setting the correct profit-maximizing price is a complicated process that can often be traced from the corporate price setter down to the man on the spot. For example, look at a large agricultural firm setting prices for the bananas it harvests. Suppose the overseer of the banana plantation notices a sickness among the laborers and, based on some kind of tacit knowledge, makes a rapid decision to inform corporate price setters that this sickness will be costly. While the overseer can articulate the consequences of what he observes, he cannot articulate or repre-

22. Nardelli u. a., „Cyber-Physical Decentralized Planning For Communizing“, 6.

23. Snow und Hayek, Frederick, „Competition as a Discovery Procedure“, 19.

sent the tacit knowledge that allowed him to make such an assessment. This is tacit knowledge of how, when, and where to use a factor of production (labor) to best produce bananas. Corporate price setters, with the shared value framework of profit, have made a rapid decision to raise the price of bananas. The shared value framework then allows market participants to understand that this price change reflects actions taken to increase profit in the face of scarcity. Firms relying on bananas might react instantaneously to purchase from a competitor or might make a long-term decision to substitute for plantains based on suspicion of long-term scarcity. Whether on Crusoe's Island or the mass market of industrialized society, shared valuation frameworks determine how individuals react to and interpret price changes, which helps them quickly and effectively adapt their own plans.

2.1.3 Prices

Adam Smith claimed that the market acts as an invisible hand guiding us towards goals that have positive unintended consequences for the rest of society.²⁴ For Hayek, the key positive unintended consequence of the market is constant decentralized striving towards social coordination. Free market prices are the engine of the market that moves the economy towards a state of coordination by communicating the consequences of actions for the scarcity of goods.²⁵ Market participants can perpetually approach a state of general economic equilibrium by pursuing certain plans (driven by a shared value framework) and adapting them when needed to price changes. Hayek, similar to Smith, believes that through its power of communication, the price system produces a decentralized social intelligence greater than the intelligence possessed by market participants alone.²⁶ This is a kind of epistemic emergence where a totality of people strives towards coordination, but no single individual consciously understands social coordination as their primary goal. It is a social intelligence incomprehensible to individuals but nonetheless exists in the efficacious economic actions of individuals driven by a shared value framework. This social intelligence is also necessary for Hayek since he believes it is impossible to completely comprehend the tacit and non-tacit knowledge needed to rationally coordinate the economy. Through the communication of a minimal amount of knowledge in the form of prices, individuals are able to adapt their plans rapidly and imperfectly coordinate society. This section will explain how competitively formed prices communicate the needed information to guide the social totality toward coordination.

The ability of prices to communicate accurate knowledge to individuals is implicit and only determined through the discovery procedure of the market that Hayek calls competition.²⁷ Consumers take it as a given that firms set high prices for things that must necessarily be valuable and low prices for things that are not valuable. Given the shared value framework of the market, this is a natural assumption. However, this assumption is often mistaken; when it is, consumers and firms undertake a process of trial and error.²⁸ Consumers will assume the higher price of a tin water bottle is a sign of the quality of a naturally scarce material. They

24. Smith, *The Wealth of Nations*, 91.

25. Lewis, 1176.

26. Sciabarra, *Marx, Hayek, and Utopia*, 94.

27. Snow und Hayek, Frederick, „Competition as a Discovery Procedure“, 10.

28. Friedman, 290.

assume the firm must acquire this material at a high cost and decide that the most profitable use of it is to make in water bottles. When unsatisfied with the quality of the tin water bottle, consumers adjust their preferences, and the firm either lowers the price or goes bankrupt. While firms set prices, they do not set them on their terms. Consumer sovereignty is a key aspect of Austrian Economics, and Hayek does not neglect it.²⁹ Consumer tastes are the plans in society that require coordination as consumption, after all, is the reason the economy exists. Giving individuals what they want in a cheaper, better, or more efficient manner is the essence of competition, and the ability to meet consumer demand is the most important aspect of social coordination.

The discovery procedure of market competition is both the vehicle for constant rapid adaptation (which creates and allows for free responses to changes in relative prices) and the embodiment of social intelligence. Through market competition, participants discover facts about the accuracy of prices and the broader world around them. Within the shared value framework, they can understand what they should produce to help bring about coordination. This is social intelligence in action; the communication of information through market prices allows individuals to understand scarcity and demand. An individual uses his tacit knowledge of iron mining and metallurgy and decides to start a business to produce cheaper iron water bottles. They do this out of a desire to fill a gap in consumer demand and to pursue profit, not to pursue social coordination. Other market participants reliant on iron only need to know that a subsequent increase in iron prices is the consequence of an action taken to increase profits. These market participants adapt their own plans performatively or strategically to help them maximize profit. Potentially, they discover new ways of making their products to maximize profit, and the cycle of discovery procedure through competition and striving towards social coordination continues.

Hayek uses the Greek word *catalaxy* (meaning exchange or reconcile) to describe this phenomenon.³⁰ In contrast to Aristotle's definition of economics as household (*oikos*) management, *catalaxy* captures economic order through prices and exchange. Social organization is an order that can be managed by an individual but can only emerge through strictly decentralized group intelligence driven by communication and interpretation of prices. This is essential to Hayek's primary suggestion in *The Use of Knowledge in Society*, which is that the economy can not run on long-term decisions alone.³¹ Short-term decisions or intuitive actions with their performative epistemology exist to complicate a clockwork model of the economy conceived of by central planners. At most, we receive hints of the knowledge that drove the actions that caused prices to shift. The knowledge compressed into a price cannot be decompressed. The nature of the social intelligence of the market does not allow us to peer behind the curtain of prices. Aristotle's household management definition suggests to Hayek that rational planning long-term plans can exist as a separate economy, but to Hayek, the social coordination produced by the market is not the result of an economy it is simply the nature of market interactions.

In this section, I deconstructed Hayek's epistemic understanding of the economy. Consu-

29. Persky, „Consumer Sovereignty and the Discipline of the Market“, 13.

30. Snow und Hayek, Frederick, „Competition as a Discovery Procedure“, 14.

31. Hayek, 525.

mers and firms enter the market with 3 types of knowledge to produce a fourth. They have traditional (representable) knowledge needed to make long-term decisions, tacit knowledge needed to make rapid decisions and knowledge of a shared valued framework. Prices are the fourth piece of knowledge that produces social coordination. When individuals with the first three pieces of knowledge interact in the market, they produce changes in relative prices. Knowledge of these price changes is acted upon to produce further price changes, driving the economy towards social coordination. Price changes are interpreted in the context of the shared value framework and are sometimes used to make calculated long-term decisions. Other times, market participants act on price changes like thermostats, using their tacit knowledge to adjust their plans automatically. Both types of decision-making processes are necessary for social coordination. *The Use of Knowledge in Society* is a paper meant to elevate the importance of rapid decisions made by the man on the spot with tacit knowledge. The ability to react instinctively and in the moment cannot be represented, modeled, or communicated to a central authority. The performative epistemology of tacit knowledge, its inexpressible nature geared towards performance, makes it suited to react instantly to small changes and keep the economy chasing equilibrium.

2.2 Emergence

Having reconstructed Hayek's price theory through an epistemological lens, we can focus on the social ontology of the price mechanism's emergent power of social coordination. In his article, *Notions of Order and Process in Hayek: The Significance of Emergence*, Paul Lewis gives an ontologically oriented account of the origin and function of Hayek's price mechanism. In Lewis's account, individuals and the market structure give rise to what Lewis calls the "emergent causal power" of the price mechanism to organize society.³² Within this section, I will explain Lewis's argument of how the emergent causal power of the price mechanism brings about social coordination. I then supplement Lewis' argument by mapping the epistemological elements mentioned in the previous section onto Lewis's ontological factors: individual, market structure, and price mechanism. Lewis's argument is a useful way to understand Hayek's catallaxy. However, to gain a full understanding, the epistemological and social ontological elements need to be merged because, for Hayek, knowledge and its properties are at the base of social coordination. This more complete understanding of Hayek will be the basis of developing broad criteria for solving the knowledge problem.

According to Lewis, the price system is the mechanism that brings about the phenomenon of emergent social coordination. Emergence refers to "situations where certain elements or parts stand in particular relations, the formed whole has properties not possessed by its constituent elements taken in isolation"³³. This definition of emergence assumes a distinct ontological separation between existing elements. For instance, a water droplet is composed of distinct molecules, which are, in turn, composed of distinct atoms, which are composed of distinct quarks, and so on. As an emergent entity, the water droplet produces emergent properties, the most notable of which is liquidity. This property exists because of the distinct arrangement

32. Lewis, „Notions of Order and Process in Hayek“, 1172.

33. Ibid, 1171.

of the elements of the water droplet in a specific structure and relation. A special class of emergent properties can shape events in the world. These special types of emergent properties are called “causal powers.” Water’s ability to extinguish fires or to power a hydroelectric dam is a causal power of water. However, water can only accomplish these things because its elements are arranged in a way that constitutes a “mechanism.” A mechanism is defined as a “way of acting or working of a structured entity.” The mechanism of water’s causal power to extinguish a fire is its arrangement in a molecular structure that allows it to be harnessed to put out fires.³⁴ Lewis gives an illuminating strategy for identifying causal powers as follows

E1: it must specify the parts or elements of which that entity is usually composed;

E2: it must provide an account of how those elements are structured or related to one another to form the entity in question;

E3: it must provide a causal explanation of how, when the parts are arranged in the requisite way, their behavior gives rise to the emergent causal powers of the entity in question (i.e. it must illuminate the working of the generative mechanism through which the interaction of the parts, structured in the relevant way produces the emergent causal power)

While this method of identifying causal powers starts from the lowest ontological unit, it does not suggest that they are present at lower ontological levels. Combining elements in a specific mechanism relation can produce the causal power in question.³⁵ This is the method Lewis uses to identify the causal power of prices in Hayek’s theory of the market.

Lewis uses this method to reconstruct Hayek’s theory of emergent coordination in the market. E1 is identified as the individuals who compose the market. E2, the condition for identifying how elements are structured and related, is more complicated. Lewis identifies E2 as a market structure that has not yet been discussed. I have so far referred to the market and the free market but have avoided a definition. Lewis describes a market as its structure or the laws, rules, and customs that individuals obey in market interactions. This is how individuals (E1s) relate to one another in a market setting and, therefore, constitutes E2. Much more can be said about Lewis’s definition of the market structure, but for our purposes, it is enough to emphasize his understanding of Hayek’s *free* market with a *free* association governed by widely understood laws, institutions, and social rules. Lastly, E3, the mechanism of the emergent causal power of the market to coordinate society’s actions, is identified as the price mechanism. When individuals are placed within a free market structure, their interactions give rise to a configuration of relative prices that enables them to accurately adjust and coordinate their plans such that all plans of individuals (and the firms they compose) fit together. In this way, prices are the mechanism by which social coordination is achieved. The market can be said to have the causal power to coordinate people’s actions, which is done through the mechanism of prices.³⁶

Despite a lack of direct reference to epistemology, Lewis’s account of emergence in Hayek’s thought relies on agents with specific knowledge. In his description of E2, Lewis states that

34. Ibid, 1172.

35. Ibid, 1173-74.

36. Ibid, 1175.

people's knowledge of the legal system, the rights, and obligations they take on themselves when they enter into legally binding contracts, and moral norms and rules play a crucial role in facilitating the formation of mutually compatible plans.³⁷ In other words, individuals' knowledge of social structures and relations determines these social structures and relations. There would be no use in defining a market structure if no one in society knows what that structure is. Lewis rarely mentions knowledge in his account as his aim is to uncover the ontological elements and their relations in Hayek's social philosophy. But while doing so, he glides over the epistemology to which these elements and relations are inherently tied. Chris Sciabarra, in his book *Marx, Hayek, and Utopia* argues that "the Austro-Hayekian argument is an epistemic justification of the market."³⁸ By strengthening Lewis's Hayekian social ontology with Hayek's epistemological argument for the market, we can arrive at something that approximates a succinct understanding of Hayek's economic model and fully captures the epistemic elements of Hayek's justification for the free market.

With this in mind, we can supplement Lewis' account of emergence by mapping the epistemic elements of the previous section onto E1-E3. Starting with E1, the individual is redefined as an individual with both tacit knowledge and knowledge of the market structure. This means that to give rise to the price mechanism's power of social coordination, individuals must have two special types of knowledge: tacit knowledge and knowledge of the market structure. Tacit knowledge can consist of almost anything. Knowledge of the market structure is strictly defined. Before altering Lewis' definition of the market structure, it is worth revisiting how performative epistemology fits into E1. E1 can now make two types of decisions: conscious long-term decisions and unconscious rapid short-term decisions. The decisions made using tacit knowledge with a performative epistemology can be considered unconscious decisions. To give rise to the causal power of the price mechanism E1, individuals must be allowed to freely make these unconscious decisions within the economic order. Jeffery Friedman suggests Hayek might have thought in a biological analogy based on his writing in *The Sensory Order*.³⁹ Friedman suggests that Hayek might have considered the man on the spot as the nervous system of the economy, interacting, feeling, and registering the outside world. The nervous system reacts both unconsciously and consciously. Our nervous systems make automatic and rapid decisions for us every second of our lives while we also consciously control our bodies and make longer-term plans. The market's individuals are the nervous system of the economy; they react both performatively and consciously, but it can often be difficult to distinguish between them.

E2 then exists to explicate the enforced market structure and the minimum knowledge all individuals must have of the market structure to give rise to the price mechanism's power of social coordination. There is a distinction between knowledge of the enforced market structure and the minimum knowledge an individual must have of the market structure to generate the price mechanism. The enforced market structure remains how Lewis defines it: the "abstract rules of contract, property, and tort law, coupled with informal social norms of honesty and promise keeping." Assuming a critical number of individuals who know and enforce the

37. Ibid.

38. Sciabarra, 93.

39. Friedman, „Hayek's Two Epistemologies and the Paradoxes of His Thought“ 285.

majority of these laws of the market structure, the rest of our E1 individuals will not need a comprehensive understanding of the legal system for the power of the price mechanism to emerge. The minimum knowledge an individual must have is the shared value framework defined in the previous section. Under a price system, consumers and producers need only be able to identify the motivation behind the actions that cause price changes. This is because, despite their ignorance of the rest of the laws of the market structure, individuals assume their existence and enforcement. Returning to the biological analogy, E2 can be thought of as the structures of our bodies. Our E1 nervous system acts within the confines of our E2 body; some nerve cells have greater importance to our consciousness (knowing the whole market structure), and others, like pain receptors, have more limited importance (not knowing the whole market structure). E3 will remain unaltered: the actions of individuals in a market structure that give rise to changes in relative prices, allowing for the coordination of plans. Or, again, in biological terms, consciousness.

The price mechanism's emergent causal powers to coordinate individuals' plans depend on the individual's tacit knowledge, traditional knowledge, and knowledge of a market structure. Social coordination is produced when individuals interact with this knowledge to produce changes in prices. Price can then be called the mechanism of social coordination. A competitive free market structure allows individuals to rapidly adapt their short (and long-term) plans and evaluate and interpret the effectiveness of their own actions and the actions of others. Compatibility of individual plans is reflected in the striving towards a general equilibrium. In this chapter, I have outlined Hayek's epistemological and ontological account of the emergence visions of emergence in a market economy (catallaxy). Lewis's argument was supplemented because it lacked an explication of the knowledge that individuals rely on and act on to produce the emergent causal power of social coordination. Hayek's understanding of emergence is both epistemic (social intelligence) and ontological (causal power of coordination). The importance of tacit knowledge and its performative epistemology lies at the heart of both types of emergence. Hayek's social coordination depends entirely on individuals' ability to act rapidly and instinctively in the market. The allowance of performative epistemology in an economic system is the center of the knowledge problem.

3 The Knowledge Problem

Hayek first formulated what is now commonly referred to as the knowledge problem in his 1945 article *The Use of Knowledge in Society*. It was not intended as a general problem but as a critique of centralized socialist economies. Against Hayek's wishes, this chapter transforms his targeted critique into a general problem. In the previous chapter, I deconstructed Hayek's philosophy to show how epistemological and ontological emergence constitute his understanding of how free market prices help achieve social coordination. In this chapter, I will build criteria for finding general solutions to the knowledge problem. The goal is to show that Hayek's philosophy can be extended beyond catallaxy and that there is nothing particular to the market's emergent social order. I loosely base the criteria on Paul Lewis' identification of emergence from the previous chapter. After building this criterion, I demonstrate its application to a set of potential economic systems. The chapter concludes with a broader analysis of Hayekian thought and a justification for extending the knowledge problem beyond Hayek's wishes.

3.1 Criteria

John Maynard Keynes categorized economies into three types: a cooperative economy, a neutral entrepreneur economy, and an entrepreneur economy. In cooperative economies, workers share in the output of what they produce and potentially use a barter, labor voucher, or free distribution system for consumption purchases. To avoid uncertainty, individuals hold onto producible goods as stores of value, but no money or markets otherwise exist. The neutral entrepreneur economy represents a version of the socialist model. It is a monetary economy, but entrepreneurship is highly regulated.¹ Here, a class of entrepreneurs exists to "hire the factors of production for money and look to their recoupment from selling the output for money".² This economy assumes that "the whole of the current incomes of the factors of production are necessarily spent, directly or indirectly, on purchasing their current output from the entrepreneurs."³ Despite a market system, money, and entrepreneurs, the neutral entrepreneur economy still resembles the cooperative economy because money exists only to facilitate exchange.⁴ The neutral entrepreneur and cooperative economies allow exchange only for the purpose of acquiring commodities. However, the entrepreneurial economy is an economy that values capital accumulation. Its distinguishing feature is that

1. Ruziev, „Money in The Early Years of The Soviet Union“, 190.

2. Keynes, *The Collected Writings of John Maynard Keynes*, 77.

3. Ibid.

4. Ruziev, 189.

money plays a part of its own and affects motives and decisions and is, in short, one of the operative factors in the situation, so that the course of events cannot be predicted, either in the long period or in short, without a knowledge of the behavior of money between the first state and the last.⁵

The shared value framework of entrepreneurial economies is centered entirely around the medium of exchange, and the class of entrepreneurs is free to pursue M at their leisure.

The knowledge problem was meant to serve as a direct argument against two alternatives to monetized market economies: neutral-entrepreneurial and cooperative economies. These types of economies can vary widely. In its most exaggerated form, the cooperative economy can represent a command economy, an entirely non-monetary, non-market social order brought about by “the articulation of tacit knowledge” and “an undistorted, unfragmented form of social knowledge.”⁶ Here, the fragmentation of knowledge between workers and capitalists is overcome and dissolved. Through a “synoptic grasp of the social totality,” central planners dictate social coordination through political methods, not economic ones.⁷ The market and money are fully abolished and replaced with planning and redistribution in kind. The neutral-entrepreneurial economy is not concerned with abolishing the market or money but instead aims to tame the price mechanism. Oskar Lange’s model is one of the more frequently referenced socialist solutions in the calculation debate. Lange’s model utilizes computers to calculate the accurate market prices of commodities without relying on the market. Lange sought to corral the market for use by socialist planners.⁸ The model was meant to avoid the unpredictable nature of market cycles while preserving the signaling power of prices but failed in Hayek’s eyes as he believed that any interventions in the price system lead to dis-coordination.

Although the organization of entrepreneurial, neutral-entrepreneurial, and cooperative economies differs, they share broadly similar goals: social coordination (the compatibility of individual plans) and the accompanying steady regulation of production, consumption, and distribution. Austrian economists like Hayek believed this coordination was a necessary outcome of free-market entrepreneurial economies and only free-market entrepreneurial economies.⁹ *The Use of Knowledge in Society* Hayek claims that because of the suppression of the price mechanism, cooperative economies and neutral-entrepreneurial economies can never produce social coordination.¹⁰ The term catallaxy exists to separate the market into a distinct form of social organization, not an economy.¹¹ The criterion developed here aims to show that social coordination is not a necessary outcome of the free market and prices that compose catallaxy but rather a necessary outcome of Hayek’s epistemic and ontological beliefs. These beliefs manifest most clearly in the free market entrepreneur economy but are not exclusive to it. Variations of the neutral-entrepreneurial or cooperative economies could embody Hayek’s epistemic and ontological beliefs. Social order could be achieved but with different regimes of regulation for production, consumption, and distribution. The developed criteria will retain Hayek’s core

5. Keynes, 408.

6. Sciabarra, *Marx, Hayek, and Utopia*, 91.

7. Ibid, 21.

8. Neuberger, „The Plan and the Market“, 148.

9. Sciabarra, 79.

10. Hayek, „The Use of Knowledge in Society“, 524.

11. Snow und Hayek, Frederick, „Competition as a Discovery Procedure“, 14.

philosophy of tacit knowledge and epistemic and ontological emergence without insisting on a market-centric solution. The goal is to show that Hayek's philosophy is not limited to the market but can be extended to non-market solutions.

The first and most essential criterion for solving the knowledge problem is that it allows individuals to act based on tacit knowledge. This is the epistemic addendum to Lewis's ontological analysis of emergence. E1 individuals with tacit knowledge are the lowest units of the Hayekian economy. The performative epistemology of tacit knowledge attaches additional criteria that individuals be allowed the freedom to act rapidly and on instinct. In *The Use of Knowledge in Society*, individuals can act to consume or produce. Decisions and actions related to consumption can naturally rely on tacit knowledge. Hayek is far more concerned with the kind of production decisions addressed in the previous chapter, that is, constant small changes in production.¹² These constant small changes can rely on tacit or explicit knowledge but are divided into two classes: normal production decisions of existing firms (substituting a material, raising a price, hiring a worker, etc.) and individuals deciding to start a new firm (entrepreneurial decisions). Hayek states of these two decisions that

The continuous flow of goods and services is maintained by constant deliberate adjustments, by new dispositions made every day in the light of circumstances not known the day before, by B stepping in at once when A fails to deliver.¹³

New dispositions made daily are normal production decisions, whereas B stepping in to replace A is an example of an entrepreneurial decision. In Hayek's tin example, producers make the normal production decision to economize tin or find a substitute. Entrepreneurial decisions are decisions made independently by the shipper, estate agent, or arbitrageur. These individuals use "special knowledge of circumstances of the fleeting moment not known to others" to fill gaps in demand.¹⁴ E1 individuals must be allowed to act on tacit knowledge: to take actions related to consumption, to make normal production decisions, and to make entrepreneurial decisions. These are not the only three types of actions possible in an economy, but they are the actions explicitly required by Hayek in *The Use of Knowledge in Society*.

Following Lewis, the second criterion is to have a defined way (E2) that the elements (E1) relate to one another.¹⁵ For Hayek, these are the laws, norms, and institutions governing market interaction. This criterion is more difficult to define for a socialist or command economy and highlights the need for Keynes' classifications. In a strict cooperative economy, social coordination is not emergent. The planners are responsible for calculating a suitable amount of goods produced, distributed, and consumed. Plans fit together not because of the interplay of actions between individuals giving rise to an emergent order but because planners declare that the plans should fit together. Completely centralized command economies could, therefore, never fulfill any criteria derived from Hayek's work because these economies do not rely on emergent behavior. They are too strictly planned and rely entirely only on scientific knowledge. To fulfill the second criterion, planned economies must have a set of laws, norms, and

12. Hayek, 525.

13. Ibid.

14. Ibid, 523-524.

15. Lewis, „Notions of Order and Process in Hayek“, 1173.

institutions that do not seek total control or domination. Individuals need to have the freedom to interact, which will allow for the production of emergent coordination.

The framework of laws, institutions, and social norms in alternate economies can be anything if they have a widely understood shared value framework and freely allow individuals to make decisions based on tacit knowledge. The market structure of entrepreneurial economies is highly complex and differs greatly between countries. Canada's laws, institutions, and social norms significantly differ from Germany's. However, both systems are entrepreneurial economies; everyone in these countries understands that their economy functions based on profit. The widely understood shared value framework of profit accumulation allows individuals to interpret price signals as relating to scarcity and the profit motive. A central planning committee making random decisions attached to no particular framework will prohibit people from forming plans or being able to rapidly and effectively act on tacit knowledge. The framework of an economy can be considered the economy itself. Therefore, this criterion subsumes the first criterion: that an economy's laws, institutions, and norms must allow individuals to act freely and rapidly on tacit knowledge. E2 framework must, therefore, have a widely understood shared value framework that allows individuals to act based on tacit knowledge.

The last criterion is related to E3, which explains the mechanism of emergent social coordination.¹⁶ Any alternative economic system must have the causal power to achieve social coordination. The third criterion is the ability to describe how the interaction between E1 and E2 gives rise to this causal power. The market, for instance, has the causal power to achieve social coordination because of the price mechanism. Lewis explains that when E1 individuals interact in an E2 framework, they produce changes in relative prices that lead to social coordination.¹⁷ To fulfill this criterion, alternate economies must explain how they can produce emergent social coordination. Strictly planned economies could explain that their mechanism of social coordination is planning. This explanation would fail as it does not rely on the phenomenon of emergence. With sufficient freedom and within a specified structure with a shared value framework, individuals will act to generate the emergent causal power to coordinate society.

While the previous chapter carefully considered ontological and epistemic emergence, this criterion does not include such a requirement. Ontological and epistemic emergence are built into the criteria in this case since any economy that solves the knowledge problem must do so by allowing individuals to interact using their tacit knowledge. The last criterion specifies simply that there must be a mechanism that brings the plans of individuals together to achieve social coordination. For the market, this mechanism is the price system, but one could also imagine a mechanism of simple communication (in the case of a more local economy) or a mechanism of collective decision-making, such as voting or consensus-building. In each case, the mechanism must be able to aggregate the dispersed knowledge and preferences of individuals to generate a coherent social order. The critical point is that this coordination arises not from top-down control but from the bottom-up interactions of individuals within the system.

I give the following criteria for solving the knowledge problem based loosely on Lewis'

16. Ibid, 1174.

17. Ibid, 1175.

tripartite identification of emergence. An economy that solves the knowledge problem will fulfill the following:

- 1. The economic framework (laws, institutions, and norms) should:**
 - a) Allow individuals to act rapidly and freely on their tacit knowledge and make decisions regarding:**
 - i. Consumption**
 - ii. Production**
 - iii. Entrepreneurship**
 - b) Clearly communicates a shared valuation framework**
- 2. Generate a mechanism with the emergent causal power to achieve coordination between the plans of individuals in society**

These are the criteria that a neutral-entrepreneurial or cooperative economy would need to fulfill to solve the knowledge problem. Criteria 1a is significantly stricter than criteria 1b and 2, which are left more open-ended. This is because Hayek's epistemic and ontological beliefs come from his emphasis on the individual and the importance of tacit knowledge's performative epistemology. In *The Use of Knowledge in Society*, Hayek states

All that we can say is that nobody has yet succeeded in designing an alternative system in which certain features of the existing one can be preserved which are dear even to those who most violently assail it—such as particularly the extent to which the individual can choose his pursuits and consequently freely use his own knowledge and skill.¹⁸

Hayek's preference for the entrepreneurial economy was predicated on his belief that this was the only type of economy that allowed individuals the freedom to act how they chose. He believed that any economy that wished to achieve social coordination and the steady regulation of production, consumption, and distribution must allow individuals to interact freely and based on tacit knowledge so that they can generate an emergent causal power. According to Hayek, any society wishing to organize its economy without this freedom would perish on its own or at the hands of a society with an entrepreneurial economy.¹⁹ To show that a centralized or decentralized economy with or without monetary and market structures could allow for this individual freedom and produce social coordination would help prove that the market is not the sole solution to the knowledge problem.

Staying true to Hayek's philosophy, this criterion prohibits tacit knowledge from being articulated. The strict cooperative economy must be abandoned, but the more general cooperative economy can remain. So long as the structures of a cooperative, neutral-entrepreneurial, or even altered entrepreneurial economy permit the freedom of individuals and are dependent on

18. Hayek, 528.

19. Lewis, 1178.

the emergent properties of the interactions of individuals for the production of social coordination, they can solve the knowledge problem as Hayek understood it. The developed criteria capture Hayek's philosophy that social coordination is an emergent phenomenon predicated on individuals interacting based on their tacit knowledge. Of this, Hayek says

...we must show how a solution is produced by the interactions of people, each of whom possesses only partial knowledge.²⁰

Individual interactions form the basis of all social coordination and likewise form the basis of the criteria. Objections to these criteria will likely be based on criteria 1a(iii). It is natural to wonder how a centralized or decentralized non-market and potentially non-monetary economy allows individuals to have the full freedom to consume, produce, and become entrepreneurs.

3.2 Alternatives and Evaluations

Having identified the criteria for solving the knowledge problem, it is necessary to demonstrate its potential use. This section outlines how different versions of planned cooperative and neutral-entrepreneurial economies could fulfill the Hayekian criteria, specifically in relation to the strictest criteria, 1a(i)-(iii). The economic freedom demarcated by 1a(i)-(iii) is traditionally avoided by economies that aim to build a non-capitalist social order. To become true alternatives to an entrepreneurial economy, these freedoms must be stripped of capitalist connotations. Through an exploration of different types of economies, this section will aim to understand how Hayek understood economic freedom and how this freedom can be maintained in non-market and non-monetary systems. Hayek's essay *Competition as Discovery Procedure* is much clearer than *The Use of Knowledge in Society* regarding what economic freedom should mean. The essay hints at what Peter Boettke and Kyle O'Donnell call "radical ignorance", or the "not knowing what one does not know."²¹ Economic freedom means making decisions without justification to the state. If individuals are to be able to make decisions freely and rapidly based on tacit knowledge, they should be able to do so without having to justify themselves. Hayek believes that when individuals can pursue entrepreneurship without restrictions, they can create new knowledge and better coordinate society.

The table below depicts the types of economies this section will evaluate. Relying still on Keynes' classifications, I further distinguish between centralized and decentralized planning. Centralized planning is understood as economic planning, mainly from the top down. Given the allowance of entrepreneurship in neutral-entrepreneurial and cooperative economies, elements of decentralization will necessarily remain even in a centralized economy. The distinguishing feature of a centrally planned economy is that a single central committee holds the highest authority. Decentralized planning can mean various things. Hayek considers the entrepreneurial economy an example of decentralized planning. Indian economist Prabhat Patnaik identifies three types of non-capitalist modes of decentralized planning: decentralization as

20. Hayek, 526.

21. Boettke und O'Donnell, 315.

	Monetary	Non-Monetary
Centralized planning	Centralized non-entrepreneurial	Centralized cooperative
Decentralized planning	Decentralized non-entrepreneurial	Decentralized cooperative

Abbildung 3.1: Keynesian Economies Divided by Planning and Monetary Structure

iteration, decentralization as multiplication, and decentralization as users' sovereignty. Iteration refers to a more decentralized version of Lange's socialist model in which enterprises can freely choose their production quantities at the state-given price. Multiplication is the absence of a centralized planning committee that divides planning into different economic sectors or administrative regions. Lastly, users' sovereignty refers to the ability of the benefiting individuals to have a final say on the precise nature of the plan. Users' sovereignty is the notion utilized here when discussing decentralized economies. This is a highly democratic planning notion that centers on individual input and community representation and lacks a single central committee at a national level.²² Economies can have more or less elements of decentralization, but the absence or presence of a single authoritative central committee is the defining feature of the division.

A centralized neutral-entrepreneurial economy could fulfill criteria 1a(i)-(iii) and permit consumption, production, and entrepreneurial decisions to be made freely and rapidly. Consumer decisions would be made using money to purchase goods and services from different firms. A centralized planning committee could grant workers or firm managers latitude to make constant small changes in production so long as the firm can still meet production targets. The planning committee could also rapidly adjust its targets based on necessary small changes made by workers or firm managers. Finally, with permission from the state, individuals could begin a new state or worker-owned enterprise. State approval of entrepreneurial activities is the biggest obstacle to fulfilling criteria 1a(iii) as it limits individual freedom to pursue enterprise. Like a capitalist economy, the planning committee could allow every proposal for new enterprises, no matter how irrelevant the proposal might seem to the long-term plan. The planning committee would then rapidly incorporate this new enterprise into the long-term plan. Just as failure to produce a profit can force a business into bankruptcy, an enterprise could be terminated after continual failure to contribute to a long-term plan. This would allow enterprises to begin with little, if any, justification. Individuals would be allowed to act freely on tacit knowledge and discover new ways of doing things uninhibited by strict controls from central planners or even access to capital.

22. Patnaik, „A Theoretical Note on Kerala-style Decentralized Planning“, 5.

Entrepreneurs in a neutral-entrepreneurial economy will receive income from their enterprises. However, “the exchange value of the money incomes of the factors of production is always equal in the aggregate to the proportion of current output”²³ This proportional income would show that consumption for consumption’s sake is the backbone of the shared value framework of the economy. Still, consumption is not precise enough to allow individuals to understand and interpret the actions of others. The central plan and its goals will ultimately constitute how individuals interpret the consumption, production, and entrepreneurial decisions of others. For instance, suppose the central plan aims to raise living standards through a set of goals surrounding consumer goods, health, education, etc. In that case, individuals will interpret the opening of a new business as relating to raising the standard of living. Individuals know that actions unrelated to these goals will eventually be discouraged, just as actions unrelated to profit can be difficult or discouraged in a capitalist society. If laws, institutions, and rules are consistent, the centralized neutral-entrepreneurial economy would then fulfill criteria 1a(i)-(ii).

The explanation of the coordination mechanism in a centralized non-entrepreneurial economy is, in the end, not so different from Hayek’s vision. The existence of money provides a way for the planning committee to privately register scarcity and abundance. These committees can react accordingly by encouraging entrepreneurship, changing wages, or refixing prices to reach the goals of a long-term central plan. The mechanism by which social coordination is achieved is not Hayekian decentralized prices but controlled centralized prices in pursuit of the goals of a long-term plan. Central committees can react rationally to price data and facilitate economic coordination through both rapid, short-term, and long-term rational decisions. Despite the reliance on the price system, the centralized neutral-entrepreneurial economy is still different from the market. The shared value framework means that the central committee formulates its plans based on the population’s needs and uses prices to coordinate society to meet this plan. It aims to replace the “impersonal coercion” of the market with the personal coercion of a goal-oriented central plan. The profit motive (or risk of starvation) of entrepreneurial economies coerces individuals to act in pursuit of money. The centralized state induces individuals to entrepreneurship with the promise of contributing to a plan to enhance everyone’s lives. Individuals will follow the money not for the sake of accumulation but because they know it will help fulfill a long-term plan. Criteria 1(b) is fulfilled with centrally controlled prices in conjunction with the shared value framework of the long-term economic plan.

The primary difference between a centralized neutral-entrepreneurial economy and a decentralized neutral-entrepreneurial economy is that in a decentralized neutral-entrepreneurial, a would-be entrepreneur must request democratic approval for implementation and resource allocation. This would complicate individuals’ ability to make entrepreneurial decisions freely, rapidly, and based on tacit knowledge. The democratic nature of ‘decentralization as user sovereignty’ means that entrepreneurs would need a democratic approval process and would not be free but directly beholden to affected individuals and communities.²⁴ This could be sped up through local delegates and representatives and a willingness of communities to support new initiatives. Individuals in the decentralized neutral-entrepreneurial could theoretically be permitted to become entrepreneurs at any speed and based on any knowledge. The framework

23. Keynes, 73.

24. Patnaik, „A Theoretical Note on Kerala-style Decentralized Planning“, 4.

could be easily fixed and based on the shared value of fulfilling a long-term plan. Fulfilling criteria 1(b) would be more difficult as there would be no central committee to aggregate the data and ensure that one region's plans fit with another region's plans. Communication between regions could be streamlined, but a mechanism for resolving resource conflicts would need to be implemented.

The absence of money and exchange seriously threatens coordination for non-market, non-monetary cooperative economies. Criteria 1a(i) can be fulfilled in two ways: through Labor vouchers, which provide workers with a compensatory ability to attain goods, or through the free distribution of goods. Criteria 1a(ii) is fulfilled in the same way as in centralized or decentralized neutral-entrepreneurial economies. Workers give themselves latitude to make production decisions or are granted latitude by a governing body. In the absence of prices, entrepreneurship in a cooperative economy must rely on a new measure of productivity or efficiency. Soviet economist Alexander Chayanov suggested other ways to measure profitability, such as 'labor productivity' and 'efficiency in using raw materials.'²⁵ Centralized economies would perform these calculations and offer the data to the public; upon request, individuals could become entrepreneurs to improve efficiency or labor productivity. Suggestions for their exact type of compensation vary widely, with some suggesting an honest in-kind system(with commodities being paid) and others suggesting a system of labor vouchers. With capital organized and provided by the state, the individual would be a state-backed entrepreneur with remuneration shared equally with workers. Depending on the type of centralization, individuals would receive immediate approval and resource allocation for their enterprise from the appropriate governing body.

A centralized or decentralized cooperative economy's shared value framework should be akin to labor productivity (or efficient material usage) in relation to a long-term economic plan. In a neutral-entrepreneurial economy, individuals understand that others pursue money for direct consumption and that these consumption, production, and entrepreneurial decisions are related somehow to the long-term economic plan. The centralized and decentralized cooperative economies are still planned, but individuals cannot access price signals. They then interpret the decisions of others, mainly production and entrepreneurial decisions, as concerning labor productivity(etc.). If iron is substituted for steel, this is interpreted as a decision based on productivity to help achieve long-term economic goals. Inventories of goods can also help to measure changes in demand, which planning committees can rapidly respond to. The coordination mechanism in cooperative economies is a long-term plan aided by signals of productivity and demand. Long-term economic plans cause people to consume, produce, and act in a way that causes the coordination of each plan in line with the overarching plan. A decentralized cooperative economy would work similarly with planning and requests for entrepreneurship done and fulfilled democratically.

Each of these economies is predicated on the radical ignorance of the planners. By allowing individuals to freely engage in any kind of entrepreneurship, planners are forced to remain cognizant of the fact that a seemingly inefficient use of resources could suddenly become an efficient use of resources. State approval for entrepreneurial activities will be granted only on

25. Magnin und Nenovsky, „Calculating without money. Theories of in-kind accounting of Alexander Chayanov, Otto Neurath and the early Soviet experiences“, 466.

the condition of feasibility. If an enterprise is feasible, then it must be approved. The planners instantly factor this new enterprise into the long-term plan, and things continue as they did before. By allowing all feasible entrepreneurial activities, planners allow for experimentation and the creation of new economic knowledge. Hayek refers to this as a discovery procedure and believes that only the impersonal coercion of market competition can impel individuals to engage in such a procedure.²⁶ With my criteria, I suggest that personal coercion can accomplish the same results as impersonal coercion. Discovery procedures can exist in planned economies. The interactions of free individuals guided by a long-term economic plan will come together and emergently achieve the stated plan. Individuals are motivated by their ability to benefit themselves and others by creating new enterprises to help fulfill long-term economic plans. Price signals can help guide discovery procedures but are not critical to discovery procedures. Austrian central planners plan what coordination should be and how it should be attained, but the emergent properties of individual interactions are needed to achieve the plan.

The goal of this section was not to construct utopias but to broadly outline different economic arrangements that can conceivably fulfill the criteria. Using the criteria, I provided a template for evaluating such economies and sought to highlight and overcome the apparent contradiction between entrepreneurship and non-capitalist societies. I showed how Criteria 1a(iii) necessitates that planners remain open-minded and take an approach of radical ignorance to new enterprises. This approach allows individuals to engage themselves in discovery procedures motivated by the more personal coercion of the state. These societies have the potential to fulfill the Hayekian criteria by relying on interactions between individuals to create emergent causal power capable of achieving social coordination. Guided by a plan and signals (related to prices or not), individuals engage in different actions that planners can respond to in the short term while retaining a long-term plan. Much of the attention of this section has focused on the role of long-term planning by planners. That is because short-term adjustments of prices, production targets, or resource allocation depend on something that has not yet been addressed: the heavy utilization of computing technology. The fleeting knowledge of the estate agent becomes useless if they must spend two weeks waiting for a form to be signed and another two months waiting for resources. A rapid, technologically capable bureaucracy is necessary to perform administrative work and economic calculations to make these alternatives into actual solutions to the knowledge problem. The technical aspects of these solutions will be addressed in the context of Project Cybersyn. I close this chapter with a section on the reasons for considering alternatives to Hayek.

3.3 Evolution and Spontaneous Order

From a Hayekian perspective, finding criteria for the knowledge problem could provide some benefits in analyzing Hayek's free market philosophy; however, applying this criterion to anything other than the market would be considered a useless pursuit. Setting aside Hayek's belief that the market formed a wholly unique social order in the form of catallaxy we find that the primary reason for his belief in the market is its evolutionary advantage. Hayek believed that

26. Snow und Hayek, Frederick, „Competition as a Discovery Procedure“, 11.

'the present order of society has largely arisen, not by design, but by the prevailing of the more effective institutions in the process of competition.'²⁷ External pressures cause social systems to evolve. This process of evolution cannot be designed but must be forged by what Hayek calls 'spontaneous order.' Evolutionary pressures on groups force them to coordinate themselves and produce a spontaneously emergent social order.²⁸ Hayek views the market as one such order, and thus, he rules out any alternative solutions. A secondary defense of the market is that any attempt to replace the market will result in "unintended social consequences." Unintended social consequences are Hayek's chief ethical concern. He is worried that by trying to implement a new social or economic system, the results will be catastrophically destabilizing for the said system.²⁹ These evolutionary and consequence-oriented arguments constitute Hayek's critique of a previously encountered term, "constructivist rationalism." I address these critiques and point out that Hayek's position of critical rationalism is compatible with a planned economy.

Hayek's most lengthy writing on rational constructivism occurs in his book *The Constitution of Liberty*, written many years after *The Use of Knowledge in Society* and *Competition as Discovery*. Despite the gap in time, the relevance of this later work to the early work should not be disregarded. The seeds for Hayek's distaste for rational constructivism are readily found in these early works. Rational constructivism is a concept defined by Hayek. He believes the philosophy originated with Descartes's overestimation of the abilities of reason to structure and organize the world around us. Between Descartes and the 20th century, there lies a significant gap in rational constructivist thinkers as Hayek concentrates his abuse on the state bureaucrats, who he believes are following the rational constructivist tradition by trying to construct new social institutions.³⁰ The problem with rational constructivist thinkers is that they believe they can gain access to relevant facts and plan a utopia. Hayek's "critical rationalism" is the solution to rational constructivism. This is a belief in the limitations of reason. Our reason is a product of evolution; as humans, we can and will only ever have a grasp on our perspectives.³¹ To grasp the social totality is impossible and against our evolution. Hayek's evolutionary and consequence-oriented arguments come from this disdain for rational constructivism.

The evolutionary argument is that social orders evolve and compete until the best social order emerges as the victor or the other social orders die out. Far from an ethical claim, this argument seeks to justify the capitalist entrepreneurial economy using natural selection. Social orders are selected by the ability of their institutions to divide labor or "economize the amount of articulated knowledge necessary for an individual to function in that society."³² Through institutions that promote the division of labor, societies not only produce wealth and growth in population but are allowed to experiment and produce new social knowledge through discovery procedures. Hayek favors institutions like the market and common law because they embrace the natural division of knowledge between individuals and simultaneously allow for experimentation and the accumulation of knowledge. These institutions are what Hayek calls

27. Hayek, *Law, Legislation and Liberty*, 154.

28. Lewis, 1180.

29. Sciabarra, 32-35.

30. Ibid, 40

31. Ibid 35.

32. Ibid 38.

spontaneous institutions, arising from traditions or social rules and not from any design or rational deliberation. Individuals stumble upon these institutions and recognize their utility, building and growing them.³³ Careful not to sound Panglossian, Hayek denies suggestions that society just happened to develop a system best suited for social order by some miracle. Instead, he suggests, “It is the other way round: man has been able to develop that division of labor on which our civilization is based because he happened to stumble upon a method which made it possible.”³⁴ Rational constructivism fails as it ignores the distinct advantages produced by spontaneously formed traditional institutions.

The problem with this argument is that it is empirically false, and its lack of ethical content makes it applicable to all social orders. The empirical falsity of this claim is apparent in Hayek’s belief that The best intuitions have been naturally selected, and institutions like the market or common law are spontaneously generated with no rational deliberation. The idea that the best institutions are naturally selected is false, as many different forms of economies and social orders existed in Hayek’s time and our own. In Hayek’s time, the Soviet Union proved that nature had not wiped out all non-capitalist orders. Today, China, Vietnam, and Laos all exhibit different types of central economic planning. In the case of China, its mixture of planning and state capitalism has allowed its population and wealth to grow at a staggering pace. Hayek might suggest that these societies are abominations and that their collapse is imminent, but this is an ad-hoc argument. Otherwise, the idea that institutions like the market were invented without rational deliberation is rather extreme and hard to verify. To say that the market arose spontaneously is ignoring the laws and norms that were rationally thought of and implemented to facilitate commerce and exchange. While I do not doubt that there is some element of spontaneity in the historical emergence of the market, we must recognize that there is also definitive evidence of the rationale in the deliberately enacted laws that prop up the market structure. Lastly, the evolutionary argument is weak in its aversion to rationally enacted changes. Changes such as the abolition of slavery or compensation for women’s work would be seen as a direct affront to spontaneously organized institutions.

Hayek’s ethical argument is predicated on his belief that rationally designed institutions bring unintended social consequences. The goal of planned economies is to alter or abolish the institution of the market in favor of a long-term economic plan. This is a conscious effort aimed towards a specific restructuring of an existing social order, and in Hayek’s view, it cannot be accomplished.³⁵ Rational long-term economic plans require the articulation of the precise effects of each action. Because this is impossible, there will necessarily be consequences not intended by the planners. These consequences can be anything from material shortages to widespread famine.³⁶ The redesigning of spontaneous institutions (which have proved their worth by their existence) and their impossible need to articulate the consequences will inevitably lead to large-scale disasters. Spontaneous intuitions don’t require the articulation of consequences; in fact, their emergence is predicated on the absence of this requirement; for this reason, spontaneous intuitions do not contain the negative externalities brought about by disorders. As a spontaneous institution, the market absorbs and communicates unintended

33. Ibid 41-43.

34. Hayek, „The Use of Knowledge in Society“, 526.

35. Sciabarra, 47.

36. Ibid, 36

consequences of actions in the form of prices. The institution is flexible, adjusts, and evolves naturally.³⁷ The ethical argument is that the market must remain because replacing it would be stepping into the world of planning, resulting in social destruction.

The ethical argument against rational constructivism is stronger than the evolutionary but still finds itself in a position of impotence, unable to change the status quo of society for fear of the all-important unintended social consequences. Whereas the evolutionary argument looks to the past and deduces the natural superiority of market society, the argument for unintended social consequences induces us to look at the future and understand that a planned effort to shorten the working day might result in future negative externalities. We are then left paralyzed, stuck in a world that we seemingly must accept as the best of all possible worlds, and unable to enact conscious rational change on our spontaneously generated instructions. Hayek does present a circumstance for when it is permissible to enact conscious change, that is, when legislation serves class interests. What a class is and what their interests are is left undetermined, and there is no elucidation of any moral framework that could help us understand when it is permissible to enact this kind of change. After all, moral frameworks are examples of spontaneous intuitions that evolve and are not rationally constructed. The ethical argument against rational constructivism is ethical in the loosest sense. Hayek would naturally agree that subjecting others to one's rational plans is morally wrong because of the inevitable negative externalities. However, the secondary or perhaps primary argument is an amoral argument that it is simply impossible to effectively enact rational plans.

Hayek's philosophy is this: "*Man is not [, has never been] and never will be the master of his fate.*"³⁸ The criteria for solving the knowledge problem is a rejection of this philosophy and a rejection of Hayek's evolutionary argument. The market itself was, in part, rationally designed. People observed the benefits of spontaneous exchange and commerce and codified institutions and laws to uphold these practices. Economic planning can work similarly. The criteria for solving the knowledge problem is the suggestion that planners do not need a synoptic grasp on the social totality nor the articulation of tacit knowledge to effectively plan the economy. We can be critical rationalists and accept limitations on what we can now while trying to create a better world. By designing institutions that do not rely on complete and total knowledge, we allow for the integration and subsumption of the unforeseen consequences of individual actions. The criteria embrace emergence, spontaneous order, and the essential division of tacit knowledge while allowing for systems that can guide human action. Designing new institutions capable of integrating tacit knowledge and rapid actions towards a specific economic goal is no easy task and was likely hard for Hayek to imagine. Here, technology points the path forward

37. Ibid 42.

38. Hayek, *Law, Legislation and Liberty*, 30.

4 Cybernetics and Project Cybersyn

This chapter introduces and explores the history and philosophy of Stafford Beer, Chilean Socialism, and Project Cybersyn. While Project Cybersyn represents the epitome of the philosophy of Stafford Beer and Chilean socialism, these projects must first be understood on their own terms. This understanding is critical for later evaluation of whether Project Cybersyn could have solved the knowledge problem. This chapter differs from Chapter One as it is a descriptive and not analytical account of Stafford Beer, Chilean socialism, and Project Cybersyn. Throughout this chapter, I have hoped to highlight the similarities amongst these ideas and between these ideas and Hayek's thought. The emphasis on individual freedom is the core theme running through this chapter. Hayek, Stafford Beer, and leaders of Chilean socialists seem to conceptually agree that individuals should have the power to act performatively. The actions individuals should be allowed to take would be vehemently disputed, but the individual freedom to take actions driven by tacit knowledge is undoubtedly permissible by these thinkers and their projects.

4.1 Cybernetics and Stafford Beer

4.1.1 British Cybernetics

Cybernetics is derived from the Greek word *kubernêtes*, which means steersman or governor. The term was first popularized by Norbert Wiener in his eponymous 1948 book.¹ At this time, American cybernetics was primarily a combination of biology, mathematics, and informatics, but it also, and to a lesser extent, included fields such as psychology, neuroscience, and engineering.² Cyberneticians from all nations saw themselves as creating a new universal field. Its methodology was built on analogy, allowing it to venture into almost any discipline. Early cybernetics attempted to understand complex systems of living beings and societies through analogies to technical systems and vice versa. The first such comparison lies at the origin of Cybernetics. During WWII, Wiener and his colleagues saw the problems in antiaircraft servomechanisms as being similar to problems encountered in the human brain. They analogized their test apparatus' unpredictable and intense spinning to tremors caused by neurological disorders. This led them to develop an idea of circular causality. A break from traditional linear causality, circular causality sees causes and effects as engaged in feedback processes.³ Cybernetics studies the feedback processes in complex systems like organisms, societies, and

1. Medina, *Cybernetic Revolutionaries*, 20-21.

2. Pickering, *The Cybernetic Brain*, 13.

3. Oliva, *The Road to Servomechanisms*, 4.

technologies.⁴ How these systems react and adapt to impulses is of central importance because once there is an understanding of feedback processes, one can effectively regulate (or control) these processes.

Stafford Beer was a member of the British cybernetics tradition, which, while related to American cybernetics, has roots less in military research and more in psychology.⁵ The psychological bent of British cybernetics led to the science of the brain taking center stage. Andrew Pickering goes so far as to define cybernetics as the science of the adaptive brain. This is evident in the machines designed by early cyberneticians, such as Grey Walter and Ross Ashby.⁶ As psychologists, their familiarity with the anatomy and biology of the brain led them away from notions of the brain as an organ for thinking and representation. Ashby states, "...to the biologist, the brain is not a thinking machine, it is an *acting* machine; it gets information, and then it does something about it."⁷ Taking an "evolutionary approach" to machine design, they sought environmental adaptation as the primary objective, building machines that did not try to represent the world but to adapt to it.⁸ British cybernetics was concerned with performance, not representation. This was driven by the conception of the brain as tied essentially to performative bodily functions instead of representative ones.⁹

The philosophy of Stafford Beer is aligned with the emphasis on the adaptive brain. Born in 1926, Beer studied psychology as an undergraduate, but due to the war, he could not pursue it academically and instead chose a path in management consulting. In the early 50s, Beer came across Wiener's book and soon after contacted Walter, Ashby, and other British cyberneticians. Through his role as a management consultant, Beer began experimenting with cybernetic solutions to corporate problems. The analogy of the factory to an organism characterizes Beer's early cybernetic ideas. He believed that as an organism, the factory should have an adaptive brain that could help manage the factory by prioritizing long-term survival over short-term goals. Factory management was likened to the nervous system, regulating and controlling processes toward a long-term goal. He emphasized the importance of feedback loops to maintain organizational stability and adaptability.¹⁰ The idea that businesses be viewed as dynamic systems capable of self-regulation and learning was novel in the field of management consulting. These ideas ultimately led Beer to define and study what he called "exceedingly complex systems."¹¹

An exceedingly complex system is defined by its ability to evade representation. These systems are so interconnected and involved that they are indescribable in detail.¹² Traditional science adequately represents and understands simpler systems using modeling, mathematical rigor, and other methods. However, cyberneticians argue that cybernetics is needed to provide tools for understanding and *controlling* exceedingly complex systems. Beer's understanding

4. Medina, 21.

5. Pickering, 57.

6. Ibid, 5.

7. Ashby, *Design for a Brain*, 379.

8. Pickering, 32.

9. Ibid, 18.

10. Ibid, 216-225.

11. Medina, 25-26.

12. Ibid

of control differs from traditional conceptions that use it synonymously with domination. Instead, Beer defined control as self-regulation. Because exceedingly complex systems cannot be represented or even fully understood, they require the use of black boxes. A black box is a device used in engineering. It is a box in which the interior is unknown, but the inputs and outputs can be measured. By black-boxing parts of a system, the behavior is retained without the need to know everything about said behavior. A flexible and, more importantly, an adaptable system can attempt to but not rely on predicting black box outputs from known inputs.¹³ Adaptable control or steering of exceedingly complex systems was at the top of Beer's mind.

The black box highlights how seriously Beer took his ideas of control and how much they differed from what had become before. He believed that in exceedingly complex systems, there is no domination, only regulation. Some processes are too complicated ever to be fully represented and integrated into a model. The only hope for our ability to regulate them is to create a black box. Beers' relationship to control highlights what Pickering describes as the main philosophical feature of British cybernetics: its non-modern performative ontology.¹⁴ The term non-modern is taken from theorist Bruno Latour; Pickering uses it to describe the non-dualism of cybernetics, how it "threatens the boundary between mind and matter," and the evolutionary rather than a causal approach to phenomena.¹⁵ Beer exhibits both of these non-modern characteristics in his work, blending the organisms with the factory and viewing adaptation and evolution as essential characteristics of his machines and of the world. Performative ontology (like performative epistemology) asks us to view the world as a series of performances.¹⁶ Cyberneticians like Beer did not want to enframe the world in representable structures. Instead, they wanted to develop ways of interacting and regulating the performances that constitute experience.

The thermostat from Chapter One, with its reaction and adaptation, is an example of performativity that highlights the goal of a cybernetic system. In its simplest form, the thermostat takes inputs and reacts to them based on its programming. Its programming aims to maintain stability, although Beer preferred the more biological term homeostasis. Control through regulation and maintaining balance is entirely performative for the simple thermostat. Domination would demand a controller paying complete attention to every detail at every moment in time.¹⁷ However, homeostasis allows flexibility and adaptation. The simple thermostat does not pay attention to every detail; it only monitors temperature. A more complex thermostat could contain a model of its regulating room and an array of complex variables. This model needs to be geared directly towards action to retain its performative ontology. A model geared toward action appears to be a contradictory phrase. This is a contradiction that Beer had to reconcile himself throughout his career. Beer understood that representations can exist but should not be depended upon.¹⁸ What is important about a system is that it can achieve its goal. The thermostat could function with varying degrees of complex models so long as these models are adaptable and not bound by their representations. This idea is explored in the philosophy of

13. Ibid, 27.

14. Pickering, 18.

15. Pickering, 25.

16. Ibid, 240.

17. Medina, 26-28

18. Pickering, 251.

the Viable Systems Model, which formed the basis of Project Cybersyn.¹⁹

4.1.2 The Viable Systems Model

The Viable Systems Model (VSM) is a model for managing and regulating exceedingly complex systems. First published in his 1972 book *Brain of the Firm*, the model was already completed when Beer was requested to come to Chile to help organize the economy.²⁰ Based on biological analogy, the VSM sought full vertical and horizontal communication and destruction of the dichotomy between centralization and decentralization. While the model is a form of representation, Beer manages to avoid dependency on representation by modeling how the system should *behave* and not what it should be. This approach also allowed for the use of adaptation to reach system-wide homeostasis.²¹ The model is heavily influenced by Beer's contemporaneous project, The Liberty Machine. An idea for a non-hierarchical system of governance that countered tyranny through information dissemination and distributed decision-making. When Beer designed the VSM, agile, adaptable systems were on his mind. He went so far as to make each model section viable through recursion, similar to a cell containing the DNA of a whole organism. The VSM was to be adaptive holistically and sectionally, reflecting decentralization through autonomy and centralization through its overall organization.²²

The VSM was organized into five systems, each representing a different function of the human body. System one represented immediate sensory perception, motor function, and bodily organs. For instance, sensory nerves or the liver act independently to respond to local conditions. They interact with one another and the outside world, maintaining homeostasis without conscious control. On the other hand, limbs require more conscious attention, but their status as interfaces to the outside world marks them as belonging to system one. In a firm, system one consists of workers in different sectors who can operate independently and communicate with each other as well as management. System two is the spinal cord of the organization, filtering information and passing it on laterally and vertically among different systems. It exists to sort out higher-level conflicts that might arise in system one. The parts of the system all communicate and work with each other; system two monitors this communication and ensures things run smoothly. The relation between system one and system is not a hierarchical arrangement but a form of adaptive management.²³

System three is equated to the cerebellum of the brain. It monitors and manages the day-to-day functions of system one. Like the cerebellum, it keeps the factory breathing, heart pumping, and limbs in motion. Its focus is on the immediate functions of the factory. In line with maintaining the autonomy of each system, system three does not receive every piece of information from systems one and two. Its job is larger, and it could not perform this function if it had to monitor every detail. Instead, with the help of system two, it receives filtered information from system one and acts and manages the most significant bits. System three is

19. Medina, 34-35.

20. Medina, 40.

21. Beer, *Brain of The Firm*, 103.

22. Medina, 33-38.

23. Ibid, 35-37.

also responsible for enacting the plans developed by systems 4 and 5. This is the first system in the vertical command axis. System four is the link between conscious and unconscious actions that we might think of as the system's control room. It filters information between systems 3 and 5 and involves longer-term planning. It has an additional role on the vertical command axis as it is the only system with a direct interface to the external world. This direct interface works closely with system three to filter important information from the world that might impact daily operations. It then works on a longer time scale to develop plans to improve day-to-day operations in line with the objectives. Lastly, there is system five. At the top of the vertical command axis, it is meant to be a multi-nodal managerial system to facilitate the flow of information at every level. It is a mixture of centralized goal setting and management and decentralized communication between all systems.²⁴

The VSM is Beer's attempt to create an adaptable, centrally planned, but decentralized organizational structure for an exceedingly complex system. It heavily reflects the non-modern performative ontology of British cybernetics while keeping with Beer's unique individual-centered approach to management and organization.²⁵ The non-modernity of the VSM is evident in Beer's frequent shift of analogy between the firm, the organism, and society. Its representative nature pushes it away from performativity, but the VSM is meant to be directly enacted, adjusted, and adaptable. The system barely begins with the model and certainly does not end with it; performativity is imperative to Beer's cybernetics. The unique flare of Beer's cybernetics is his overemphasis on individual autonomy and non-hierarchy. No element of the VSM is meant to be more important than another; just as all body parts work together, so does the system.²⁶ Each part works simultaneously on its own and with each other. This autonomy gives the system its non-hierarchical and decentralized structure. Despite Beer's non-hierarchical attitude, hierarchical elements do remain. The vertical command axis is the center of power in the firm, but Beer's conception of power and control again comes into play. The long-term planning of systems four and five, like the managerial activity of system 3, has more chance of being informed and adaptable.²⁷ Project Cybersyn was designed based on the VSM of centralized structure and decentralized organization.

4.2 Chilean Socialism

Chilean socialism is the context within which Project Cybersyn was developed. It greatly influenced Beer and his designs, but ultimately, it is not the focus of this thesis, and a short summary of ideology will suffice to show that Beer's ideas were relevant to the Chilean socialist project. On September 4th, 1970, Salvador Allende was elected president of Chile with a 36.3 percent majority. Galvanized by ideological support throughout Chilean society, Allende was the first democratically elected president of Western democracy to declare himself a Marxist.²⁸ Allende's Popular Unity (UP) government governed alongside various radical and left-leaning

24. Ibid, 37-38.

25. Pickering, 250-252.

26. Medina, 35.

27. Medina, 37.

28. Navia und Osorio, „‘Make the Economy Scream’?“, 771.

parties with differing ideological currents. Allende and the non-Soviet aligned parties (all but the communist party) espoused beliefs in individual freedom, worker self-management, and decentralization.²⁹ Even militant groups such as the Movimiento de Izquierda Revolucionaria emphasized this combination of participatory politics and political freedom.³⁰ The grassroots support and participation on local and national levels meant that Chilean socialism was a democratic, bottom-up approach to socialist revolution. Allende believed that the country could transform itself without anyone ever having to fire a gun.³¹ Thus, the democratic, participatory nature of Chilean socialist ideology was bound to it at its inception.

The emphasis on participatory democracy, individual freedom, and worker self-management was a result of a republican political tradition. Ideologically, the UP government anchored itself against liberal individualism (characteristic of Hayek). Of the differences between republicanism and liberalism in Latin America, Laurence Whitehead states that

Whereas in liberal theory politics must be held accountable to the preferences of citizens pictured as individual agents, in the republican variant politics should be held accountable to the collective public sphere.³²

Chilean socialism saw social emancipation and individual freedom as tied to one another. This emancipation would be achieved through republican participatory politics and equally participatory economic development. Liberalism tends to equate the economic freedom and property rights of liberal markets with democracy. Alternatively, republicanism suggests that these rights can be curtailed for social solidarity, republican virtue, and self-determination.³³ Self-determination is particularly important in the Chilean context. In theory, liberal governments do not chart conscious goals for their economies like economic justice or development. Free markets are outlets for the preferences of individuals, and liberal governments exist only to allow the facilitation of free exchange to satisfy individual preferences. This view is reflected neatly in Amartya Sen's approach to development, which emphasizes individual capabilities rather than economic self-government or planning.³⁴ The UP with its republican principles wanted to chart a collective future for Chile and its economy with goals of social justice and economic independence.³⁵

Chilean economist Pedro Vuskovic saw radical new industrial policy as key to achieving decoupling and allowing Chile to pursue its own fate. Vuskovic pictured Chile as charting a new path towards both socialism and economic development. Inspired by the Cuban revolution, Vuskovic saw the existence of collectivized farming alongside individual holdings as something to aspire towards.³⁶ The Vuskovic Plan became a central pillar of the UP government. The plan consisted of four different proposals: nationalization of industries, income redistribution, creation of a state-owned banking sector, and agricultural collectivization. The plan was

29. Medina, 39.

30. Schlotterbeck, *Beyond The Vanguard*, 132.

31. Medina, 40.

32. Whitehead, *Shifting frontiers of citizenship*, 35.

33. Ibid

34. Arboleda, „Development as National Liberation“ 27.

35. Medina, 65.

36. Ibid, 31.

ambitious, but through it, Chile sought to assert its independence from the global north and find a new way toward a socialist society.³⁷ The most critical and perhaps controversial part of the plan was the drive towards nationalization. Allende saw this as the most achievable and important and began the government on an aggressive nationalization program.³⁸ Allende's goals were aligned with the Vuskovic plan and UP, but Allende understood the need for rapid increases in living standards. His political base was mostly swayed by ideology and could easily collapse if living standards began to drop.³⁹ The planning needed to coordinate these newly nationalized industries is the context in which Beer is brought to Chile to help develop a new system to guide and coordinate production.

4.3 Project Cybersyn

In July 1971, Fernando Flores, the general technical manager of the Chilean State Development Corporation (CORFO), contacted Stafford Beer to help develop a new system to help manage the economy.⁴⁰ The aggressive project of nationalization had finally become too much to bear. By the end of 1971, CORFO was responsible for managing 150 businesses and 12 of Chile's 20 largest companies. Allende viewed economic productivity as central to making socialism work in Chile, but CORFO was losing control of the nationalization process essential to increasing productivity.⁴¹ The number of bureaucrats needed to manage these new state-owned industries was growing too rapidly, not to mention the revolt of left-wing workers who were seizing businesses or industrialists who were actively plotting against the Allende regime.⁴² Finding a way to actively and effectively manage newly nationalized businesses was a national priority. To increase production, CORFO desperately needed the ability to monitor industries, analyze data, and quickly make decisions.⁴³ This is the context in which Stafford Beer found himself when he arrived in Chile in November 1971.

Beer arrived in Santiago with lots of leeway from the Chilean government and a prepared report mapping the Chilean economy to the VSM. The idea was to overcome the traditional dichotomy of centralization and decentralization and, in the process, create something organic that aligned with the participatory values of Chilean socialism. This organic system would help lead Chile into a socialist, democratic, and productive future. But before any entity could be built, there must be a way to link the different systems, as the interconnection of the systems is the backbone of the VSM. The Cybernet was the idea to link different systems using telex machines (early faxes). Factories would transmit production data to a single mainframe terminal. Using special software, the computer would register and interpret the data. This software was called Project Cyberstride and was the most significant and encompassing component of Project Cybersyn.⁴⁴ To maximize adaptability and predictability, Project Cyberstride called for

37. Ibid, 29.

38. Medina, 16.

39. Navia und Osorio, „‘Make the Economy Scream’?“, 779.

40. Ibid, 15.

41. Ibid, 51.

42. Schlotterbeck, *Beyond The Vanguard*, 153-155.

43. Medina, 52.

44. Ibid, 69-75.

a simulation of the Chilean economy, known as the Chilean economic simulator (CHECO). With this model, managers at CORFO could experiment with variables and better understand real-time relations between output, taxes, wages, and more.⁴⁵

The last key component of Project Cybersyn was the operations room, or “Opsroom,” the system five of the exceedingly complex Chilean economy. This is where all elements of Project Cybersyn (Cyberstride, Cybernet, and CHECO) would come together. It best encapsulates how the philosophy of Cybernetics, Stafford Beer, and Chilean socialism also came together. Project Cybersyn was developed to “win the battle of production.”⁴⁶ Those in the operations room were, therefore, meant to make decisions without regard to prices or the market. Increasing production and maintaining production were the only goals that mattered. Engineers were, therefore, tasked with finding the most relevant production data for the operations room. A study was conducted analyzing every aspect of production in a Chilean furniture factory, from raw materials and production time to specific varnishing and the impact of humidity levels. This was used to calculate the typical product. The typical product was situated in relation to “capability” and “potentiality” values. Defined respectively as “what we could be doing” and “what we ought to be doing.” Cyberstride would compare and present the actual data with potentialities and capabilities for those in the operations room to interpret. Based on this data, the members of the operations room would decide how to best direct production.⁴⁷

Equality and non-hierarchy were at the center of the Operations room’s design, just as they were meant to be at the center of Project Cybersyn and Chilean Socialism. The operations would be composed of seven individuals from the government elite or the workers. The seven seats made sure that the majority would make each decision. The member’s chairs were arranged circularly, and no member had more say than any other despite any differences in class or education. Each chair had a control panel that allowed members to cycle through data. The inability of factory workers to type led to the control panels being equipped with geometric symbols rather than letters or a keyboard so they could easily view different screens.⁴⁸ The data they were to view would be filtered and transformed into graphic depictions, allowing everyone in the operations room to understand complex production processes. Ideally, these graphic depictions would be updated continuously, allowing the members to coordinate and respond rapidly and actualizing Beer’s vision of a real-time system of control.⁴⁹ The operations room attempted to create the least centrally planned, centrally planned economy that one could imagine.

Far away from the Operations Room were the factory workers who were supposed to benefit from decisions made in the room. Beer’s vision for them was overwhelmingly participatory and democratic, and he viewed himself as having a supportive, not commanding, role in a worker-led reorganization of society. His cybernetic obsession with adaptation led him to believe that worker participation and improvisation would increase the robustness of Project Cybersyn and boost production.⁵⁰ Giving workers more autonomy within the Cybersyn fra-

45. Ibid, 86.

46. Ibid, 50.

47. Ibid, 129-131.

48. Ibid, 125-128.

49. Ibid, 113-115.

50. Ibid, 159.

nework would strengthen the system itself. With this socialist spirit, Beer sought to do away with traditional factory management systems.⁵¹ Technology would enhance individual worker participation in every level of society. Squaring this ideology with the operations room was easy for Beer as the operations room was meant to be making very high-level decisions in direct communication and partnership with the general populace. One of his most participatory ideas was Project Cyberfolk. Through a meter, Chile's citizens would communicate directly their satisfaction levels with the operations room.⁵²

Throughout all of these systems and technologies, the centrality of the individual remained paramount. Adaptation, equality, and democracy were the means to end to give individuals their freedom. Beer's revulsion for the proposed highly centralized Soviet cybernetic system highlights his commitment to these beliefs.⁵³ Upon being asked by Allende whether he would utilize tools from the Communist party or Moscow, Beer replied, "I'm sorry, it's all rubbish."⁵⁴ The Chilean Socialist project wanted to preserve individual liberty, and so did Stafford Beer. Authoritarian top-down approaches were antithetical to what both Beer and the Chilean people were trying to accomplish. The authoritarianism of managers, business owners, and bureaucrats was to be abolished by reorganizing the economy with workers first.⁵⁵ Not everyone agreed that Project Cybersyn could guarantee a non-authoritarian mode of government. But Beer firmly believed that the filtered flow of information to the top of the system would always prevent the central government from obtaining too much power. Autonomy would flourish, and the divide between centralization and decentralization would be abolished.⁵⁶ The Soviet system's insistence on control as domination, centralized flows of information, and red bureaucracy were Beer's nightmare and were strictly avoided in the liberatory conception of Project Cybersyn.

The dream was never fully realized, neither in theory nor in practice. Theoretically, Beer ran into problems with his definition of autonomy and freedom. In the context of Project Cybersyn, he often preferred to use the term "effective freedom". This computational value determined the level of autonomy a firm could have without threatening the whole system. Effective freedom flowed naturally from Beer's definition of control as regulation, not domination. Every part of a system must be subject to control (regulation). Chilean factories would then not be dominated but regulated, always regulated. Complete autonomy was a fantasy in a national economy. Beer did not see this as a theoretical contradiction, but it's easy to understand how some Chileans might have felt deceived or confused by this idea.⁵⁷ In practice, only the network of fax machines known as Cybernet saw the light of day. During what became known as the October Strike, CORFO utilized the Cybernet to keep Allende and his cabinet informed and capable of making up-to-date decisions. CORFO also utilized the system to help organize production, respond to shortages, and help with distribution in real time. While part of a larger economic infrastructure, Cybernet undoubtedly played a significant role during the

51. Ibid, 37.

52. Ibid, 89-90.

53. Ibid, 59.

54. Ibid, 75.

55. Ibid, 8.

56. Ibid, 37-38.

57. Ibid, 181.

strike.⁵⁸ Its effective utilization showed that it could organize production, consumption, and distribution.

Stafford Beer's philosophy, Chilean Socialism, and Project Cybersyn all centered on individual freedom. The Soviet Union's command economy bears little resemblance to the socialism that UP and Stafford Beer pursued. What distinguishes Chilean socialism is its reliance on the emergent power of the people to help guide Chile toward specific political and economic goals. Individual freedom so that individuals can live independently of one another was anathema to the Chilean understanding of freedom. Chilean socialists pursued individual freedom not just for its own sake but because it was also instrumental to the broader cause. Individual freedom was necessary to give rise to the emergent power of individual interactions to coordinate society. Project Cybersyn was to harness this emergent power in a computer system capable of adaptive control. Cybersyn would direct this emergent power towards a common goal laid out by the UP government. Instead of anarchy in the market, Chile would have a union of producers who could exercise a collective political will and achieve specific goals.⁵⁹ A maximally decentralized centralized system would engage in adaptive control of the economy to harness the emergent power of social coordination that exists when individuals are able to interact freely within an economy.

58. Ibid, 148-152.

59. Arboleda, „Development as National Liberation“,27.

5 Evaluation

Measuring social coordination or the alignment of all individual plans in society is difficult. Some social scientists resort to economic growth or social stability as a proxy for showing this alignment. Hayek bases his much of his argument for the superiority of markets on his societal Darwinism. He argues that because market societies dominate the world, they are, therefore, the best form of social organization. Likewise, the ontological and epistemological properties these societies rely upon must also be the best. This thesis has rejected the former claim but embraces the second. This chapter contends that market societies can mutate and retain the core ontological and epistemological emergence that Hayek finds so appealing. The developed criteria reflect the core characteristics that make social coordination possible. Project Cybersyn is an evolutionary mutation of the market that still contains the core characteristics necessary for Hayek's definition of social coordination. Here, I evaluate Project Cybersyn according to the criteria and then provide an analysis of recent failings in the calculation debate and how one might consider alternatives.

5.1 Cybersyn and the Knowledge Problem

Project Cybersyn was a centralized planning mechanism used to monitor and control production in Chilean state-owned industries. Beer's desire to transcend the tension between centralization and decentralization was groundbreaking but never realized in theory or practice. The project relieved as much tension as possible between the dichotomy, but the Opsroom, had it been functional, would have become Chile's authoritative central planning committee (albeit much weaker than previous iterations of the idea). The project was both monetary and non-monetary at different levels. The Opsroom's capabilities and potentialities approach was an entirely non-monetary method for making economic planning decisions.¹ However, the Chilean economy was still monetized. Given their autonomy and access to information, sectors, factories, and individuals could have made decisions based on price signals.² This evaluation will focus on the Opsroom as the central planning committee, which would have granted autonomy to factories as it saw fit. Still, references to the role of money as driving coordination will persist. Additionally, the Chilean government would have controlled the autonomy of the Opsrooms as CORFO was a state agency; therefore, it is essential to highlight the differences between the philosophy of Project Cybersyn and that of the Allende government. The design and function of Project Cybersyn were heavily influenced by Chilean socialism; however, the project was never fully adopted by the government, and key differences remained between the two projects.

1. Medina, *Cybernetic Revolutionaries*, 129.

2. Ibid, 106.

5.1.1 Criteria 1a

Project Cybersyn and the Chilean government's relationship with economic freedom differed in ways that complicate the fulfillment of criteria one. Beer, Flores, Allende, and the engineers who worked on the project all saw individual political freedom and autonomy as one of their highest goals.³ Economic freedom was a different consideration. The freedom to make uninhibited decisions regarding (i) consumption, (ii) production and (iii) entrepreneurship were core goals at best and vilified at worst. Advocates of Chilean socialism saw consumer choice as the only economic freedom relevant to their political project. Winning the battle of production was primarily about providing consumers with a higher quality of life by allowing them to purchase more consumer goods.⁴ Individuals were encouraged to buy and select different types of consumer goods and raise their standard of living. The Allende government was trying to meet increased consumer demand driven by wage increases. Still, it was ultimately struck by shortages due to capital flight and the unwillingness of the United States to sell capital goods in Chile.⁵ Even though it faced setbacks, Chilean socialism did everything possible to allow consumers the freedom to consume what they pleased. Consumerism was equally an important part of Project Cybersyn. In 1974, Beer wrote an essay entitled *Cybernetics of National Development*, he saw Project Cybersyn as playing a key role in national development, economic growth, and consumerism.⁶ The individual came first in the structure of Project Cybersyn. Consumer choices were naturally unregulated, and individuals could purchase whichever goods they chose. Both Chilean socialism and Project Cybersyn could have fulfilled criteria 1a(i).

Production decisions were largely autonomous in both Project Cybersyn and Chilean socialism. The autonomy of factory workers to make rapid decisions based on tacit or scientific knowledge is a direct component of Project Cybersyn. Beer saw this ability as one of the project's main features. Not relying on central planners for every decision would give factories flexibility they would not otherwise have. Factories, sectors, and systems can independently communicate, source materials, and coordinate actions through the framework of Project Cybersyn.⁷ Further, a new decentralized management structure would also increase workers' ability to make decisions based on tacit knowledge. Project Cybersyn sought to change how factories were managed and give workers more control over their workplaces.⁸ This would allow workers to have more say and act more confidently based on their tacit knowledge of production processes. Other decisions, such as decisions typically related to management, would be subject to democratic workplace procedures. Democratic deliberation might pressure those with tacit knowledge to articulate their tacit knowledge. The solution to this impasse is for all (or at least most) workers to either develop their tacit knowledge about decisions that were traditionally made by management or simply learn to trust colleagues with tacit knowledge to make decisions. This freedom and workplace democracy was, unfortunately, subject

3. Ibid, 30.

4. Schlotterbeck, *Beyond The Vanguard*, 116.

5. Espinosa, „Salvador Allende's Development Policy“, 99.

6. Medina, 225.

7. Ibid, 73.

8. Ibid, 161.

to change in times of shortage or crisis, as the Opsroom always retained the ability to limit the freedom of lower systems. Chilean socialism carried identical values of worker democracy and production autonomy. Under normal conditions, Project Cybersyn and Chilean socialism could fulfill criteria 1a(ii).

Project Cybersyn and Chilean socialism's relationship with entrepreneurship is a more complicated topic. As someone intimately involved in the private sector, Beer knew the value of creating new firms and industries. Nothing in Project Cybersyn explicitly suggests that entrepreneurship was to be disallowed. The autonomy of the individual and of system one suggests that there would be no problem if an individual wanted to start a new firm. No documents seem to exist that indicate that individuals would be prohibited (or allowed) to use their tacit knowledge, coordinate with other firms, and procure the labor and materials needed to start a new worker-owned firm. Project Cybersyn would have been able to fulfill criteria 1a(iii). Chilean socialism was not able to fulfill this criterion. In 1972, Allende created entry barriers for entrepreneurs, making it more difficult for individuals to make entrepreneurial decisions based on tacit or scientific knowledge.⁹ While the two projects are interwoven, Stafford Beer envisioned Project Cybersyn as a politically neutral technology. It was supposed to make the economy adaptable, democratic, and resilient. Aspects of Project Cybersyn that appear political, such as the Opsroom's factory floor, were seen by Beer as politically neutral steps toward developing Chile's economy. For this reason, (iii) entrepreneurship could be worked into Project Cybersyn. Chilean socialism, as a political project, saw itself as being far from a neutral force. Its disdain for capitalism led to its rejection of entrepreneurship and its inability to meet criteria 1a(iii).

5.1.2 Criteria 1b

Fulfillment of criteria 1(b) requires a framework of laws, norms, and institutions that successfully communicates a shared value framework. In contrast to criteria one, there is a strong overlap between Project Cybersyn and Chilean socialism regarding their fulfillment of these criteria. A complete evaluation would comprehensively outline the framework of these two systems. With limited space, it is sufficient to outline how the structures would have likely been constituted under Project Cybersyn and Chile Socialism. Chile partly determined the laws, norms, and intuitions of Project Cybersyn, but the project also had a separate framework based on the Viable Systems Model. The organizational structure of Project Cybersyn was based on this model, and, in many ways, it entails its own legal and institutional framework. The division of the systems, the filtering of information, the differing levels of autonomy, and the rearrangement of the workplace all constitute a restructuring of laws and institutions that follow from the imposition of Project Cybersyn. Though it had trouble in practice, Chilean socialism was theoretically consistent in its desire for a democratic, bottom-up approach to governing a socialist Chile. There is no reason to doubt that the laws, norms, and institutions of the UP government would have existed and been functional had Allende survived the coup.

These laws, norms and institutions would be the transmitters of the shared value framework in Chilean society. Fortunately the shared value frameworks imposed by Project Cybersyn and

9. Espinosa, „Salvador Allende's Development Policy“, 104.

Chilean socialism had roughly the same content. Criteria 1(b) requires that the social framework of laws, norms, and institutions allows everyone to have a shared motivation. Project Cybersyn and Chilean socialism sought to create a planned economy. The shared value framework in this planned economy would have been the long-term plan. Given the authority, those in the Opsroom could have set a central plan. However, as a branch of CORFO, the Opsroom would have been at the mercy of the UP. Project Cybersyn was meant to monitor and increase production and not to formulate comprehensive economic plans.¹⁰ The Chilean government would likely have devised long-term plans and used Project Cybersyn to implement them. A long-term plan's shared value framework could be easily communicated throughout society. The participatory bottom-up approach of Chilean socialism, if successful, would have likely entailed a bottom-up approach to long-term economic planning. Given enough time, it might have come to resemble decentralized planning. Access to more consumer goods or the creation of labor-saving technologies could have been quality-of-life goals driving long-term plans. On its own and in conjunction with Chilean socialism, Project Cybersyn could have fulfilled 1(b).

5.1.3 Criteria 2

The last criterion is to explain the mechanism that brings together the plans of all individuals or how, within a framework, individuals can generate emergent social coordination through their actions. This coordination needs to depend on both ontological and epistemic emergence. Ontological emergence is given by the framework which allows individuals to take the necessary economic actions. Epistemic emergence is more complicated and relates to the ability to communicate information rapidly and accurately, similar to the price system. Chilean socialism did not clearly articulate a future without money or prices and would likely still rely on a system of *centralized* prices for social coordination. This was evident in the frequent use of price and wage controls under the Allende government. Hayek would likely consider this a failure. An altered price system with strict controls and limited response times would not generate the epistemic emergence Hayek believed the price system contained.

Project Cybersyn, on the other hand, would have relied on constant efficiency measurements (capabilities and potentialities) for epistemic emergence and thus as its mechanism of social coordination. Using the structure of the VSM Project Cybersyn could have coordinated production, consumption, and distribution to all individuals in society based on the labor hours of individuals and the efficiency of different industries. Whether individuals are making long-term or rapid decisions to change production processes in their factories, start a new enterprise, or consume different goods, Project Cybersyn could distribute the necessary information needed for individuals to make decisions as well as to record and communicate the consequences of other decisions. In a cooperative version of Project Cybersyn, the mechanism of emergent social coordination would be well-communicated efficiency and labor vouchers. Enabled by critical technologies such as Cyberstride and Cybernet. All systems throughout Project Cybersyn would have access to the real-time data they need to update their plans and coordinate their actions.

10. Medina, 47.

This system could potentially have been faster and smarter than the price mechanism and generated an even better form of epistemic emergence. Near-instant communication and relatively quick processing of large data sets would allow firms to make more accurate and informed decisions. The price system faces problems like lag or asymmetric information. With cooperation across industries and among firms, information would be communicated quickly and directly. Individuals and firms would then be free to adapt their plans and make new decisions based on updated production data. The role of this production data would be similar to the role played by prices. Data about which goods are being produced efficiently or which goods are being demanded would allow people to find places to become entrepreneurs in a potentially more efficient way than prices. With knowledge about demand or labor efficiency, one could begin an enterprise knowing what other firms are doing that causes efficiency. Cooperation and knowledge sharing between firms could allow for greater productivity overall. The phenomenon of epistemic emergence, which Hayek believed exists only in the market, would come to exist outside the market in a potentially more accurate and rapid form.

The interactions between free individuals within the framework of Project Cybersyn and with easy action to any production data (instead of price signals) would likely generate the ontological and epistemic emergence needed for the economy to have the causal power of social coordination. This was Beer's direct goal. He wanted to generate robust emergent phenomena using technology.¹¹ The VSM structure of Project Cybersyn would allow for the autonomy of different body parts under the brain's broad direction. These parts have set functions, and their autonomy could theoretically be limited, but the ability of these parts to interact would generate an emergent causal power of coordination. The body, like society, would be able to sustain itself independently under the guidance of goal-driven planning.¹² A spontaneously ordered but still structured system capable of coordinating the plans of individuals and consciously planning the future.

5.1.4 Discussion

At its advent, Hayek recognized the deep similarities between his own thought and that of cybernetics. In the post-war period, Hayek became familiar with the science of cybernetics and began to reference it in his work on theoretical psychology and systems organization. The cybernetic concept of feedback loops was particularly useful to him. Norbert and Ashby used this concept to describe how humans psychologically engage in teleological actions. If one wants to pick up a pencil and fails to do so, a negative feedback loop is triggered until one successfully picks up the pencil.¹³ Hayek used this concept to explain how individuals continuously adjust their plans in light of price signals to complete their desired actions.¹⁴ Additionally, the cybernetic understanding of self-organizing systems leads Hayek to use the term 'homeostatic control' in his essay *Notes on the Evolution of Systems of Rules of Conduct*. There, Hayek echoed the cybernetic idea of control and suggested that in orders with insect-like structures and division of labor, it was possible to steer the group milieu but not

11. Ibid, 22.

12. Ibid, 38.

13. Lewis, *Purposeful Behaviour, Expectations, and the Mirage of Social Justice*, 14.

14. Ibid, 16.

the individuals.¹⁵ The integration of cybernetic conceptions into Hayek's thought shows that he recognized the parallels between his own ideas and those of the new discipline and was influenced by them.

Despite the acceptance of cybernetic ideas his embrace of its core philosophy was ultimately limited. The behaviorism of cybernetics pushed against Hayek's subjectivist tendencies.¹⁶ Hayek believed that mental states are important, especially in economics. His embrace of tacit knowledge and its performative epistemology bears only a practical resemblance to cybernetics. The performative epistemology of cybernetics is behaviorist.¹⁷ Cyberneticians view 'knowledge' as mere information that can be measured. When faced with unassimilable forms of information, such as tacit knowledge, cyberneticians opt for the black box. If a behavior was exceedingly complex, a cybernetician could black box it as part of a wider system, paying attention to it only as it relates to the wider system and attempting to learn as much as possible about its response to different inputs. Humans would be treated similarly under Project Cybersyn.¹⁸ The behavior of each individual does not need to be measured, nor does the system rely on the unreliable or sometimes false mental models that individuals carry. Instead, individuals can act freely within the confines of the black box to produce emergent coordination. The higher systems will monitor and assimilate the output into the model. Cybernetics is an enacted behaviorism that, while different from Hayek's subjectivism, does not necessarily contradict it. Mental states are more than allowed to exist within a black-box environment. Most importantly, the structure and organization of Project Cybersyn are not dependent on reading, analyzing, and controlling the black box outputs of individuals. These outputs would be only of many pieces of data that would help those in the Opsroom guide the economy toward social coordination.

Traditional command-style economic planning is incompatible with Hayek's philosophy because it is rational and centralized and views social coordination independently of mental states. From Hayek's perspective, centralization, economic planning, and behaviorism are all reflective of constructive rationalism. Project Cybersyn works to fulfill Hayek's criteria because it is not (like many other 20th-century socialist projects) derived from constructive rationalism. Stafford Beer sought to resolve the conflict between centralization and decentralization, economic planning and spontaneous order, behaviorism and subjectivism. Project Cybersyn would be a 'self-organizing system through the devolution and autonomy of systems.'¹⁹ Combining centralized economic planning with a highly decentralized base meant that Project Cybersyn did not need to meticulously plan every detail of the economy. It was a system of *adaptive control* not total command or domination. The project remained reliant on emergent properties by giving individuals an enormous amount of latitude to engage in production, consumption, and (potentially) entrepreneurship. In response to more autonomous forms of planning, Hayek says that many separate plans cannot form a planned whole.²⁰ At the time of Project Cybersyn, Hayek might have still been within his rights to doubt its ability to integrate

15. Oliva, *The Road to Servomechanisms*, 34.

16. Lewis, *Purposeful Behaviour, Expectations, and the Mirage of Social Justice* 19.

17. Ibid, 15.

18. Medina, 178.

19. Hancock, „Spontaneity and Control“, 14.

20. Lavoie und Coyne, *National Economic Planning* 125.

data into a larger plan and system of adaptive control. This Hayekian objection only goes to show that computational objections would be the last honest resort for a Hayekian objection to Project Cybersyn.

As I have recognized extensively throughout this thesis, the reason for the knowledge problem, for Hayek's rejection of Project Cybersyn, is political rather than economic or even philosophical. Max Hancock writes that the fundamental difference between Beer and Hayek was that:

Beer believed that subordinating politics to the exigencies of the market augured against individual liberty, and Hayek was convinced of precisely the opposite.²¹

Beer saw humanity (and himself in particular) as being able to design (spontaneous) intuitions with emergent properties of social coordination. These institutions could black box the individual and allow for political and economic freedoms to exist alongside a stable pursuit of a consciously chosen collective goal guided through a system of adaptive control. That emergent institutions could be rationally designed or could potentially serve the cause of individual freedom was inconceivable to Hayek. His conservative tendencies led him to believe that spontaneity and evolution were the yardsticks on which institutions should be judged. If an institution had not evolved through spontaneous articulate and non-articulated historical processes, it could not achieve an adequate level of social coordination.²² But contrary to Hayek, acting rationally does not mean separating ourselves from history or abandoning tacit knowledge; Marx himself was against such a suggestion.²³ It is possible to rationally (not spontaneously) generate institutions based on historical and material conditions. Rationally designed institutions do not need to make a complete break from the past. These rational institutions can adapt and evolve over time. Hayek is correct; rational constructivism is a failed ideology, but he is mistaken in who and what he chooses to include under the banner of rational constructivism.

The fitting of Project Cybersyn into Hayekian criteria works because Project Cybersyn would have functioned with allowance for decentralization, spontaneous growth, and a neutral attitude to mental states. Beer and Hayek shared beliefs about the importance of emergent social coordination, a phenomenon that they believed stemmed directly from the interactions of free individuals.²⁴ With the individual at the center of their models, Beer and Hayek could not have agreed more about the importance of liberty in social systems. With the right amount of liberty within a fixed structure, the natural interactions of individuals would lead to social coordination. Beer and Hayek disagreed on the need for prices to coordinate these interactions. This reflected their diverging views on centralization. For Hayek, centralization is an unnatural, rational phenomenon that seeks to impose a behaviorist worldview on individuals with unassimilable mental states (tacit knowledge) that are crucial to the achievement of social coordination. For Beer, centralization is necessary to balance the collective good with individual freedom. Appropriate amounts of black boxes and decentralized systems could ensure

21. Hancock, 19.

22. Sciabarra, *Marx, Hayek, and Utopia*, 11.

23. Ibid, 75.

24. Hancock, 12.

liberty, structure, and social coordination. The two views are irreconcilable. Here, I have attempted to reconcile as much as possible, but Hayek's conservative belief in the evolutionary superiority of our present social systems (a belief that precedes his critique of rational constructivism) puts him forever in opposition to a designed social order like Project Cybersyn.

5.2 Past The Calculation Debate

Chapter One separated the philosophically salient elements of Hayek's economic theories regarding social coordination, looking specifically at his paper *The Use of Knowledge in Society*. Hayek's philosophy of social order contains aspects that appear transcendent. The idea that social coordination is when the plans of all individuals fit together can apply to any system of social organization. Further, the idea that individuals need a framework within which to interact can again be applied to many different societies and economic structures. Other elements of his philosophy were limited to his time and specific worldview. The idea that entrepreneurship is critical to the functioning of an economy was a conclusion driven by circular reasoning. By identifying society with the market, Hayek and other Austrian thinkers see market competition as the only discovery procedure available to humanity. Rather than seeing competition and entrepreneurship as an effect of the market structure and shared value framework, Hayek interprets them as necessary components of a broader social order. Hayek presents entrepreneurship as the only outlet for human action in the economy. Max Nieto succinctly states: "In short, Austrian School authors mistake the general conditions that would define any complex social order for the features of a specific social order (such as the capitalist order.)"²⁵ The criteria from Chapter Two were forced by this circular reasoning to include entrepreneurship as a universal element of social order.

Circular logic is a fatal flaw for the Austrians in the calculation debate, but left-wing political and economic thinkers make similarly serious mistakes. They have come to believe that computing technology has given them an upper hand in the calculation debate. Most tend to think that this advantage is due to the ability of computers to perform immensely complex calculations in fractions of a second. In their book, *The People's Republic of Walmart*, Leigh Phillips, and Michael Rozworski argue that corporate planning done by companies such as Walmart and Amazon demonstrates the ability of centrally planned economies to achieve social coordination. They argue that the computing power available to us now will allow a future planning committee to perform economic calculations that the Soviet Union or Project Cybersyn could not access. Contemporary Austrian economists point out that these arguments fail spectacularly in their attempt to prove the feasibility of socialist central planning. The distinction between economic planning and a planned economy is crucial. Where economic planning is something Hayek embraced, a planned economy is a centralized, encompassing economic system * The suggestion that modern supercomputers give us the tools to solve the calculation debate further presumes that prices will still exist under socialism and that social coordination does not or will not rely on tacit knowledge. This is a flat denial of the objections raised by Austrian economists as well as a denial of the ability of communism to abolish the value

25. Nieto, „Entrepreneurship and Decentralised Investment in a Planned Economy“, 141.

form. Popular left-wing contributions to the calculation debate aim to prove the calculation is possible while forgetting the more important criteria of emergent coordination.

The work of this thesis was to treat Hayek's thought with philosophical rigor. Analyzing his philosophy and developing criteria was done with seriousness. Unfortunately, applying this criteria required a lack of seriousness. Project Cybersyn was never fully tested, and its success in fulfilling the criteria can never be guaranteed. The project of developing and applying criteria for the Hayekian knowledge problem is nonetheless a worthwhile pursuit as it points to the possibility of socialist fulfillment even within Austrian economists' circular logic and criteria. Beyond the fulfillment of Hayekian criteria, we can look to a future without the historically specific forms of competition and entrepreneurship as the sole discovery procedures in a society. In an ideal world, there would be designed structures of human activity "that accept the fundamentally self-directed, spontaneous, and creative character of human action."²⁶ Technology is the means by which this future could potentially be realized, but only insofar as developed technology embraces human individuality and freedom.

Beer himself sought to avoid an over-reliance on computing technology. The employment of biological metaphors was his way of stepping over technical aspects and into the human. Beer staged a non-modern performative ontology. One where computing technology is used actively and equally with human input. The idea of romantic cyborgs is a useful conceptual framework for imagining this future. That an information-centered approach to technology will bleed away and an organic but still technologically mediated form of social reality will emerge is something to hope for. We can imagine a future where we no longer see computers as machines but as extensions of ourselves and society.²⁷ Jasper Bernes refers to a kind of "planarchy" Where the link between control and calculation is severed. Beer's effective freedom was a way to control society when faced with the need for calculation. An ever-present but unnoticeable technological apparatus will become an unconscious extension of our social reality and integrate our free, unhindered decisions into a calculus that can perpetually meet consumer demand. The collapsing of the division between the physical world and the world of information will not overcome the calculation debate but will subsume it. We will have reached a point where divisions between centralization and decentralization, rational planning and economic freedom, and behaviorism and subjectivism will be assimilated. Beer tried to live this reality with his organically modeled VSM, but he was limited by the technology of his time. What future technologically assisted alternative economic systems will look like exactly is impossible to say, but Project Cybersyn shows that these future systems should, in theory, be tolerable to Austrian economists.

26. Bernes, „Planning and Anarchy“, 70.

27. Coeckelbergh, *New Romantic Cyborgs*, 154-167.

6 Conclusion

Men make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly encountered, given and transmitted from the past. The tradition of all the dead generations weighs like a nightmare on the brain of the living.¹

The ideas promulgated by Hayek and Beer played out very differently over the course of Chilean and world history. On September 11th, 1973, General Augusto Pinochet overthrew the Allende government in a violent military coup. Pinochet had little use for or understanding of Project Cybersyn, and it was promptly shut down. Beer was lucky enough to have been living in England at the time, but many others who worked on the project, such as Flores, would become imprisoned under the authoritarian regime. Beer was devastated by the coup and the policies of Pinochet. In a CBC radio broadcast some time after, Beer stated, “You all know what happened. On 11th September 1973, Salvador Allende died in a bloody business, of which the consequences for mankind are incalculable today.” No calculation can determine what might have been had the Allende regime survived. Project Cybersyn might have very well solved the knowledge problem or transcended it entirely to achieve an entirely new social order. Analysis and speculation can serve to unveil the deeper philosophical points about social coordination, emergence, centralization, and much more. This thesis analyzed Beer’s ideas within the context of Hayek’s thought, not least because of what came after the coup.

Stafford Beer’s failure became Frederich Hayek’s greatest success. The Pinochet regime’s free market economic policies made Hayek a staunch defender of the new Chilean Government. Hayek visited Pinochet’s Chile twice and was appointed honorary chairman of the think tank most responsible for Chile’s economic transformation.² Hayek and the famous “Chicago Boys” became the faces of economic liberalization in Pinochet’s Chile. Economic freedom through authoritarianism was preferable to Hayek than any freedom sought by Allende. While the Western press painted a stark picture of mass disappearances and opposition figures dropped from helicopters, Hayek would complain that Pinochet was a victim of a negative propaganda campaign.³ During one visit to Chile, Hayek even coined the phrase “Chilean Miracle” to describe the period of economic growth. When faced with contradictions between his love of liberal democracies and the political and economic freedom they provide with his embrace of the Pinochet regime, Hayek said that deviations from the norm sometimes have to occur in transition periods but that, hopefully, these periods are temporary.⁴ Hayek was

1. Marx, *The eighteenth brumaire of Louis Bonaparte*, 5.

2. Caldwell und Montes, „Friedrich Hayek and His Visits to Chile“, 288-289.

3. Ibid, 283.

4. Ibid, 300.

shamelessly inconsistent in his morals and principles and favored conservative free markets wherever or however they might emerge.

The failure of Beer and the success of Hayek cast a large shadow. Beer's ideas were at the forefront of technology and economics but were cast aside. Hayek's ideas shaped the global economy and continue to enjoy largely unchallenged ideological hegemony. 1973 can be looked at as a defining year of economic ideology. A year when a potential alternative, one that should have satisfied Austrian economists, was violently struck down. This was also the year one could have astutely observed the overt contradictions and dishonesty of the Austrian school and the neoliberal ideology it spawned. We will never know a world in which Beer's ideas had won out over Hayek's, but this thesis showed that Beer's and Hayek's ideas are not as different as we imagine and that it is perhaps only a matter of historical contingency that we live in Hayek's world and not Beer's.

Abbildungsverzeichnis

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