Ignorance and Humility: Markets in an Uncertain World

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Abstract: The problem of dynamic change and knowledge has long preoccupied free-market economists. Following the philosophical tradition from Hume to Kant, which sought to use reason to temper its own excesses, this paper argues that economics must undertake a similar task. Formal equilibrium models have sidelined the problem of ignorance, when it ought to be central. We propose that under a connectionist model of the human mind, economic analysis must shift from 'things in themselves' to agents' interpretations of objective facts. These agents are not passive receivers of sensory data; rather, the mind actively imposes order through structures shaped by experience, institutions, and rules. Crucially, these institutions emerge through species-learning and group selection, forming a pre-cognitive framework that enables social coordination. We contend that equilibrium theory must incorporate the human mind as a fundamental unit of analysis. In doing so, we advance a dynamic, subjectivist conception of equilibrium—one rooted in 'plan-compatibility' among agents.

Keywords: Austrian Economics, Ignorance, Connectionism, Epistemic Humility, Plan-Compatibility, Equilibrium Theory

JEL: B41, D87, D83, P16, D50

INTRODUCTION

A central feature of the social sciences is the dynamic change of human societies. Unlike a mechanistic view of simple systems, the social sciences study various kinds of complex systems. At the heart of these complex systems is the fundamentally elusive human mind, many millions of them. This places the economist firmly as a student of complex human orders, ones which arise from human action, but not human design (Hayek 1960, p. 57).

This central feature of complex systems is not merely a quirk; it is a fundamental character. Institutions have arisen over time precisely to cope with radical ignorance not only of the future, but of other individuals. A society that has no predictability about its neighbour's behaviour tomorrow could never possibly develop the extent of coordination and innovation that we have today. These institutions operate under the principle—not of treating men at their best—but of 'constraining them at their worst' (Hayek 1948, pp. 11-12).

The study of the mind is a complex endeavour, and one which may bear more resemblance to the kinds of institutions that we have developed than may first appear the case. Indeed, the mind is not static. It is an adaptive system which evolves in reference to its outside conditions. The standard conception of

the mind within economic theory is an ontologically atomistic one; the mind is merely a passive receiver of rational optimisation. It is neuroscience, and an investigation into the sensory order that reveals this conception to be inadequate at addressing human behaviour.

We propose a model of the human mind which operates as a categorisation system; data is not just received but fundamentally 'ordered' into different categories based on abstract rules and previous experience. Objects do not elicit certain reactions based purely on their physical qualities, as many objects have similar qualities, yet vastly different reactions. The mind develops certain categories over time through synaptic weights, and neurons fire off in specific patterns to signify or 'reference' categories. If this fire-off pattern proves to have successful predictive power, the linkage between the neurons grows and strengthens the category; if not, then it weakens, and the mind adapts to new patterns that govern thought.

This framework reveals that the mind must, to act, use more knowledge than any individual is capable of knowing. Upon consideration, we can see that our thought processes are governed by many abstract rules which we cannot explain in their totality. Many of these rules were never consciously adopted; we cannot say with any certainty as to why we follow them, and we do not know with any precision what function any specific one serves. What we do know, however, is that these kinds of institutions enable men to act wisely when they are ignorant. They know 'how' but not 'that'. This is a direct function of rules and institutions.

We expand this further into economic methodology. In particular, we argue that equilibrium theory is challenged at its very core under this model. The theory presupposes a static and passive ontology of the mind, leading to less than reasonable abstractions about reality. It views epistemic signals—such as prices—to be fundamentally given 'behavioural commands.' We dispute this, seeing interpretations and expectations about epistemic signals as rule-driven behaviours that come about through agents being taught to behave in such ways, not driven by an inherent 'essence' of the signal. Models such as perfect competition, rational actor theory, or even rational expectations are all underpinned by these base ontological assumptions

We argue that this shift into a connectionist model of neuroscience—one where the mind is continually evolving, and a dynamic system of neural linkages—provides the core foundation for a subjectivist branch of economics. While recent literature has explicitly endorsed more agent-based modelling, such as information economics and Austrian economics, they have not fully integrated this vision of neuroscience as a foundation. Here, we attempt to not only make this model explicit in the context of subjectivism but also frame it as a core ontology. We also attempt to clarify some of the different kinds of rules and institutions, and their relationship to articulation in a formal typology.

This essay examines the fundamental links between economics, philosophy and neuroscience in terms of knowledge. We begin by examining the method of robust political economy, a new analytical apparatus which is based on the epistemic limitations that we face. We then turn our attention to the intricacies in the theory of knowledge, its fundamental limits and why objective facts become actively interpreted within a pre-existing framework. Individual agents are, in this sense, 'thrown' into a world of pre-conceived notions and abstract rules. The connectionist framework makes a new ontology clear: subjectivism—with a clear recognition of holistic attributes—can be the only sufficient answer to base our concept of expectations and decisions. Finally, we examine the consequences of this connectionist framework on the theory of equilibrium and a new alternative, which is closely rooted in the human mind.

ROBUST POLITICAL ECONOMY

The robust political economy stems from Adam Smith's traditional concept that a good policy does not rely on either benevolence or omniscience. It takes men as they are—rational, but imperfect. Market participants have a particular teleology; they aim towards their own disparate and separate goals, and the market arises from this conglomeration. The market does not have a teleology, or goals of its own; it is the web of interrelationships between individual units, a process which gives rise to structures not reducible to those

individuals directly. The institutional arrangement which results is a whole greater than its parts, embodying the web of voluntary relationships which individuals have mutually entered into (Buchanan 1999, pp. 244-245). We are immediately left with a pressing question: if market agents have imperfect knowledge of the world and of each other's competing plans, how is social order and coordination possible?

The knowledge required to make up any economic decisions exists tacitly in the minds of millions of individuals, only to be revealed dynamically by a process of profits and losses. If a business or planner knew ex ante exactly in what proportions each output was required to create a general equilibrium, it would be quite easy to assume that any system could work under these conditions (Mises 1966, p. 696). The problem of the economic system is not to optimise outputs according to given static conditions, but to determine the best use of available resources for the plans of producers and consumers through time (Hayek 1968, pp. 15-16).

The conditions of so-called static analysis, which are typically imposed, are: complete or perfect information, equally informed participants, perfectly flexible prices, complete markets, low or no barriers to entry, and perfectly rational actors. In the name of abstract analysis, static models assume away the entire economic problem (Boettke 2004, p. 100). The robust political economy requires that a system demonstrate its ability to adapt to systems of less-than-ideal conditions, rather than how it functions in the perfect case. Institutions in this world possess the role of coping with ignorance.

The robust political economy then requires a confrontation with this problem of knowledge, even if we assume that a planner is completely benevolent, a framework for regulation or planning becomes immensely difficult without the kind of knowledge required for the planning. A system must grapple with these issues, not simply abstract from them. If it cannot be established by way of analysis that, without these assumptions, a system of coordination cannot in fact coordinate, a robust political economy may deem this a bad system.

As will be examined further in the rest of this paper, this confrontation with knowledge is necessary as the human mind is a system based directly on connectionism (a theory of cognitive processes arising from interconnected fundamental units). Unlike natural sciences, the human sciences must deal with constitutive beliefs. Our very expectations can give rise to behaviour and outcomes that fulfil those expectations. Robust political economy, in this sense, is an analytical apparatus that challenges us to remain within a reasonable epistemic stance. Unlike the method of French rationalists, it does not assume that human reason and knowledge are boundless. Rather, it is based on the fundamental recognition that objective facts in themselves are not sufficient. We are active interpreters of facts, and those interpretations are bound by rules and institutions along with prior experiences.

Economic actors also respond to incentives. It is insufficient in the eyes of robust political economy to view a system as working 'if only human nature had changed.' It must deal fundamentally with the world in which we exist and provide an 'institutional filter'—such as private property and the rule of law—to channel self-interest into public benefit (Smith 1776).

By firmly rooting robust political economy in a connectionist model of the mind, this paper provides the cognitive micro foundations for the epistemic humility central to the RPE framework. Doing so yields a more realistic model of human behaviour and strengthens the case against economic theories that overestimate the capacity of human reason.

THE PROBLEM OF KNOWLEDGE

The knowledge problem was a concept introduced by Friedrich Hayek over the course of the Socialist Calculation Debate (Hayek 1945, p. 520). The argument follows directly from Ludwig Von Mises, who argued that in the command economy, there was no feasible system of economic calculation. The planner—without access to prices—could not assess what the relative costs of production are for input goods. Without prices, it is not possible to know which inputs are more urgently required, which close substitutes

should be used, and which inputs should be allocated in the production of another final good (Mises 1920/1990, p. 20).

Hayek stressed that prices conveyed knowledge—they signalled a shift to particular kinds of behaviour that individuals followed without ever having to know why. The planned economy requires this kind of systematic knowledge of products to be available to the bureau, where they can maintain access to private consumer wants and the relative opportunity costs of production. Yet, this kind of systematic knowledge requires the planner to be a step raised from the rest of humanity. In his seminal essay, Hayek (1945, pp. 519-520) wrote that:

> The economic problem of society is thus not merely a problem of how to allocate "given" resources—if ''given' is taken to mean given to a single mind which deliberately solves the problem set by these "data." It is rather a problem of how to secure the best use of resources known to any of the members of society, for ends whose relative importance only these individuals know.

The task of any social science is to explain not how men can design extensive and substantial orders, but how they can come about without anyone in particular 'designing' the whole system (Hayek 1945, p. 528). The problem which we face is not taking a given function and optimising the output, but that the entire system of knowledge is bound in a very decentralised fashion and is dynamic in and of itself. Information constitutes a stock of tangible data, whereas knowledge is a flow that emerges from the process itself (Boettke 2002, p. 266) and the tacit underlying rules which bind the structure.

Standard search theory treats the knowledge concept as a stock—perfect in principle but imperfectly known. Actors under this will search until the marginal cost equals the marginal benefit. However, not all knowledge is available to be 'searched' for, as not all knowledge currently exists, or there is no alertness to it. Being exists in this constant flux of discovery, and then discoveries are made based on those discoveries (Shackle 1972, p. 156).

Knowledge is not static; it is a flow through time. Even if we knew all of the directly accessible and public information, we would be in no position to plan complex systems. Other kinds of knowledge are necessary for this plan, such as the decentralised knowledge of time and place. We also have to forecast into the future to try and anticipate what kinds of new knowledge will be created, but does not yet exist. This is contained in a largely non-articulable form within the minds of many individuals.

Civilisation is built on the central component that, despite not knowing what comes tomorrow, if we err, society does not come crashing down. The span or control of resources in complex industrial economies is far beyond the scope of any one person or organisation (Lavoie 1985, p. 58). Through the continued use of statistical aggregates and mathematical analysis, we have systematically neglected the issue of time and place, and unseen opportunities. The knowledge problem shows that the world of top-down conscious design could never produce the institutions necessary for growth and coordination; only the process of many individuals interacting with each other can do that.

The way in which mainstream economics prescribes knowledge as a stock is fundamentally detached from the subject itself. While there exists a kind of objective true or false category of knowledge, the vast majority of knowledge that economic planning requires is not known in the same sense. The statement 'all triangles have three sides,' for instance, differs widely from the statement 'I prefer apples to oranges.' The former statement is a detached category of truth, which exists independent of knowing subjects; the latter is a subjective judgement that does not have the same detached truth quality. It is fundamentally linked to a knowing subject, and tied to their values and beliefs (Ibid.).

In this sense of learning, as knowledge grows, it is not true that we necessarily converge closer to the truth, but actively acquire interpretation skills to adapt and create new knowledge in a dynamic world. For our purposes, this does not reduce ignorance or uncertainty to any reliable degree—but proves we have 'not yet falsified it' (Mitra 2020). This sentiment was touched on by both Michael Polanyi and Karl Popper. Peter Godfrey-Smith (2003, p. 81) writes:

> If the prediction does come out as predicted, then all we should say is that we have not yet falsified the theory. For Popper, we cannot conclude that the theory is true, or that it is probably true, or even that it is more likely to be true than it was before the test. The theory might be true, but we can't say more than that.

Polanyi too established that even in the case of scientific investigation, what most hold as a pursuit of truth (despite the problem of induction), cannot ever aim at providing an absolute disconnected truth. Polanyi held that the scientist must pronounce tacit judgements that cannot fully be defended (Hartl 2011, p. 53).

When knowledge exceeds a single mind, it requires an element of articulation. It must be communicable, and yet this kind of knowledge is largely inarticulate. Yet, as Polanyi argues, if all knowledge had to be articulated to be known, we are not capable of knowing anything at all (Polanyi 1966, p. 18). Formulating any statement not only relies on other propositions, as Aristotle noted, but also on using inarticulate rules of statement formation (Lavoie 1985, p. 60).

Even intra-comparisons of different kinds of rules, systems or categories, as Wittgenstein showed, can be subject to tacit and ineffable commonalities, such as in Wittgensteinian language-games (Kripke 1982). These rules of communication and commonalities remain components of our knowledge, but they are largely inarticulate, and actors themselves are not even aware that they possess them. Thomas Sowell points out that (Sowell 1980, p. 335):

> Nothing can be literally exhaustively articulated, the process of articulation is necessarily to some extent also a process of abstraction. Some characteristics are defined, to the neglect of others which may be present, but which are deemed less significant for the matter at issue.

With this, we have a firm ontological grounding; knowledge is subjectively dispersed amongst many different people who will never know or directly communicate with each other. Yet, economics and complex systems require coordination amongst their participants to have a thriving system. What mechanisms may actually bring about the coordination and order of market participants? The key to this question is in the principle of institutions, rules and mass communication. To grasp these complex systems, we first have to understand how the individual mind imposes order on the infinite sensory data it receives.

CONCEPTUAL SPECTACLES

To clarify the relationship between knowledge and the human mind, we first must make a clear ontological distinction. There are two kinds of orders that exist, which individuals may refer to: the physical order, described by the physical sciences, and the sensory order, which we experience through our everyday lives. In the physical order, objects are referred to by other objects, and how they relate to each other independently of human perception (Lewis 2024, p. 1). The sensory order, however, cannot be expressed in purely physical terms. The narrative that we will do in this section on the neural structures of the mind is specifically an imperfect reflection of the mind's procedure; the physiology which follows it.

This section is intended to provide a connectionist account of the human mind and to challenge the assumptions of atomistic views of the mind. This forms the new ontological scaffolding which economics may model after. This is a fundamental account of human cognition, and its relationships to 'knowing' and 'ordering'. Knowledge is a subset of the functions which is under the mind's domain, and thus, to get a full picture of it, we have to see the cognitive underpinnings that it follows. Each individual's unique cognitive landscape—in this view—is not a mere novelty, but an instrumental part of the analysis. It alters the way in which agents interpret signals, and respond to them.

The significance of social analysis is not in detached objects but in how people view and interpret those objects. They become instrumental to analysis only so far as the human mind attaches importance and meaning to these objects. This image is formed as a direct product of the mind and the relationship

that arises over time in the nervous system (Kulessa 2006, p. 275). The stimuli that arise are not passively 'imposed' by the external world; they are actively interpreted by the mind and make meaningful connections based not only on previous experiences, but on the institutional framework which prevails in society.

The sensory order is distinguished in this way as it is not a direct 'mirror' into the physical world, but it filters and interprets data in a meaningful way. While we may talk of 'deriving' data from the physical order, the mind is a classification system that allows us to categorise objects not based purely on physical qualities, but on experience and learning. If an individual were capable of seeing the external world as it truly is, they could have pure experience—but they are shaped by rules of interpretation, past experiences and the institutional framework.

The mind does not obtain data from reality in an unfiltered form. It does not mirror reality, but maps it. There is no one-to-one derivation of the physical order. The mind derives objects from a process of classification, and not from particular 'physical' qualities of objects. We know of a great many objects that, while physically they may remain similar to each other, we interpret vastly differently. For instance, song sparrows use signals that are very similar in rhythm, structure and harmony, but react very differently to physically similar structures in certain cases. In some cases, they ignore or interact with it, and in some cases, they treat it as actively hostile.

Conversely, there are many objects physically very distinct, and yet we treat them as part of the same classification of objects. We cannot then hold that if we simply aggregate the qualities of objects in some formulaic method, we will produce a classification system. Our interpretation of objects stems from the connections between nerve fibres, generating specific neural 'firing networks'. If these networks fire in similar ways, objects may be treated similarly. Over time, this develops an instrument of pre-interpretation, understanding objects holistically rather than as a collection of properties (Lewis 2024, pp. 4-5).

In this sense, individuals view the world not as a window but through 'conceptual spectacles' where the mind operates to classify external stimuli. It would be in error to conceive of the proper question for social analysis as 'what exists' rather than 'what is perceived to exist'. As Hayek (2010, p. 84) eloquently comments:

> While the naïve mind tends to assume that external events which our senses register in the same or in a different manner must be similar or different in more respects than merely in the way in which they affect our senses, the systematic testing of science shows that this is frequently not true. It constantly shows that the "facts" are different from "appearances." We learn to regard as alike or unlike not simply what by itself looks, feels, smells, etc., alike or unlike, but what regularly appears in the same spatial and temporal context.'

The 'objective' physical world we reference is itself not entirely complete. It is a theoretical construction, not a direct apprehension of mind-independent facts. All knowledge claims we can articulate are, necessarily, mind-dependent. It is a theoretical construction that is predicated on pattern recognition. This construction of a physical world is built under adaptive needs, and to reflect our perception (Di Iorio 2010, p. 183).

These rules that we utilise in order to make sense of the physical world are not static they are ever-changing and dynamic. Throughout history, continually adapting frameworks have been used in order to enhance survival with new, and perhaps more accurate constructions arising out of older and more primitive ones by way of evolution (Mulligan 2010, p. 90). Through the use of precise measurement and experimentation, we can reform our understanding of the physical world and stave off the misleading aspects of our sensory perceptions. In this way, the physical world—as it is constructed—and the sensory order can benefit from each other and find themselves both relying on each other for a coherent framework (Mulligan 2010, p. 94).

These are not observations formed in a vacuum. They are necessarily 'theory-laden' in that all measurements or predictions will be based on a framework of apodictic facts. Even theories themselves are

based on other theories. The problems of physical order do not begin with the collection of data to discover a problem, but with finding the problem to solve at the outset (Popper 1959). If we look toward measuring instruments to form the base laws on which other theories are predicated, we will quickly find that these measurements are predicated on their own laws, and to make sense of their findings, we must presume them to be true (Feyerabend 1993, p. 232). To expand on this, Gerald Steele (2010, p. 67) writes:

> It is the essence of understanding that abstract constructs are a prerequisite to shaping order from disorder. Facts are not given; they are created. So, there is a (second) universal methodological principle: whether implicitly or explicitly stated, theory pervades every observation. Without theory, we cannot know what is taking our attention. And there is an associated measurement problem. Theory is built upon theory.

This framework on the subjective properties of knowledge leaves us with a pressing question: if we acquire knowledge through active interpretation, what are the dynamics of the structure and rules which govern it? An important point to clarify is that the nervous system is a dynamic one, which changes with experience. It is a relationship of interconnected nerve fibres that interact with each other. To impose order on a vast collection of data, the mind 'classifies' the objects it perceives into certain categories, meaning that we classify them based on their relationship with our perception of other objects, and not their physical qualities (Hayek 1952, p. 142).

When classifying different categories of objects, neurons will generate electrical impulses, and nerve fibres become interconnected. In developing, fibres form relationships amongst each other, creating an overall 'pre-interpretive' model based on experiences and rules. For instance, two objects that generate a similar pattern of electrical impulses will give rise to a similar kind of classification (Lewis 2024, p. 3).

This view of classification becomes not only referential in terms of differentiating external stimuli, but also the relationships among nerve fibres. It cannot be explained purely by the physical reactions of nerve fibres because they themselves are physically similar, as Hayek (1952, p. 10) explains:

> Impulses in a particular sensory nerve fibre may thus be set up by any one of a group of stimuli which physically may be similar or altogether different. But if a given fibre responds to any of these stimuli the character of the impulse transmitted will always be the same, irrespective of the nature of the stimulus.

These nerve fibres do not just have direct relationships with each other, but they also have indirect relationships, called secondary impulses. By following the first impulse, the mind will create a complex and adaptive system of classifying objects. This has one important caveat, which is that the mind is a fundamentally limited system: it cannot understand systems of a higher complexity (Steele 2010, p. 60). The rules which bind our thinking are inaccessible as they are of a higher complexity in structure than the mind itself. In order to explain our own operations, we must know more than we do in all instances (Hayek 1952, p. 185). In understanding complex phenomena, we can only abstract and produce classifications within the bounds of our own system, never being able to expand on those rules themselves.

Over time, the reinforcing and developing neural pathways that result from experience provide a map, which is an imperfect guide to classifying objects of the physical world. The previously developed pathways act as a storehouse to classify groups of stimuli and impose order on future sensory data (Horwitz 2010, pp. 265-266). This 'map' is semi-permanent in the sense that it always exists to guide classification of experience, but is slower to adjust systematically. Previous assumptions and classifications over time may be exposed as incorrect or incomplete—in this sense, the map is dynamic and will learn with experience (Hayek 1952, p. 110).

The more a particular kind of experience is reinforced, the more those nerve fibres will 'wire together'. The strength of this connection has been referred to as synaptic weights (Hebb 1949). If the expectations

are that particular kinds of results come from actions, and they prove to be true, then the synaptic weights grow stronger. Conversely, if the expectations prove a different result, then the weights grow weaker and the map adjusts (McQuade 2010, p. 52). This feedback loop logic is essential, not only in neuroscience but in equilibrium theory. Formal models assumed this feedback was mechanical; agents responded in set ways to specific signals, but did not investigate the foundations as to 'why' individuals respond in this way.

Even in a more specific fashion, we may say that individuals form economic expectations with reference to these synaptic weights—if the expectations which they hold produce a beneficial outcome, whether profitability or socially, the synaptic weights amongst neural linkages will grow stronger and an individual's bias will tend towards positive expectations of those kinds. On the opposite end, if a trader loses significant capital owing to faulty expectations, his expectations will become more negative for projects of those kinds, and synaptic weights will grow weaker. This signals to agents they must revise plans or projects without them having to know 'why' they failed in any interpersonal detail.

Physically, the networks which form to constitute the map will imperfectly reflect the surrounding environment they are attempting to reproduce, and this begins at the earliest stages with transmission from the ganglion cells (Caldwell 2003, p. 241). As stated before, this is not a one-to-one relationship with the physical order, but one based on experience. The map is constantly adapting and making new pathways to better increase survival, as a process of biological evolution (Gaus 2007, p. 12).

On the flip side of the map, the model is also employed in decision-making to derive a guide to behaviour. It is not semi-permanent in the same way as the map, but it is the current flow of nerve impulses which exists at a given time, or in a given environment. As the immediate situation is eternally changing, the model will be inherently more adaptive than the map (Butos 1993, p. 309). All interpretation of current environments, or objective facts, is then constrained by experience. Many different people will interpret the same environments vastly differently depending on their makeup, and the model is reinforced by neural pathways.

A model of this kind does not only live in the world of past experiences, as some allege, but expectations regarding the future are informed by past experiences. In this way, behaviour depends just as much on expectations as it does on past experiences—it enables the testing of behaviour for if-then thinking (Horwitz 2008, p. 151). The neural networks which we describe are predictive in the sense of recognising patterns where x generally equates with y as opposed to an apodictic fact which occurs in all cases. Only through requisite learning will neural networks gradually increase their accuracy and predictive power over time (Lewis 2024, p. 7).

Experience serves an essential role in this regard, with constantly shifting synaptic weights noted in the work of Hebb. These kinds of relationships in the nervous system allowed for a map of pre-interpretation that had relative predictive strengths. The strength of the interconnectedness was measured by synaptic weights, which proved stronger or weaker based on dynamic experiences.

This feedback loop is not only dynamic but also provides a source of fundamental requisite learning. A neural network can compute the magnitude of its errors through error backpropagation, which utilises adjusting these weights for new experiences. By adjusting these weights, they account for the direction of signals and adjust to earlier layers to create an apparatus with lower margins for error (Lillicrap et al. 2016).

The direction, or intensity of these weights can be calculated using the inner dot product; the higher the product between two classes of relations, the more connected they are to the same classes of objects. In Bayesian terms, this also allows for an approximate ordering of conditional probability, which is inherently linked to experience. These probabilities are not founded on any strong foundations, or even necessarily qualitative, however.

The physical characteristics derived from certain objects do not have a demonstrable or even intuitive relationship. Rather, they are dependent on experience, evolutionary context and current institutional arrangements. For example, some animals that have a large stature will not inherently be linked with the triggering of fear as an impulse; it depends on the perception of the particular animal. The map, which

develops from this, uses neural pathways as a store of experience, given that previous circumstances dictated it to be the case.

This refers to our earlier statements on the price system; our expectations and assumptions are rule-following in certain respects. Epistemic signals do not always speak on their own, and certainly not from a certain effable 'essence' that makes itself seen, but no one can explain. Rather, people follow action signals in certain context-dependent ways. If a society very strongly sanctioned a profiteer, we would see a cognitive bias against following profitable behaviour. These 'signals and the corresponding 'action', whether in economics, sociology, or criminology, must be separated and not confused with each other. Institutions which produce a 'signal' with no corresponding 'action' will see a confused result.

In this sense, modern cognitive theory provides a further foundation for a predictive model based on experience—the mind could calculate conditional probabilities that, if A happened in the past, how likely is it for B to happen in the future. Due to the nature of forecasting, there is no significant qualitative calculation for conditional probability; it can only arise as an ordering of various outcomes. In this sense, when faced with uncertainty, actors will take a guided decision, but not one based on a numerical probability. They will rank outcomes by order of likelihood from past experiences (Lewis and Runde 2007, pp. 7-8).

When there is missing key information, these relations can 'fill in the gaps' and predict events from previous experiences. It is not necessary, and in fact generally not the case, that people derive experience from their surroundings as much as their pre-interpreted framework would predict it to be. Thus, the behaviouralist suggestion that we may drop the dualism of economic science is a far cry from sufficient—it deprives us of the most essential character of our science.

This model of the mind, therefore, is inherently dynamic and individualistic. The experience which every individual has throughout their life, combined with the various rules and teachings they have ingrained, will fundamentally alter their interpretations of various objective facts or signals. We cannot assume direct and concrete relationships between interpretations and physical qualities. The mind in this vision is a fundamental system of imposing order on abstract senses, or data. It builds both a map and a model over time through the various linkages and secondary impulses that form strong synaptic connections from a lifetime of building experience. However, as alluded to before, if each individual had these widely varying interpretations of different signals and external conditions, how could people ever come to be coordinated? We argue that this depends on a function of abstract rules, 'limiting the range of possible behaviours.'

BRIDGING THE INDIVIDUAL AND THE SOCIAL

Whilst every person does not passively accept the objective conditions around them, the way in which they subjectively determine these conditions is recursively social. Social institutions evolve spontaneously over a long period of evolution and result from human action but not human design (Ferguson 1782). If we establish the primacy of these kinds of 'abstract rules', the question may be posited: why do we follow these rules at all?

RULE-FOLLOWING IN HUMAN BEHAVIOUR

Rules and institutions both follow a spontaneous and evolutionary structure, making it natural and necessary for new rules and systems to emerge over time. This is precisely because individuals are so ignorant of the larger picture of existence. Rules are an indispensable facet that enables coordination to ever be possible in any sphere of life. This includes things like aviation control, where rules are established to act as guides to correct action without knowing 'that' (Butler 1983, p. 23).

The social selection of rules—much like reinforcement of synaptic weights—will be judged based on their ability to stabilise and accurately deal with the ever-changing reality around us, including our own

beliefs (Smith 2014). The first movers in this situation can act as quasi-institutional entrepreneurs, paving the way for others to adopt a better lens into the world that suits their purposes.

Rules are only consciously adopted in this way when there is direct change or conscious attention paid toward them. Ordinarily, rules adapt themselves in a subconscious way where agents naturally gravitate away from a lens which produces faulty if-then claims. Norms, rules and institutions are best described as imitation games where no one person knows in particular why they adopt the rules they do, but they feel compelled they ought to follow them. If they do not, they may be faced with negative social consequences, sanctions or a 'categorisation catastrophe' where they cannot make intelligible sense of their surroundings (Fleetwood 1995, p. 110).

'Rules' is a hard and fast word for an abstract concept which does not tangibly exist in the conscious mind; they are not 'rules' in the sense that they are consciously followed, but guides for the mind to categorise, reflect and make sense of the behaviour of others. Introspection is only so orderly in making sense of behaviour because we are governed by the same social rules. They act as a warning against certain kinds of actions, shortening the infinite array of actions that individuals will likely take (Hayek 1960, p. 56). This does not mean that they cannot serve as prescriptive guides to action, but that they may not always necessarily do so.

Institutions are a storehouse of wisdom and contain the essential lessons of experience that future generations can obtain without the degree of hardship. It is advantageous for people to adopt social rules not only because they may avoid the negative sanctions of categorising the world 'differently' but also because they may serve as more accurate guides to reality.

The term we have thus far been using, 'rules', may also be too ambiguous and broad for a deeper investigation into their role within economics. We can divide these 'rules' into three separate categories to aid our understanding: social rules, perceptive rules, and meta-rules.

Social rules are attached with a degree of critical realism—whilst often absorbed and internalised by the cognitive process, they exist independently of agents. They are transferable and taught. Their identification can exist independently of agents, but they are internal to all agents (Hollis 1987, p. 145).

The rules which aid in ordering and categorising perceptions are called perceptive rules. They are embedded into cognitive models and serve as the primary heuristic that the mind may use to categorise objects. When discriminating between different objects or concepts, it is not just the pure aggregate of qualities that identifies an object or reactions to an object. These are integrated directly within the neural map and help to distinguish the line between purposeful and instinctive reactions.

Meta-rules, on the other hand, are not simply extensions of what is learned through experience, but fundamental capacities that must already be known to all to enable learning in every other fashion. This may include categories such as causality, time and space, imagining a better alternative, and so on. Without these categories, it would prove impossible that subjects would ever undertake any action at all—they must already be aware that their actions can play a definitive role in shaping the reality around them. These different kinds of rules are shown below in Table 1.

Type of Rules	Characteristics	Epistemic Role
Social Rules:	External, transferable and internalised rules	Shared frameworks for coordinating behaviour
Perceptive Rules:	Cognitive heuristics, embedded in the ordering process, and non-articulatable	Shapes the underlying expectation and classification
Meta Rules:	The fundamental preconditions that must be known to learn	Underpinning the possibility of ever learning, or acting in any fashion

Table 1: Different Kinds of Rules

Immanuel Kant (1781) has suggested that these kinds of dispositions exist inherently, they are eternal and unchanging products of the mind. It is certainly conceivable that these kinds of meta-rules are a product of species-learning, through evolution over time, that adjusts how our very sensory order is capable of conceptualising and ordering the world around us. In this way, the longer as a species we continue to pass down perceptive rules through genetics, the greater our capacity to form broader categories of associations and generally have a 'richer' order from earlier stages. These are, again, not 'known' or understood rules as such in any way—but they are concepts held integrally to the mind's model that it cannot exist without. They are not propositional knowledge, but additive nonetheless (Mises 1962).

When it is said that these rules are not known in a particular sense, this refers specifically to kinds of knowledge which are propositional or non-propositional. Kinds of perceptive and meta-rules evade analysis precisely because they exist in non-propositional forms; they are not bound in content but exist on a pre-interpretive level. Rather than an object being an addition of elements which make it up, the mind understands an object before its qualities based on the previous descriptions of synaptic weights and abstract rules. These are not 'propositional' in the standard sense of knowledge.

It is impossible to separate these kinds of rules from our expectations and perceptions, as the 'objective facts' are filtered through the lens of the perceiver. They cannot become 'part of the observer' themselves, as knowing implies a degree of remoteness from the thing which is known. Even in cases where social classification exists, it exists somewhat remotely from the self and must exist in a vacuum independently of a particular being. Knowing, therefore, implies a separation from the particular principle employed and means that whilst they are not 'mind-independent' knowledge they can be identified independently of any particular mind.

In these cases, where the world is so subjectively absorbed into the sense of self and being (Heidegger 1927), we rely on the very basic cognitive underpinnings of rules that have been formed over thousands of years to make any sense of what exists around us, or perhaps as part of us. This is contained within the concept of 'throw-ness', where interpretation does not exist as a detached and passive receptor, but it is inherently attached to being. The world into which we are 'thrown' is not necessarily metaphysical in this sense, but categorised. Through the function of institutions and rules, we can attain a degree of 'richness' in the sensory order from the outset, enabling learning to be possible. In this sense, our primary modes of social interaction and connection (sorge, or care) become bound up by the norms of institutions.

We do not ever attempt to mirror one-to-one reality, but have a useful imagination that our introspection holds by virtue of ordering systems. Without being rule-following creatures, complex systems would quickly prove themselves impossible to adapt to, and the extent of human growth we have seen would never have proved possible. In this way, rule-following underpins and can explain the very fundamental proclivity of humans towards complex systems.

IGNORANCE AND SOCIAL INSTITUTIONS

The mind, in this sense, is poised toward a position where it knows more than it can ever state. It can never fully explain its own operations as the totality of its processes is more complex than itself. This is due to the primacy of social rules within our cognitive operations, which serve one vital factor: they allow agents to depict the actions and expectations of others with relative accuracy.

These social institutions represent the bridge between the inherently private world of our own cognitive processes and the socio-economic world at large, and they recursively develop each other over time. As the human mind evolves, so too do the social rules which it adopts (Hayek 1978, p. 85).

The price mechanism is one kind of institution that enables the coordination of agents' actions without anyone knowing the content of any price level. Gilbert Ryle has instrumentally illuminated the way forward into analysing the function of social rules in guiding coordinating behaviour, by distinguishing between knowing 'how' and knowing 'that' (Ryle 1949). The norms which govern the behaviour, as elaborated above, are central to the cognitive processes of interpretation, and ensure a certain degree of

consistency in interpreting the same signals, similarly. Even if we have an array of relative prices to guide economic behaviour, without any underlying rules to guide these interpretations, there is no reason to assume that any coordinating plans arise as a result (Lachmann 1986, pp. 22-58).

The norms and rules under which we operate assist in enabling coordination, but this does not necessarily mean that the institutions are the Pareto optimal ones to attain coordination, or even that they will be successful in enabling coordination, but they provide the best comparative ability for agents to coordinate their actions (Lachmann 1970, pp. 49-50).

THE THREE CATEGORIES OF INSTITUTIONS

To enhance the distinct kinds of institutions, we will divide them into three categories: formal/explicit institutions, abstract institutions and informal institutions. Formal institutions are those which are explicitly codified, and agents can actively search for. They tend to be contained in formalised structures and stored there. This includes legal rules, such as property rights, and torts (Pennington 2014, p. 257).

The next two categories—abstract and informal institutions—differ significantly from explicit rules in the sense that they are not explicitly stated and are subject-dependent. While formal institutions may be effectively stored in structures, making them subject to the cost-benefit analysis of searching, these other two categories are inherently more difficult to obtain. Abstract institutions may reside in structures and be articulatable on some level, but it is not without great difficulty to derive their content, where it quickly becomes ineffective to know it at all (Pleasants 1997, p. 28).

It may be said that, as a general rule, abstract institutions are directly accessible in a qualitative form; we can grasp the essential principle to direct our action, but not the content of these principles. They are enabled to act upon them without any propositional knowledge of their subject (Ryle 1945, p. 7). This kind of rule may comprise certain aspects such as the linear passage of time, notions of justice or fairness, and the notion that cause precedes effect (Lewis 2014, p. 209).

Informal institutions are more social in nature, and maintain the most subject-dependent form of these rules and therefore have the most significant possibility of deviation in similarly situated individuals' perception. They tend to form a section of an individual's view of 'time and space', and they are 'loosest' on rule-following behaviour. This may include rules such as etiquette, workplace boundaries, and dress codes (Wenzel 2010, pp. 323-324).

THE PARADOX OF IGNORANCE

In establishing this categorical overview of institutions, we must also turn our attention toward the individual, recursively using and developing these different kinds of rules and institutions to anchor their expectations. In this, we will categorise two kinds of ignorance: radical ignorance and practical ignorance. Radical ignorance cannot be coped with; it can only be adjusted to. This not only means ignorance of the future and unintended consequences, but non-discursive knowledge that cannot be acquired through ordinary, alienable means (Fleetwood 1995, pp. 91-93). A more reasonable kind of ignorance for the economist is practical ignorance, where individuals are simply ignorant of publicly available facts, and it becomes a matter of searching for kinds of information using formal institutions such as libraries.

The problem is only compounded by the sheer volume of facts which an increasingly large division of labour and knowledge presents, but the fundamental problem is an epistemic, and not a practical one. Many individuals remain at all times ignorant of essentially the entire character of the economic system for one simple reason: social institutions do not quantitatively add content-knowledge to our functioning, but enable us to take actions whilst remaining in a state of ignorance. This has been elsewhere termed the paradox of ignorance (ibid., p. 100). Agents, in essence, are enabled to know 'how' without knowing 'that', and we can express this as agents do not maintain propositional knowledge over these matters.

Theorists such as Nyiri (1988, p. 22) have suggested that social institutions function as 'summaries' of knowledge which otherwise would have been too extensive and costly for individuals to obtain—but this mischaracterises the essential nature of how social institutions affect cognitive processes. Rather than being 'additive' propositional knowledge in this sense, they are a kind of pre-functioning knowledge that guides our thinking of all other things without us ever knowing it. If it were the case that they re-packaged knowledge, it would imply that individuals do not face this kind of radical ignorance, as they only face the problem of obtaining less quantitative knowledge than they otherwise would have gathered. Rather, the problem is that they fundamentally remain ignorant as to 'that'. This view also discounts the role knowledge of a tacit kind plays, as it assumes that all knowledge is already 'objectively available—subject to search'.

Nyiri (1988, p. 23) correctly concludes this exact position by discussing: 'Practical knowledge that could in no sense be dissolved into knowledge of a propositional sort…a bedrock upon which all knowledge rests.' This position is irreconcilable, social institutions cannot both 'summarise', or 'abbreviate' knowledge while at the same time not providing a quantitative additive knowledge to the existing base. Individuals are either radically ignorant in this position, or they are practically ignorant, but it cannot be both at the same time. Steve Fleetwood (1995, p. 103) perceptively notes this point, writing:

> Accessing formal institutions increases the agent's stock of knowledge "that" in a quantitative, additive manner. Rule-following might not increase the agent's stock of knowledge 'that' at all. The nature of the change is qualitative in the sense that the agent is now a more skilful manipulator of knowledge "how".

This distinction serves as an important logical exercise in demonstrating what the true role of social institutions is in our social and economic structures. It may be true that this kind of knowledge is additive only in the most abstract way, in that an individual will now maintain a knowledge of capability in certain actions, but this is not additive in a propositional form (Hayek 1967, p. 40).

THE ROLE OF SOCIAL INSTITUTIONS

This is certainly not to say that social institutions do not serve a coordinating function—in fact, it is quite the opposite. Social institutions enable men to be wise in spirit and ignorant in nature. It does not rest on men overcoming ignorance, but in coping with it. In this sense, social institutions do not 'convey' knowledge, but structurally contain it. Upon interpretation, we do not see particular objects as concrete additions of categories and qualities, and the contributions of social institutions are much the same—they are accessible concepts with inaccessible content. Their great contribution is in 'overcoming' the need to access this direct content. Hayek (1960, p. 158) understood this when he wrote:

> Man does not have to know the circumstances which make him act in a certain way; he need not even be able to state the rules which govern his action. It is sufficient that he obeys them.

Despite the fact that individuals are effectively radically ignorant of the underlying facts, market institutions enable individuals to act as if they were wise. Only where these institutions properly serve to inform agents of relevant social knowledge will any kind of coordination prevail in the sense of producer and consumer plans dovetailing.

LOCAL KNOWLEDGE AND THE TACIT DIMENSION

A particular difficulty in the kinds of knowledge which must be contained within social institutions is the problem of articulation, and the knowledge of time and place. There are generally two kinds of local

knowledge: non-tacit local knowledge, and tacit local knowledge, which can be helpfully distinguished as 'subject-independent', and 'subject-dependent' kinds of knowledge. The latter can effectively be stored in formal institutions, and therefore allow for a critical realism which is independent of their identification (Fleetwood 1995, p. 91). The relevant kind of knowledge for economic behaviour is not only knowledge of demand, price and quantity but also knowledge of norms, customs, time and place (Butos 1985, p. 340).

The subject-independent knowledge is articulated and inherently alienable precisely because of its nature. This kind of knowledge is acquired in a learning process; every learning depends upon articulation at some previous point in time. While not all tacit knowledge is necessarily inarticulate, this kind of knowledge is generally non-tacit (Ioannides 1992, pp. 36-37). Some local knowledge is also inherently accessible just by virtue of being in a particular spatial-temporal location. Whilst this still presents a particular kind of specialised knowledge, it is more a practical difficulty than an epistemic one. Thus, subject-independent local knowledge is inherently accessible, transferable and stored within formal institutions.

Some kinds of local knowledge can become institutionally embedded over time, which can become tacit as a growing complexity in the structure of production makes it impossible to fully articulate. Only by a continuation of the firm's collective memory can it continue to facilitate the full provision of the product, as DeWeaver (2020, p. 53) comments on the defence industry:

> Unlike the knowledge required to produce a World War I era biplane, which could to a large extent be derived from a blueprint, the essential knowledge resources behind a platform such as Lockheed-Martin's Joint Strike Fighter are primarily local, residing in the collective memory of an organization and difficult if not impossible to express in any explicit form.

Subject-dependent local knowledge, on the other hand, exists only within the minds of individuals and cannot be 'identified independently of knowing subjects' (Popper 1972, p. 115). Not all subject-dependent local knowledge is inherently tacit, but may also be semi-tacit in the sense that its operation and character may be uncovered but only by a long and strenuous process. By the time its operation is uncovered, it would likely prove unhelpful or misleading in the course of economic organisation. It is also generally not 'learned' in the traditional sense, as it applies to formal rules. It resembles more closely a character like abstract rules, which must be introspectively uncovered and guide a pre-cognitive process.

This kind of knowledge does not always refer to concrete propositional claims themselves, but a kind of meta-knowledge over processes which generate outcomes. Think, for instance, of a musician who may be able to explain the notes of their song but would be at a loss to explain the entire operation and interaction of its full melody, and what creates definite emotional effects. This is the function of knowing 'how' and knowing 'that'; the musician, like social institutions, can impart knowledge of how, but not that. They know this kind of knowledge non-discursively and act as a kind of filter (Fleetwood 1995, p. 97).

Furthermore, there are other kinds of non-propositional states that direct action, like 'hunches' or 'intuitions' which may be reducible to certain facts or experience, but we are at a loss to explain how this judgement should be adapted or applied. Paul Lewis (2014, p. 207) elaborates:

> Much of the knowledge which is important in everyday business life consists in things like an entrepreneur's hunches and intuitions about the sort of product which is likely to prove attractive to consumers, or in a production engineer's knowledge of how to solve various technical problems, or in a businessman's capacity to glean information about new sources of finance, rather than in a grasp of particular facts which people could list and state explicitly if required to do so.

The mind is fundamentally limited to explaining operations of lower complexity than itself—and therefore, given the primacy of these abstract rules in governing our cognitive processes, it should be impossible

for any person or group to fully explain the entire operations and contents of these abstract rules. As a corollary, they are at a loss to explain the operation of other minds.

So long as this persists, it shall prove impossible that any central planning agency—or top-down 'reformer of society' will engage in rational and fairly informed decision making. It is not that individuals themselves under markets are sufficiently well-informed, but that markets enable ignorant men to be 'wise in spirit' that creates successful outcomes. Institutions in this sense are vital to this coordination, and that includes informing about the actions of others.

As institutions are both functionally embedded in cognitive processes through generational species-learning and through the development of the mind over time, this facilitates coordination by limiting the range of available interpretations people will take out of given facts (Lewis 2014, p. 208). For example, in a workplace, the way that two long-term employees will interpret particular facts will be vastly different from two new employees. However, the way these four employees interpret institutions like language will tend to converge closely. By acting along the same lines, Lachmann's basic problem of 'how people will interpret price signals along the same lines' is effectively solved.

COORDINATION, PREDICTION AND UNCERTAINTY

It has been a long-confounded debate in the subjectivist tradition whether or not the market 'tends' toward equilibrium. Equilibrium in this sense is a kind of centre of gravity that all prices move and fluctuate around in different degrees. The prime mover in this debate was not—as sometimes conceived—the entrepreneur or market forces, but the debate was firmly grounded in fragmented knowledge and ignorance about the future. The function and institutions of market economies can help abate and aid decision-making, but they do not in themselves have a teleology. It is the plans formed by producers and consumers that must be compatible to describe movements toward equilibrium. The idea of equilibrium has long been misapplied, misunderstood, or outright confused and muddled. Fritz Machlup (1958, p. 2) once said:

> A term which has so many meanings that we never know what its users are talking about should either be dropped from the vocabulary of the scholar or "purified" of confusing connotations.

To 'purify' this term of its meanings, we propose a clear definition of equilibrium: equilibrium is attained when the plans of producers and consumers are perfectly compatible with each other, and compatible with the subjective and objective data. This means that when we are in a state of equilibrium, there is no excess or shortfall; all products are consumed in exactly the right amounts. All plans will be fulfilled as they were originally intended and expected—there is no implied revision or loss of value in capital. This is certainly not an unbacked definition; in fact, it has been endorsed in Hayek, Hahn (1984, p. 44), and Stiglitz (1987, p. 28). In this endorsement, Hayek (1937/1948, p. 37) writes:

> Equilibrium exists in this connection … if the actions of all members of the society over a period are all [successful] executions of their respective individual plans on which each decided at the beginning of the period.

This not only implies that plans must be correct in the subjective and objective data present at the time, but also correct in the future. Plans are intertemporal and multi-layered concepts that rely on each other. To have complete plan coordination, all other plans must be compatible with each other. This is an impossible standard, as all expectations in this vision must essentially be correct. The purpose of equilibrium constructs is to be a clear visual tool, i.e., they abstract from other factors to show that one thing can specifically cause another thing. They are not intended to be realistic interpretations of the world.

However, some radical subjectivists such as Ludwig Lachmann have argued that these kinds of elaborate thought experiments push the real world too far from the point of analysis, and actively hamper

understanding (Lachmann 1986, p. 14). As we shall see, this conception of equilibrium poses a major problem and fragmentation in economic theorising. The key point is that the market is not a state of predictive outcomes which is locked in its own 'data'; rather, it is a process that leads to endogenous changes, revisions and errors in the heart of uncertainty.

PROCESS AND OUTCOME

In the traditional conception of equilibrium, one approach that underscores all others is equilibrium as a balance of forces. This means that when one force (such as supply) is balanced, or negated by another force (such as demand), then an equilibrium point will be reached. Many other conceptions and interpretations are largely derived from this approach.

Equilibrium exists in a few different states, and can be analysed in two primary ways. The first is equilibrium by scope. In this, there is a general equilibrium. This is when the entire economy exists in equilibrium. There is a partial equilibrium, where only a part of the economy is in equilibrium. Finally, there is individual equilibrium, which is more or less akin to rational actors.

In the second sense, equilibrium can be analysed by timeframe. This may be either contained to one period, or to a succession of sub-related periods. The former is called static equilibrium, while the latter is intertemporal equilibrium.

The basic problem is this: static equilibrium defines the outcome of what it looks like to achieve equilibrium, but it does not explain in any part the process by which we may come to attain it. In fact, in all cases in the real world, we cannot even say how far we stand from equilibrium, because we have no idea what the equilibrium is! (Lewin 1999, p. 29). In a static state, we have only the abstraction and no true sense of distance from the equilibrium. We can attain a state of equilibrium when producers and consumers have a state of perfect knowledge of subjective and objective conditions—perfect flexibility, full optimisation, and so on. This hedonistic conception gave rise to an uproar, with critics holding it was ill-suited to address human nature (Veblen 1899/1948, pp. 232-233).

The very question which economics set out to answer—namely that of how social order can arise in the face of epistemic humility and uncertainty—was assumed away by the models meant to explain it. This is the essence of the subjectivist critique: formal theorising does not explain the process by which we happen upon the economic question; it only explains what the outcome of it being solved would be. Without the essential framing of equilibrium in the human mind, and as a dynamic process, it lost its meaning entirely. Hayek noted (Hayek 1937/1948, pp. 36-37):

> The equilibrium relationship comprises only his actions during the period in which his anticipations prove correct. Since equilibrium is a relationship between actions, and since the actions of one person must necessarily take place successively in time, it is obvious that the passage of time is essential to give the concept of equilibrium any meaning.

Furthermore, equilibrium theorists made a quiet assumption in passing from the individual to the social world. It can be shown, effectively, that an isolated individual in a period will be in equilibrium with himself. However, the situation when it comes to social equilibrium is very different. In effect, economics has falsely 'atomised' the social world and assumed that what is true for each person individually can be applied to the entire social world. In our case, this change of application from the micro to the macro is vastly inappropriate, as Hayek (1937, p. 35) insightfully realised:

> I have long felt that the concept of equilibrium itself and the methods which we employ in pure analysis have a clear meaning only when confined to the analysis of the action of a single person and that we are really passing into a different sphere and silently introducing a new element

> of all together character when we apply it to the explanation of the interactions of a number of individuals.

To prove a fruitful socio-economic analysis in any sense, any social theory must take account of basic epistemic issues. In the first place, it cannot abandon the question of knowledge acquisition outright. Instead, it must recognise that individual decisions and plans are not guided by some unmediated objective knowledge, but by subjective valuations and personal interpretations of objective events. In fact, even with reference to these 'objective' events, every person stands at all times in such a limited capacity to understand or even conceive of the entire range of objective data (ibid., p. 50).

Even in the hypothetical case that they could conceivably know all the data, each individual would have subjective perceptions and expectations of this data, leading to disparate plans. Economics cannot couch its analysis in the objective facts, but in the subjective perceptions of many individuals (Vaughn 1992, p. 263).

PLAN-COORDINATION AS A NEW EQUILIBRIUM

Standing in sharp contrast to the textbook Walrasian theory that treats foresight as perfect, information as given and a static one-period world, Hayek's conception of equilibrium is one framed in subjectivism and dynamic processes. It meets the condition of being couched in the subjective perception of many individuals, and allows room for socio-economic analysis of a multi-period, dynamic analysis. Individuals form plans over periods of time that are constantly revised and adapted to uncertain conditions; they are a comprehensive survey formed by individual values of means, and how they may be used (Lachmann 1971, p. 30).

Each individual has limited access to his own kinds of local information, upon which he acts with a particular kind of advantage over all others, and he maintains various kinds of knowledge which even he does not know or understand in its totality (Polanyi, 1966). Knowledge is not only limited—in this way—to the existing data, but is a flow.

You cannot plan for unforeseen knowledge, just as you cannot plan for innovation (Littlechild 1977, p. 7). This unmediated domain of subjective knowledge makes itself felt in the organisation of plans, as Hayek (1945, pp. 521-522) understood:

> A little reflection will show that there is beyond question a body of very important but unorganized knowledge which cannot possibly be called scientific in the sense of knowledge of general rules: the knowledge of the particular circumstances of time and place. It is with respect to this that practically every individual has some advantage over all others in that he possesses unique information of which beneficial use might be made, but of which use can be made only if the decisions depending on it are left to him or are made with his active cooperation.

It is then the question of economics to explain how a social order may arise that is relatively coordinated and cohesive in the face of fragmented and disseminated knowledge, and Hayek argued this was the primary function of the price system. Given the right institutional filters, this leads to prices signalling coordinating behaviour, and providing incentives to commit to it through the system of profits and losses (Nozick 1974, pp. 18-22). This does not only mean having the right kinds of market institutions, such as exchange and money, but also the right kinds of political and legal institutions, such as private property and the enforcement of contracts.

Institutions of this kind help to reduce the range of unpredictable behaviour which may be exhibited by all other participants in a social system—they reduce uncertainty and unpredictability by limiting the range of available behaviours. In terms of plan-coordination, these kinds of socio-economic institutions are vital as people must not only factor in their own subjective conditions and objective facts, but also

consider that all the actions of other individuals may be in error or conflict with their own plans. To have perfect plan-compatibility, all plans must be consistent with subjective knowledge, the objective data and all other plans made by other agents (Lewis 2014, p. 200).

When we apply this concept to multi-periods, these plans not only have to be correct in the existing framework but also all frameworks of the subsequent periods—the initial expectations must prove correct. In this sense, it may only permit that in a one-period equilibrium, only a momentary equilibrium could be conceived. In a multi-period equilibrium, however, only a partial equilibrium may prove possible. This is due to Lachmann's Axiom, or Von Mises' Dictum that 'the passage of knowledge inherently implies a change in the state of knowledge' (Lachmann 1976, pp. 127-128; Vaughn 1992, p. 258).

If the state of knowledge is an inevitable consequence of time passing, in our multi-period equilibrium, it implies that intertemporal plans will be impossible to exist in a general equilibrium. This plan coordination will only be possible in a partial or industry-specific state. The changing structure of knowledge will render some plans obsolete and imply revisions to their use. Some plans will now be in conflict that were previously compatible.

Furthermore, the revisions will change the use and distribution of resources. These kinds of changes 'spill over' into other industries, where producers may purchase capital that would not have otherwise been purchased. These capital goods are scarce, and imply that someone else will not be able to use that resource in their own plan, placing them in conflict.

This kind of plan-coordination is—as stated earlier—not an empirical statement of the economic situation. Quite the contrary, it is a tool for logical abstraction to illuminate cause-and-effect. However, models cannot and should not stray too far from their base reality, as it begins to run the risk of misleading conclusions and incorrect cause-and-effect relationships (Lewin 1999, p. 20). The major advantage of the plan-coordination model is that it avoids the shortcomings of static and one-period equilibrium analysis, which cannot bridge the model and the real world. Rather, it firmly bases itself in subjectivism and includes a dynamic, intertemporal process.

The framework of standard equilibrium models requires essential ontological assumptions about the human mind; primarily, it assumes that it is a passive receiver of data. Yet, the connectionist framework makes clear that agents are not passive, but active receivers. They are not receiving an 'unfiltered' data source, but the mind is acting upon each sense that enters cognition and ordering it under broad categories to classify objects together. We only understand, for instance, the full epistemic signal of a price not because every person is a price theorist, but because the abstract rules which govern our interpretations limit this range. Epistemic signals in this sense are not fundamentally given; even if we receive a certain 'action compulsion' from this now, it may not necessarily be the case that the signal inherently offers such a compulsion.

It is the fundamental institutional structure and system of abstract rules which enables us to receive certain epistemic signals in a certain way, and the plans formed thereof are coordinated to a degree. If the system of rules and institutions had been entirely different, there is certainly no guarantee that price signals on their own would guarantee any movement towards plan compatibility.

This affects equilibrium models in two primary ways: it shows that fixed assumptions of passive receivers fall to the basic problem which Kant exposed; it asks questions about the 'objective' technical knowledge, and not the inner interpretations which agents receive. This is insufficient, as the paths upon which economic phenomena will follow is inherently dependent on the interpretations of these objective facts. The second implication, as we have discussed for equilibrium models, is that its assumptions dismiss the fundamental role of human behaviour, or human action in a 'process' based analysis. It gives rise to a view of human society which moves holistically, like an invisible hand with no mover.

It is then insufficient to use formal equilibrium models as a method to explain any tendency toward equilibrium, as it assumes the answer before it asks the question. The fundamental explanation of economic coordination and order must lie in this analysis of rules, as price signals alone are not sufficient to explain why people act the way they do on certain signals. It is certainly not analytically implied within

the definitions of the signal; it is an extension which can only arise as a contextual relation. Much like Wittgenstein's classic example of builders engaged in a language game, someone who points at an object and uses the word 'there' does not imply a command of 'bring' in pure language terms (cf. Wittgenstein 1953/2009, §27). Price signals do not imply a command of behaviour change; they achieve this result through incentives and through ordering relations. Agents have been taught, through culture and embodied abstract rules, to respond in certain fashions to epistemic signals like prices.

Reframing equilibrium models within terms of plan-compatibility allows us to place the very central of expectations into the economic model, and allows us to consider what the effects may be of entrenched herd psychology in speculative markets, etc. This is also particularly instructive in the money markets to analyse disequilibrium as it does not have its own central market to clear.

The concept of robust political economy makes clear that to produce a good, or a strong mode to depict reality, those assumptions must also convey the epistemic limits of human reason. As elaborated on in the paper, the connectionist framework cannot be neatly situated within a static equilibrium, as it cannot adequately provide a theory of ignorance. Economic actors do not stand as an Archimedean figure, separated from their context, but rather exist firmly governed by it. They cannot objectively observe the properties of equilibrium, but will actively interpret facts and data with reference to linkages and social rules. Without the right kinds of institutions (which equilibrium economics already sees as exogenous and given), we can have no capacity at all to assume economic actors rationally interpret data. It is only through the development of institutions over time that they can limit the range of available interpretations (in many cases) and provide a kind of cohesion among epistemic signals.

CONCLUSION

This paper has fundamentally phrased the central economic problem as a problem of coordination between many people who know nothing about each other. They stand at all times in the face of complex systems that no one can fully understand, in particular, and have to cope with an uncertain future that no one can predict. Whilst institutions do not serve as 'knowledge surrogates' in the typical sense, but enable individuals to act as if they possess knowledge they do not. They know 'how' without knowing 'that'. This is the task we are faced with as economists—to shed light on the operations of this spontaneous order. To develop a sphere which can make sense of this, our assumptions must correspond to the reality we are faced with. A robust political economy is based on two central pillars: epistemic limitation and incentives. If a theory cannot adequately provide an explanation or address either of these effects, it should be abandoned in favour of a more robust system.

The connectionist framework in neuroscience makes it explicit that we cannot rely on the perceived 'objective' facts under a human science, because how people respond to objective facts may be entirely different depending on their linkages in mental maps, or owing to the institutions that may interpret epistemic signals in wholly different lights amongst each other. Economics and politics, as disciplines, both rely on this institutional overlap to ensure that individuals can rationally make decisions. It is not only relevant that agents can make decisions about the status of things, but primarily that they can make decisions based on other agents' desires and plans.

In this way, the concept of economic equilibrium may be removed from a conception of 'static forces' and reintroduced amongst this idea of plan-coordination. Equilibrium is attained when the plans of producers and consumers are perfectly in sync. By rephrasing this static concept into a dynamic one rooted in the human mind, we can overcome the limitations of assuming perfect knowledge, price-taking, and no agents of economic change. This is also vastly more compatible with the analytical apparatus of robust political economy and with the connectionist model.

The human mind may always explain less than the totality of its own operations, and in terms of complex systems, the claims of reason to 'construct' systems are fundamentally incapacitated. If the mind

cannot explain the totality of its own operations, it cannot explain small fragments of complex systems which require the cooperation of many minds.

The task of the economist, then, is to 'whittle down reason with reason' and grapple with the concepts of knowledge and ignorance more fundamentally. If the limit of reason is not taken seriously and addressed, there is a 'planning-trap' which views society as pawns on a chessboard to be moved at will. Economics is particularly illustrative that when you move pieces on a chessboard, there can be unintended consequences that produce the opposite result of our intentions when the problem at hand exceeds the scope of a single individual or a group of people to deal with. For subjectivist-oriented economics, this model of neuroscience provides a framework for investigating phenomena around decision-making and expectations, which have formed some of the core topics in microeconomics.

In macroeconomics, the connectionist framework and the challenge of meeting the standards of robust political economy provide an invaluable check that we are acting within essential boundaries to respect and consider. Abstracting too far from reality runs the risk of never quite producing a conclusion that applies to it, and thus, we must be cautious about how far we abstract. By establishing a foundational microeconomic perspective of cognition, and recognising agents are active interpreters, framework for future research into how economic investigation ought to be conducted going forward, by recognising the importance of ignorance and institutions to provide cohesion.

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