

ARTICLE

# The tacit dimension and behavioural public policy: insights from Hayek and Polanyi

Agnès Festré<sup>1,2</sup> and Stein Østbye<sup>2</sup>

<sup>1</sup>ELMI Graduate School of Economics and Management, Université Côte d'Azur, CNRS, GREDEG, France and <sup>2</sup>School of Business and Economics, UiT The Arctic University of Norway, Tromsø, Norway

**Corresponding author:** Agnès Festré; Email: [agnes.festre@univ-cotedazur.fr](mailto:agnes.festre@univ-cotedazur.fr)

(Received 16 October 2024; accepted 22 October 2024)

## Abstract

In this paper, we revisit the Knowledge Problem addressed by Hayek eight decades ago and emphasised more recently by Rizzo and Whitman in their critique of the new paternalist approach of mainstream behavioural economics promoted by Sunstein and Thaler. We do this in light of the work of Michael Polanyi. Polanyi developed a theory of knowledge which has some commonalities with Hayek's but also departs from it by emphasising the tacit, personal and perceptual dimensions of any process of knowing, thus radically renouncing any attempt of a knowledge typology separating different types of tacit knowledge (TK) and even denying that general knowledge could exist independently of TK.

**Keywords:** behavioural economics; Hayek; Michael Polanyi; paternalism; tacit knowledge

## Introduction

Rizzo and Whitman (2009) demonstrate the deep epistemological divide between today's mainstream behavioural economics and its related libertarian paternalistic form of public policy, represented by Thaler and Sunstein (T&S), and Hayek's complexity and evolutionary approach to human knowledge, rationality and learning (Festré, 2019; Dold and Lewis, 2022). Central to the argument is Hayek's Knowledge Problem, the 'problem of the utilization of knowledge not given to anyone in its totality' (Hayek, 1945, p. 520), i.e. the knowledge of 'the particular circumstances of time and place' (p. 521). This knowledge possessed by the individuals includes tacit knowledge (TK), a concept introduced and developed by Hayek's contemporary Michael Polanyi (Polanyi, 1959, 1962, 1966).

The Knowledge Problem is expanded and addressed repeatedly by Rizzo and Whitman (R&W) in their critique of libertarian paternalism (Rizzo and Whitman, 2009, 2020, 2023) with TK mentioned several places, but without reference to

Polanyi.<sup>1</sup> We believe TK deserves more attention in order to raise awareness of limitations caused specifically by TK for ‘the theory of nudges’ (Thaler and Sunstein, 2021), i.e. for the operationalisation of libertarian paternalism.

The rest of this paper is organised as follows. The next section (Knowledge problems) reinterprets the Knowledge Problem by bringing Polanyi and his concept of TK into the picture. This reinterpretation involves questioning the division between general and local knowledge on which R&W’s critique of Sunstein’s interpretation of Hayek relies (Subsection General and local knowledge), and discussing more in depth the often undermined or even assumed-away issue of knowledge acquisition (Subsection Knowledge acquisition). In the subsequent main section (Implications for policies), we discuss policy implications of the epistemological turn ushered in by Polanyi, highlighting the pervasiveness of tacitness. His and Hayek’s contribution is at odds with T&S’s ideas of predictability and biological determinism of human cognitive biases as a defence for nudging (Subsection Predictability and biological determinism). Instead it elevates the fundamental role of learning and education (Subsection Learning and education). The paper is rounded off with a concluding discussion.

## Knowledge problems

Sunstein (2023) claims that the T&S approach is a ‘Hayekian behavioural approach’ for informing policymaking. But according to Sugden (2023), this is just a new example where the Hayekian label has been improperly claimed. Sunstein’s approach relies on a Kantian and ‘constructivist approach that Hayek consistently criticized’ (Sugden, 2023, p. 189). R&W also dismiss Sunstein’s claim and substantiate their argument by contrasting the epistemological foundations of the T&S approach and Hayek’s original Knowledge Problem.

Yet Hayek’s view of knowledge varied throughout his work. It can be reconstructed by emphasising two justifications of subjectivism: the first is *cognitive* (or connectionist) and related to *The Sensory Order* (TSO) published in 1952 (Hayek, 1952b);<sup>2</sup> the other one is related to what Hayek called ‘the social division of knowledge’ (Arena and Festré, 2006) and developed in Hayek (1937) and Hayek (1945). TSO shows an influence of the philosopher Ernst Mach. This is the reason why Smith (1997, p. 14) places Hayek among the precursors of connectionism, among whom are to be included not least Heidegger, Merleau-Ponty, Michael Polanyi and the later Wittgenstein. From the point of view of these philosophers, human reason is an intuitive, creative, contextual, holistic affair – a matter of ‘knowing how’ rather than of ‘knowing that’ (Ryle, 1949).

The problem addressed in TSO is establishing the relation between the ‘two orders’ of the subjective, sensory, perceptual, phenomenal, on one hand, and of the objective, scientific, physical on the other (Hayek, 1952b, p. 14). The main thesis of the work is to show that all attributes of mental experience pre-exist physical experience in the

<sup>1</sup>This is somewhat surprising since Rizzo previously has referred to Polanyi in relation to TK and also signalled awareness of more recent literature building on his work: O’Driscoll and Rizzo (2014): see p. 142, quoting and referencing *Personal Knowledge* (Polanyi, 1962); Rizzo (2005): see footnote 4, p. 793, referencing ‘The Logic of Tacit inference’ (Polanyi, 1969) and ‘What is Tacit Knowledge?’ (Collins, 2000).

<sup>2</sup>TSO has been re-edited by Vanberg with an extensive new introduction (Hayek, 2017).

form of abstract systems of classification in our brain and can be explained by the place in a system of connections of corresponding groups or patterns of nerve-excitations. Therefore, there are as many subjective forms of knowledge as there are individual 'nervous systems', i.e. agents are heterogeneous.

In later writings, Hayek seems to endorse a slightly different perspective on knowledge, having recourse sometimes to classifications of different forms of knowledge as put forward by Fleetwood and Runde (1997, pp. 164–6): general explicit knowledge such as scientific knowledge, local explicit knowledge such as practical or professional knowledge and *tacit* and *unconscious* knowledge. This is similar to Rizzo when he writes:

Local or objective knowledge can be, in turn, held in two ways. The first is *explicitly* or as knowledge capable, at least in principle, of articulation in propositional form to one's self or to other agents. This articulation and communication is generally costly. On the other hand, the knowledge can be held *tacitly* insofar as it cannot be stated in propositional form and hence is not communicable to others in a direct way. Such knowledge is communicated, if at all, implicitly through personal relationships. (Rizzo, 2005, p. 793)

We will now take a closer look at the 1945 essay where Hayek emphasises the social dimension and knowledge. This essay is the one that R&W highlight to criticise Sunstein's interpretation of Hayek. We use the essay as a point of departure for discussing two related but different questions: what knowledge is necessary (Subsubsection General and local knowledge), and what is the process by which people acquire knowledge (Subsubsection Knowledge acquisition). In doing this, we not only invoke Hayek but also Polanyi.

### **General and local knowledge**

Hayek's distinction between general (scientific) knowledge and local knowledge in his 1945 essay plays a key role in Sunstein's contention in favor of a Hayekian behavioural approach. He reminds the reader about passages where Hayek, according to Sunstein, 'emphasized the unshared nature of information' (Sunstein, 2023, p. 171):

Hayek emphasized the unshared nature of information—the 'dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess' [(Hayek, 1945, p. 519)]. That knowledge certainly includes facts about products, but it also includes preferences and tastes, and all of these are taken into account by a well-functioning market. Hayek stressed that above all, the 'very important but unorganized knowledge which cannot possibly be called scientific in the sense of general rules: the knowledge of the particular circumstances of time and place' [(Hayek, 1945, p. 521)].

Note that Sunstein is using the term 'information' as if the objective nature of knowledge should be taken for granted.

Hayek's distinction between the general and mostly abstract scientific knowledge (or theories) and the concrete knowledge of the 'circumstances of time and place' is

at the core of his argument in favour of the superiority of markets for coordinating individual economic plans in comparison to central planning.

But as emphasised by R&W, this distinction is both a ‘comparative institutional claim’ and an argument about the knowledge limitations of would-be-planners (Rizzo and Whitman, 2023, p. 200). The latter is the issue central to the critique of libertarian paternalism.

Later in the 1950s, the evolutionary theory of the selection of social rules of conduct developed by Hayek provided another solution to the knowledge coordination problem, with a more important role played by TK. Unlike local and general explicit forms of knowledge, TK does not require the preliminary definition of an objective to be deliberately learnt. As put by Hayek in *The Constitution of Liberty* (1960):

The growth of knowledge and the growth of civilization are the same only if we interpret knowledge to include all human adaptations to environment in which past experience has been incorporated. Not all knowledge in this sense is part of our intellect, nor is our intellect the whole of our knowledge. (Hayek, 2011, p. 26)

This passage provides a good illustration of the reasons that led Hayek to believe that individual knowledge involves much more than simply ‘explicit and conscious knowledge’ (p. 25).

We already mentioned the cognitive and social dimensions of Hayek’s view on knowledge. This is important for understanding the limits of access to specific knowledge. If access to specific knowledge is limited, how is it possible for would-be-planners to have privileged access to it in the first place? Secondly, assuming this is possible, for instance through the extensive use of experiments or artificial intelligence, is it reasonable to assume that this specific knowledge can be generalised so as to justify the design of one-size-fits-all policy interventions? Following R&W’s argumentation, behavioural paternalists or choice architects claim to have general scientific knowledge that may be unavailable to individuals.<sup>3</sup> But most of the knowledge accumulated through experimental research informing behavioural policies is highly specific. The claim that interventions such as nudges are ‘evidence-based’ does not make it more general. Most of experimental psychological findings are indeed highly context and domain specific. Thus, generalising quantitative experimental evidence to real-world scenarios and using it to support ‘one-size-fits-all’ policies, such as nudges, is highly problematic.

The knowledge of experts can at best be relevant in specific contexts and domains, and cannot in principle be anymore general than local knowledge. Moreover, not only is local knowledge subjective and context-dependent but it is also often tacit and unconscious. One example could be self-regulating behaviours which are often associated with nudges and difficult to observe because they entail tacit and partly unconscious knowledge. Therefore, the presence of self-regulation means that the operative level of cognitive bias may be quite different from the level of bias observed in

---

<sup>3</sup>General scientific knowledge would advocate for education instead of policy interventions.

laboratory studies or even field studies. Moreover, it may be different from one person to another.

Subjectivity, context-dependency and tacitness weaken the predictive power of paternalistic behavioural policies and may make the prescribed cure worse than the perceived disease.

### **Knowledge acquisition**

Two phenomena assumed away in S&T are very important in the process of acquisition of knowledge. Firstly, the process of acquisition of knowledge may be *social* as emphasised by Herbert Simon and others. Secondly, the cognitive constraints are not static as emphasised in different ways by Hayek and Polanyi, implying that preferences are not static either. We will start out by looking at social learning and then turn to the less straightforward approaches to knowledge acquisition developed by Hayek and Polanyi.

As suggested by Simon in *The Science of the Artificial*, human goal-oriented behaviour (i.e. their thinking and problem-solving) is ‘artificial’ and hence, highly variable, because it is learnt in a particular social environment and thus reflects the shape of the latter:

Insofar as behavior is a function of learned technique rather than ‘innate’ characteristics of the human information-processing system, our knowledge of behavior must be regarded as sociological in nature rather than psychological—that is, as revealing what human beings in fact learn when they grow up in a particular social environment. (Simon, 1996, p. 72)

The importance of social or strategic interaction and social intelligence – usually mistaken as logical errors or cognitive illusion in the paternalist behavioural literature – is commented upon at length by Gigerenzer (2015, p. 370) when discussing the literature on framing. Kahneman’s Linda problem or the Asian disease problem for instance have been given alternative explanations pointing out the fact that many people interpret some options to serve as reference points because of added or missing information or as the result of social intelligence (McKenzie and Nelson, 2003). Similarly, default options may be interpreted by people as recommended actions (McKenzie *et al.*, 2006).

Let us now turn to the issue of cognitive constraints on the knowledge acquisition process. Hayek and Polanyi are clearly complementary in some respects because they highlight indeterminate and non-teleological features of learning processes, but they also offer quite distinctive perspectives on knowledge that are difficult to reconcile and integrate into a unified analysis. Let us start by looking at the work of Hayek and then turn to Polanyi.

### **Hayek**

According to Hayek, the ‘logic of classification and reclassification’ gives a high degree of plasticity to the cognitive complex system, while negative feedback processes provide the property of homeostasis. In a nutshell, welcome or not, TK is there, and preferences are endogenous, as argued by Dold and Lewis (2022) in relation to Hayek’s main work

in psychology – TSO. As we will develop later, T&S's new paternalism relies on stable and given individual preferences instead.

What does Hayek mean by the logic of classification and reclassification? In his 1937 essay (Hayek, 1937), Hayek is mentioning the problem of knowledge acquisition in relation to his critique of the assumption of perfect foresight for understanding equilibrium. The 1937 essay is pivotal in the development of his thinking about complexity, and complexity is intimately related to his ideas about classification and reclassification. The essay also contains important ideas reappearing in his celebrated 1945 essay, notably the issue of the division of knowledge:

Clearly there is here a problem of the Division of Knowledge which is quite analogous to, and at least as important as, the problem of the division of labour. But while the latter has been one of the main subjects of investigation ever since the beginning of our science, the former has been as completely neglected, although it seems to me to be the really central problem of economics as a social science. (Hayek, 1937, p. 49)

In the context of the nudge debate, the 1937 essay seems at least as relevant as the 1945 essay.

According to Caldwell (1988, 2004), Hayek's main focus shifted in the 1950s. The manuscripts of Hayek's two ongoing works at that time, TSO (Hayek, 1952b) and his essay on 'Scientism and the study of society' (Hayek, 1952a), prompted Hayek's interest in complex systems such as cybernetics, the system theory of Ludwig von Bertalanffy and von Neumann's theory of automata. During this period Hayek also worked on a manuscript entitled 'Within Systems and about Systems', later split into two parts. One became his 1955 essay: 'Degree of explanation' and the other: 'The Theory of complex phenomena' (1964), both reprinted in Hayek (1967). From the 1950s onwards, Hayek elaborated on the idea that the cognitive system (as developed in TSO) and the system of rules of conduct are two complex systems, which share some properties of emergence in multi-level analysis.

On one hand, *the logic of the cognitive system*, as developed in TSO, is based on the principle of increasing classification, which reflects the relations that take place between events and effects. In compliance with the logic of multilevel systems in cybernetics, classification is a hierarchical process. As Hayek explains, 'the classification may thus be multiple in more than one respect' (Hayek, 1952b, p. 50). Firstly, 'not only may each individual event belong to more than one class, but it may also contribute to produce different responses of the machine if and only if it occurs in combination with certain other events' (p. 50). Secondly, 'different groups consisting of different individual events may ... evoke the same response and the machine would then classify not only individual events but also groups consisting of a number of (simultaneous or successive) events' (p. 50). Thirdly, the logic of classification is 'multiple' in a third sense due to its reflexivity: 'it can take place on many successive levels or stages, and any one of the various classes in which an impulse may be included may in turn become the object of further classification' (p. 70).

On the other hand, *the logic of system of rules of conduct* is particularly well illustrated by Hayek's famous dictum: 'the result of human action but not of human design'.

Hayek's analysis of the complex system of rules of conduct is found in his 'Notes on the Evolution of Systems of Rules of Conduct' (Hayek, 1967), which is a central piece of his often-debated theory of cultural evolution. In this article, Hayek explains how rules of conduct followed by groups of individuals give rise, thanks to a process of selection, to orders of actions that take place at the level of the group as a whole at a given time in the course of evolution. The process of selection of rules involves two distinct systems or levels of analysis: 'the elements of any order' and the 'resulting order' in general terms, or, in the particular instance of Hayek's social theory, 'the individuals' and 'the group of individuals' (Hayek, 1967, footnote 1, pp. 66–7). As emphasised by Hayek, the systems of rules of individual conduct and the order of actions which results from the individuals acting in accordance with them are not the same thing (p. 67). The connectionist complexity approach of the mind as a classifier system based on abstract rules is for Hayek the basis for the existence of TK (Smith, 1997), while the two orders of rules are at the core of its social dimension.

### *Polanyi*

Let us turn to Michael Polanyi and his conception of TK or rather tacit knowing. Polanyi's view on TK resists any categorisation: it cannot be treated as a substantive possession of individuals and groups or defined as a residual after accounting for explicit knowledge. It is rather a process (of tacit knowing) involving the commitment of a person who is embedded in a social and historical context. This process is elucidated by Polanyi through the extensive use of analogies, notably visual clues or representations such as visionary illusions and stereoscopic images.

As Polanyi explained, tacit knowing is the result of a dual process, i.e. 'tacit inference' and 'tacit integration', as it can be identified in the visual perception. Tacit inference corresponds to subsidiary awareness (the awareness of the components of a whole in visual perception, e.g. the details of a face), while tacit integration corresponds to focal awareness (the focus on the whole or the act by which we understand or recognise that what we see is actually a face).

Therefore, the main concept in order to understand Polanyi's notion of TK appears to be the concept of integration:

This act of integration, which we can identify both in the visual perception of objects and in the discovery of scientific theory, is the tacit power we have been looking for. I shall call it tacit knowing. It will facilitate my discussion of tacit knowing if I speak of the clues or parts that are subsidiarily known as the proximal term of tacit knowing and of that which is focally known as the distal term of tacit knowing. (Polanyi, 1966, p. 3)

As pointed out by Scott (1971, pp. 23–4), Polanyi endorsed a unified perspective on TK 'by providing a structural account of this feature of cognition, which utilizes seeing as a paradigm for knowing' and by 'stretching the term awareness rather far to use it for ... a variety of more or less subliminal processes'. By so doing, Polanyi escaped from debates such as whether TK is unconscious or not, whether it is abstract, as for Hayek, or whether it can potentially be made explicit.



More precisely, tacit integration is described as the manifold (also called ‘from-to’ relation) between focal and subsidiary awareness. As developed in Polanyi (2009, 1966), this relation is three-dimensional: *functional*, *phenomenological* and *semantic*. The functional dimension relates to the structure of TK, i.e. the fact that when looking for example at a facial expression, we are, as Polanyi said, attending *from* certain characteristics (i.e. subsidiary awareness or, what Polanyi, borrowing the metaphor from anatomy, refers to as the ‘distal term’ of tacit knowing) *to* the face (i.e. focal awareness or the ‘proximal term’ of tacit knowing), without being able to specify the features that form the latter (Polanyi, 2009, p. 10). As for the phenomenological dimension, it refers to the fact that our focal awareness emerges from the appearance of the distal term of attention. In the words of Polanyi, ‘we are aware of that *from* which we are attending *to* another thing, in the *appearance* of that thing’ (p. 11). Finally, the semantic dimension relates to the significance or meaning of the relation between the distal and proximal terms of tacit knowing, which combines its functional and phenomenological aspects (p. 11).

In brief, Polanyi’s theory of tacit knowing, abolishes the dichotomy between tacit and explicit knowledge. For Polanyi, there is indeed no room for such a distinction. Any kind of knowledge, including scientific knowledge, involves irreducible tacitness. Furthermore, knowledge is better described as a process of knowing. Tacit knowing is often described by what it is not. But also by analogies with explicit rules, perceptions and interpretations (Turner, 2012). An example is Polanyi’s definition of ‘skilful performance’ as ‘the observance of a set of rules which are not known as such to the person following them’ (Polanyi, 1958, p. 50).

To summarise, there are important difference between Polanyi and Hayek’s view of TK. The origin of these difference is located in their respective epistemologies (see, e.g. Mullins, 2010; Oğuz, 2010). It seems Hayek essentially follows Popper<sup>4</sup>, while Polanyi rejects any form of positivism and is not in favour of Popper’s falsifiability.<sup>5</sup> Contrary to Popper who states that scientific knowledge is objective, namely, ‘knowledge without a knower’ or ‘knowledge without a knowing subject’ (Popper, 1972, p. 109), Polanyi emphasises the *embeddedness* of knowledge in individuals, that is, ‘the knower’s active participation in any act of knowing’ (Polanyi, 1981, p. 4). Polanyi does not endorse Hayek’s view on TK as related to the brain as a classifier system based on abstract rules. For him, abstractness is a non-operational criterion since we do not know ‘how to distinguish between abstract principles on which we should base the order of the economy and speculative ideas, the fascination of which we must firmly resist’ (Polanyi, 1949, p. 267). For Polanyi, TK is derived from a phenomenological body–mind approach (see Festré and Østbye, 2021, p. 97).

Epistemological foundations of both Hayek and Polanyi’s conception of knowledge in general, and TK in particular, are clearly at odds with the new paternalist approach of mainstream behavioural economics. As argued by R&W but also Devereaux (2019), T&S’s attempt to incorporate insights from cognitive psychology, in particular to accommodate the empirical findings of consistent biases in human behaviour, while

<sup>4</sup>The nature of the relationship between Hayek and Popper is controversial. See Birner (2009).

<sup>5</sup>For the relations between Popper and Polanyi, see Jacobs and Mullins (2011).



keeping the normative approach of rationality, is not only incompatible with Hayek and Polanyi's conception of knowledge, but is also epistemologically ill-founded. This leads to a schizophrenic situation where behavioural welfare economics is implicitly using a psychologically ungrounded model of human action in which a disembodied 'inner rational agent' interacts with the world through an error-inducing psychological 'shell' (Infante *et al.*, 2016, p. 1).

This flaw in the epistemological foundations is bound to have repercussions on their stance on policy making, a topic we address in the next section.

### Implications for policies

We will here consider nudging and education as alternative policies. This choice is not random, but based on the heated debate over the very same alternatives, such as in the context of risk assessment as highlighted in Bond (2009) or more generally in Gigerenzer (2015). In Subsection Predictability and biological determinism, we examine the basis for endorsing nudging and in Subsection Learning and education the basis for endorsing the alternative, education. As we shall see, the champions of nudging, stressing determinism, are again at odds with both Hayek and Polanyi, stressing indeterminacy. TK has a role to play in this debate by emphasising indeterminacy as an argument against nudging and in favour of education and learning.

### *Predictability and biological determinism*

In the 'Final edition' of *Nudge*, as the authors ironically call it in order to nudge themselves, T&S define nudges exactly as in the first edition of their book:

Any aspect of the choice architecture that alters people's behavior in a *predictable* way without forbidding any options or significantly changing their economic incentives. (Thaler and Sunstein, 2021, p. 8, italics added)

An important term in the quotation is 'predictable'. The idea is that what is new with the libertarian paternalism is not that people make mistakes but that these mistakes are attributed to systematic and stable cognitive errors.

Predictability is not only linked to the 'schizophrenic' treatment of economic behaviour as we have hinted at before. It is also the result of a static perspective on rationality, whereby each agent achieves an intrapersonal equilibrium at each point of time, and for all possible combinations of preferences and beliefs, regardless of adjustment costs. Furthermore, as noticed by Whitman and Rizzo (2015, p. 419), these adjustments costs are inversely related to the likelihood of options: 'the expected marginal benefit of discovering and/or forming these preferences presumably declines as the compared options get further from one's likely future experience'. Finally, it also involves a vision of the individual devoid of social interaction with others. In particular, when decision making involves face-to-face interactions, there is a gap between knowledge (what we should do, assuming we are aware of this knowledge) and behaviour (what we actually do). There are famous examples of supposedly absurd decisions that are the result of hierarchical relationships in organisations (see Morel, 2002).

In a nutshell, in many social relationships, emotions prevail over consistent Bayesian updating. This may lead to procrastination or choice avoidance not out of irrationality but as a consistent way not to be exposed to stress or blame from others. As we have shown in the ‘Knowledge problems’ section, both Hayek and Polanyi stand apart from the deterministic view of human behaviour. Both Hayek and Polanyi focus on the indeterminate or non-teleological (without explicit purpose) dimension of the knowledge acquisition process.

For Hayek the cognitive system and the system of rules of conduct are two complex systems, one hierarchical (the cognitive system), whereas the system of rules and conduct is not (Festré, 2019, p. 925). Concerning the hierarchical cognitive system, we have emphasised that Hayek defines TK in general and abstract terms, related to the classification process of the human’s mind, i.e. the idea that perception is the result of classification at various levels of abstraction.

Indeterminacy in the cognitive system can be related to Gödel’s 1931 incompleteness theorem and the later known Ashby’s Law of Requisite Variety (Ashby, 1956).<sup>6</sup> Hayek expresses a very similar idea when he writes in his essay on ‘Scientism and the study of society’ that

any apparatus of classification would always have to possess a degree of complexity greater than any one of the different things which it classifies; and if this is correct it would follow that it is impossible that our brain should ever be able to produce a complete explanation (as distinguished from a mere explanation of the principle) of the particular ways in which it itself classifies external stimuli. (Hayek, 1952b, p. 49)

Concerning the indeterminacy of social structures related to the two levels of selection of rules of conduct, Hayek (1967, p. 75) refers to ‘conjectural history’ as an adequate term for describing (social) structures or events. The indeterminacy of the result of the selection processes is due in particular to the manifold influences occurring both at the cognitive level and at the social level, i.e. ‘the concrete individual actions will always be the joint effect of internal impulses, such as hunger, the particular external events acting upon the individual (including the actions of members of the group), and the rules applicable to the situation thus determined’ (p. 68).

More generally, Hayek’s main arguments concerning the limits to prediction in complex systems are found in the two already mentioned 1955 and 1964 articles (Festré, 2019, pp. 927–28). First, he explains that theories of complex systems do not constitute closed self-contained systems but define ‘only a kind (or a class) of patterns’ while ‘the particular manifestation of the pattern to be expected will depend on the particular circumstances (the initial and marginal conditions to which we shall refer as “data”)’. Consequently, ‘how much ... we shall be able to predict will depend on how many of

---

<sup>6</sup>Hayek quotes Ashby (with a typo: Ashley instead of Ashby) in a footnote in *TSO* (Hayek, 1952b, p. 95), reminding that according to this law, regulation and control of a system are possible if and only if the system that undertakes to control and regulate this system is at least of the same variety. He refers to Gödel in ‘Notes on the Evolution of Systems of Rules of Conduct’ Hayek (1967, p. 62). The exact meaning of the supposed relationship between Gödel’s theorem and the essential propositions of Hayek’s theory of mind is subject to interpretation (see Hauwe, 2011).

those data we can ascertain' (Hayek, 1967, p. 24). In other words, the more complex is a system, the less we are able to predict particular phenomena.

The degree of complexity of phenomena is defined as 'the minimum number of elements of which an instance of the pattern must consist in order to exhibit all the characteristic attributes of the class of patterns in question' (p. 25). It follows that with sufficient complexity we must contend ourselves with explanations 'of the principle of the thing' and resist the temptation of control.

Hayek also points out the consequences in terms of the refutation criterion of Popper:

the more we move into the realm of the very complex, the more our knowledge is likely to be of the principle only, of the significant outline rather than of the detail ... and in consequence only the theoretical system as a whole but no longer in part can be really falsified. (p. 20)

As emphasised in the previous section, Polanyi's description of the process of tacit integration is characterised by two kinds (contingent and logical) of irreversibility, which involves some degrees of indeterminacy.

The first type implies that looking at exactly the same clues but from a different angle may result in a totally different resulting picture. Like Kahneman, Polanyi uses the visual metaphor in order to illustrate irreversibility. But unlike mainstream behavioural economists assuming stability of cognitive biases, Polanyi highlights the intrinsic instability or context-dependence of visual illusions. As an illustration, Polanyi gives the example of stereoscopic images, which use 3D imaging to create and to enhance the illusion of depth in an image by means of stereopsis for binocular vision. Most stereoscopic methods present two offset images separately, one to the left and one to the right eye of the viewer (a metaphor for subsidiary awareness). These two images are then combined in the brain to give the perception of 3D depth (a metaphor for focal awareness). What Polanyi explains is that finding our way back to the clues in the two pictures is difficult. Firstly, because they are hardly visible and secondly, because there are many other clues to seeing something, like memories and the feeling inside our eye muscles, which we either cannot trace or cannot experience in themselves at all; they are *largely submerged, unspecifiable* [italics in original].

The second type of irreversibility is even more devastating for determinacy:

to go back to the premises of a tacit inference brings about its reversal. It is not to retrace our steps, but to efface them. Suppose we take out the stereo-pictures from the viewer and look at them with both eyes. All the effects of the integration are cancelled; the two pictures no longer function as clues, their joint meaning has vanished. What has happened may be regarded as the inverse of tacit inference; a process of *logical disintegration has reduced a comprehensive to its relatively meaningless fragments*' [italics in original]. (Polanyi, 1969, p. 213)

This relates to the third dimension of the process of tacit integration (the *semantic* dimension). This dimension involves an emergent process as suggested by Gestalt theory by which we are able to give significance or meaning to the relation between

subsidiary and focal awareness. A good style, for example, cannot be explained by a correct use of grammar (Polanyi, 2009, p. 37).

### *Learning and education*

In mainstream behavioural economics, the idea of biological determinism through the use of analogies seems abusively linked to the denial of the role of education.

As put by Gigerenzer (2015, p. 365):

The claim that people largely cannot unlearn these errors is typically made through the use of analogies rather than evidence. The three analogies used are *visual illusions*, the *reptilian brain*, and a biologically hard-wired *System 1* that relies on heuristics and intuition rather than on statistics and logic. The choice of analogies aligns cognitive errors with biological determinism. For instance, comparing reasoning errors—aptly called *cognitive illusions*—to visual illusions implies that trying to educate people out of them is a doomed effort.

In the previous subsection Predictability and biological determinism we have seen that Hayek and Polanyi through their conceptions of TK, dismissed biological determinism of human behaviour and therefore by implication also should have dismissed the argument against education presented above. Thaler, in a *Nature News Feature* article, is quoted to say: ‘Our ability to de-bias people is quite limited’ (Bond, 2009, p. 1191). This seems to imply that Thaler, as opposed to Gigerenzer, considers education at best as an ineffective alternative to nudging. Although the context in the article is risk assessment and the News Feature format is not that of an academic paper, there are some rather general takeaways that are worth mentioning when contrasting nudging and education, and the format may make the contrast sharper.

One difference emphasised is the way information is presented to the public. Nudging is about framing information in order to increase ‘the chances that people will exercise good judgement’ (p. 1191). Education, on the other hand, is about presenting information as transparently and clearly as possible, but leaving the decision to be made to the individual without consciously framing the information in a specific direction. This is sometimes referred to as educational paternalism (Viale, 2019). Again, both Hayek and Polanyi would probably have approved educational paternalism and disapproved of nudging based on distorting information, although the distinction between what is a nudge and what is not is not always very clear. As Gigerenzer puts it, ‘since the publication of Thaler and Sunstein’s (2008) *Nudge*, almost everything that affects behavior has been renamed a nudge, which renders this concept meaningless’ (Gigerenzer, 2015, p. 363). One good example is provided by Sunstein himself: ‘Is Hayek endorsing a kind of nudging? No doubt about it (as long as we include, as we should educative nudges as nudges)’ (Sunstein, 2023, p. 176).

Another difference is revealed by introducing a dual-process perspective: ‘The problem, as many researchers in cognitive neuroscience and psychology have concluded, is that people use two main brain systems to make decisions. One is instinctive ... The other is conscious and rational.... Unfortunately, the first system has a way of kicking in even when deliberation would serve best’ (Bond, 2009, p. 1190). The ‘bat-and-a-ball’ task from the Cognitive Reflection Test (Frederick, 2005) serves as an example

of when the wrong system tends to kick in: 'Such findings are why many researchers think that the attempt to improve decision-making through education, which tries to put the rational system in charge of the instinctive one, lie somewhere between over-optimistic and hopeless. Two of the most prominent sceptics are Thaler and Cass Sunstein' (p. 1190). Of course, Gigerenzer does not agree: 'Some people, he says, like to attribute every poor decision to hard-wired mental processes that humans cannot control. He maintains that there is plenty of evidence that people can learn to rewire their minds' (p. 1191). Hence, while T&S consistently appear to think in terms of biological determinism of human behaviour, Gigerenzer allows for breaking out of the biological determinism, by admitting behaviour to change based on learning.

The dual-process perspective also allows us to comment on another aspect very much present in sports psychology and practical literature pertaining to improving sports performance. This is also a good example of what Michael Lynch suggests as one important reason for the continued interest in TK more than half a century after Polanyi and others were working on this topic: 'No doubt, there are many reasons for the persistent interest in tacit knowledge. The most obvious reason is that the theme resonates with the discourse and interest of practitioners as well as scholars (and of scholars as academic practitioners)' (Lynch, 2013, p. 56).

The perspective by T&S is that performance is hampered by 'the wrong system kicking in', where the wrong system seems always to be the 'instinctive' System 1 and the appropriate system the 'rational' System 2.<sup>7</sup> But in sports it is the other way around. Performance is hampered by the rational System 2 'kicking in' and interfering with System 1. Although this is an area where academics have taken interest for some time, the practitioners seem to have been thinking about this much earlier based on experience and an intuitive approach to teaching sports. A prominent example is the inner-game approach invented by the tennis coach Tim Gallwey in the 1970s and later applied to other sports and beyond (Gallwey, 1974).

Recently, the possibility that things can work both ways, if not at the same moment in time, has been suggested (Furley *et al.*, 2015, p. 120): 'In our opinion the efficient switching between these different modes of processing [Type 1 and Type 2] constitutes an important factor in performance proficiency in sports, and has not received the research attention that it may deserve'. This might also be relevant outside the sport domain.

For Gigerenzer (2015), the problem with new paternalism is not its associated interventions, but that such interventions are ill-justified due to an overly narrow conception of rationality ('narrow logical norms'), and selective reporting of evidence (i.e. a 'confirmation bias'). As discussed by Rizzo (2017), there is an interesting connection between broader conceptualisations of rationality exemplified by ecological rationality promoted by Gigerenzer and others, and Hayek's pragmatic rule-following rationality.

Gigerenzer presents many examples where education actually works better (by making people more 'risk savvy') than nudges. One good example concerns information campaigns about mammography screening:

<sup>7</sup> A distinction may be made between nudges aimed at blocking the interference from the instinctive system (system 1 nudge) and nudges directed at empowering the rational system (system 2 nudge) (Sunstein, 2016).

Consider the appointment letters sent ... [with] a preset time and location. This default booking is a nudge that exploits inertia ... in the letters and pamphlets encouraging screening, it is often stated that early detection reduces breast cancer mortality by 20%. That figure is a second nudge that exploits people's statistical illiteracy. Screening reduces breast cancer mortality from about 5 to 4 in 1,000 women (after 10 years) ... typically presented as a relative risk reduction of 20%, often rounded up to 30%, to look more impressive [(Gigerenzer, 2014)]. This example illustrates the difference between nudging and educating. The aim of the appointment letters is to increase participation rates, not understanding. As a result, women in the European Union are less knowledgeable about the benefit of screening than Russian women, who are not nudged by relative risks and similar persuasive techniques [(Gigerenzer *et al.*, 2009)] (Gigerenzer, 2014, p. 362).

Previously we have seen that Hayek and Polanyi through their conceptions of TK dismissed the possibility of determinism and by implication the foundation for nudging without discussing nudging *per se*. We have also seen that a similar inconsistency does not apply to education. But did Hayek and Polanyi explicitly endorse educating the general public?

Hayek does not discuss education much. An exception might be said for his interest in education as a prerequisite for social stability in democracies, as exposed in the last chapter of *The Constitution of Liberty*, entitled 'Education and research'. He is concerned about illiteracy and admits some basic education should be available for people to be able to learn to read. However, the epigraph in Sunstein (2023) is a quote from Hayek that can conveniently help us out here: 'Even the most essential prerequisite for its proper functioning [the competitive system], the prevention of fraud and deception (including exploitation of ignorance), provides a great and by no means yet fully accomplished object of legislative activity'. Although Hayek points to legislative activity and neither nudging nor educating as explicit means to accomplish what is not already achieved, it seems reasonable to believe that Sunstein considered his epigraph to be relevant for his article. If we rule out nudging (in a meaningful interpretation) because we would not like to claim that Hayek would favour policy instruments that are inconsistent with his own theory of knowledge, what we are left with might be education or maybe 'educative nudges' (which seems a confusing term).

For Polanyi, an affirmative answer to the question is more evident. Also Polanyi was concerned about the relationship between education and liberty. He was convinced that the enlightenment of the masses was urgently needed in order to preserve freedom in society. He was upset by the cloister-like character of many economists of his time who preferred the *status quo*, i.e. giving statements that are deliberately inaccessible to the general public in order for it not to err in speculation. Polanyi was in full disagreement with this contention and took it as the symptom of a 'craving for economic consciousness' (Polanyi, 2016, p. 11).<sup>8</sup> Polanyi had the hope that, by diffusing political economic ideas using visual tools in a creative way, he could make the general public more aware of the dangers of the scientific and materialist view of science, which was also penetrating the field of economics. As an example, consider his 1940 film 'Unemployment and

<sup>8</sup>See Biró (2020, p. 94).

Money. The Principles Involved', where Polanyi aimed at modifying the perceptions and beliefs of people on how economic policies affect their concrete lives.

Polanyi was not only a scholar but also an academic practitioner using unconventional tools in the role of educator. Importantly, he did this in order to increase understanding so people could take better-informed decisions just like the Russian women in Gigerenzer's mammography example.

### Concluding discussion

Throughout this paper, we have argued that taking TK seriously implies the denial of any form of legitimacy to Thaler and Sunstein's 'libertarian paternalism' and its associated nudge interventions based on the idea of cognitive error.

We started out by looking at Hayek's Knowledge Problem (Hayek, 1937, 1945) in the context of the attention received in the nudge debate, or 'the nudge wars' with a more provocative term sometimes used by libertarians. In that respect, we do not claim much originality as most of this is well known (see, e.g. Rizzo and Whitman, 2009, 2020, 2023; Sugden, 2023), but still important to clarify and present as a backdrop to our discussion.

We have emphasised the development of Hayek's theory of knowledge in cognitive and social terms spelled out in his book in theoretical psychology *The Sensory Order* from 1952 (Hayek, 1952b) and later works (Hayek, 1967, 2011). Here, we have gone into far more detail than what is commonly found in the nudge debate in order to clarify the basis for Hayek's notion of local and subjective knowledge.

Foremost, we have brought Polanyi's theory of TK or tacit knowing, as he preferred to call it, down from the attic and into the limelight along with Hayek's theory. Combined, the two make the defence of libertarian paternalism an even more challenging and difficult task. Our main arguments are based on comparing the theories of knowledge of Hayek and Polanyi to the epistemic foundation of libertarian paternalism. A minimum requirement for qualifying as Hayekian or Polanyian behavioural economics would certainly be consistency.

There may be several reasons why Hayek has attracted considerable attention in the nudge debate. Sunstein and the 'behavioural welfare economists' may have considered evoking Hayek as a good strategy 'in trying to head off the criticism that behavioral welfare economics is unacceptably paternalistic' by '[r]ebranding behavioral welfare economics by naming it after the greatest classical liberal economist of the twentieth century ...' (Sugden, 2023, p. 197).

Sunstein engaging 'in a kind of intellectual mis-selling' as Sugden calls it, may in part be due to confusion. Hayek developed two apparently contradictory epistemologies. The epistemology he seems to hatch in his 1945 essay where he credited the price system for aggregating and communicating local (and possibly tacit) knowledge, in fact undermines the knowledge issue (nudges could be interpreted as the equivalent of prices but for intra-personal regulation). The other epistemology is attributed to human and non-human organisms alike the error-prone interpretation of stimuli, which could never truly be said to be knowledge but rather subconscious – non-intentional – rule-following behaviour. From this second perspective, the notion of cognitive error has no meaning.

The fame of Hayek may be one reason why Polanyi seems to have been left in the shadow in the nudge debate. Hayek and Polanyi met the first time in Paris in 1938



(where Polanyi previewed his film *Unemployment and Money* with Hayek and Mises in the audience) and corresponded extensively later (Howard, 2008, p. 6). Hayek stopped referencing Polanyi in 1950, but restarted in 1960 (*The Constitution of Liberty*) and increasingly explicitly acknowledged Polanyi in later work. As put by Howard (2008, p. 37),

By the late 1960s both Hayek and Polanyi were employing nearly identical arguments to promote a very similar ontological perspective, one that acknowledged the tacit component in knowledge, science and society ... Hayek's project never engaged in an explicit program to reformulate epistemology and science as was Polanyi's ... Polanyi realized many of the far reaching implications of Hayek's work and was encouraging him to broaden the scope of his research project.

But by contrast to Hayek, developing two different epistemologies, Polanyi is not exposed to the ambiguity due to his unitary notion of tacitness as a process and his mind-body approach of knowledge.

Despite the gradual convergence of Hayek and Polanyi emphasised by Howard, some things still set them apart. If we side with Polanyi on the matters of disagreement, the break with libertarian paternalism seems complete. If we side with Hayek, at least he shares with libertarian paternalism the idea that there is such a thing as objective knowledge.

**Acknowledgement.** We would like to thank the editors and anonymous referees for useful comments and suggestions.

**Competing interests.** None.

## References

- Arena, R. and A. Festré (2006), 'Knowledge and beliefs in economics: the case of the Austrian tradition', in R. Arena and A. Festré (eds), *Knowledge, Beliefs and Economics*, Cheltenham: Edward Elgar Publishing, 35–58.
- Ashby, W. R. (1956), *Introduction to Cybernetics*, London: Chapman & Hall.
- Birner, J. (2009), 'From group selection to ecological niches', in Z. Parusniková and R. S. Cohen (eds), *Rethinking Popper*, London: Springer, 185–202.
- Biró, G. (2020), *The Economic Thought of Michael Polanyi*, New York: Routledge.
- Bond, M. (2009), 'Decision-making: risk school', *Nature*, **461**(7268): 1189–1192.
- Caldwell, B. (1988), 'Hayek's transformation', *History of Political Economy*, **20**(4): 513–541.
- Caldwell, B. (2004), 'Some reflections on F.A. Hayek's The Sensory Order', *Journal of Bioeconomics*, **6**(3): 239–254.
- Collins, H. M. (2000), 'What is tacit knowledge?', in K. K. Cetina, T. R. Schatzki and E. von Savigny (eds), *The Practice Turn in Contemporary Theory*, London and New York: Routledge, 115–128.
- Devereaux, A. (2019), 'The nudge wars: a modern socialist calculation debate', *The Review of Austrian Economics*, **32**(2): 139–158.
- Dold, M. and P. Lewis (2022), 'F. A. Hayek on the political economy of endogenous preferences: an historical overview and contemporary assessment', *Organization*, **196**: 104–119.
- Festré, A. (2019), 'Hayek on expectations: the interplay between two complex systems', *The European Journal of the History of Economic Thought*, **26**(5): 911–941.
- Festré, A. and S. Østbye (2021), 'Michael Polanyi on creativity', *Revue d'Économie Industrielle*, **174**: 89–116.
- Fleetwood, S. and J. Runde (1997), 'Hayek III: the necessity of social rules of conduct', in F. F. Stephen (ed), *Hayek: Economist and Social Philosopher*, London: St. Martin's Press, 155–183.

- Frederick, S. (2005), 'Cognitive reflection and decision making', *Journal of Economic Perspectives*, **19**(4): 25–42.
- Furley, P., G. Schweizer and A. Bertrams (2015), 'The two modes of an athlete: dual-process theories in the field of sport', *International Review of Sports and Exercise Psychology*, **50**(3): 401–431.
- Gallwey, W. T. (1974), *The Inner Game of Tennis*, New York: Random House.
- Gigerenzer, G. (2014), 'Breast cancer screening pamphlets mislead women', *BMJ*, **348**. <https://www.bmj.com/content/348/bmj.g2636.full.pdf>
- Gigerenzer, G. (2015), 'On the supposed evidence for libertarian paternalism', *Review of Philosophy and Psychology*, **6**(3): 361–383.
- Gigerenzer, G., J. Mata and R. Frank (2009), 'Public knowledge of benefits of breast and prostate cancer screening in Europe', *Journal of the National Cancer Institute*, **101**(17): 1216–1220.
- Hauwe, L. M. P. V. D. (2011), 'Hayek, Gödel, and the case for methodological dualism', *Journal of Economic Methodology*, **18**(4): 387–407.
- Hayek, F. A. (1937), 'Economics and knowledge', *Economica*, **4**(13): 33–54.
- Hayek, F. A. (1945), 'The use of knowledge in society', *The American Economic Review*, **35**(4): 519–530.
- Hayek, F. A. (1952a), *The Counter-Revolution of Science: Studies on the Abuse of Reason*, Glencoe: The Free Press.
- Hayek, F. A. (1952b), *The Sensory Order: An Inquiry into the Foundations of Theoretical Psychology*, London: Routledge Kegan Paul.
- Hayek, F. A. (1967), *Studies in Philosophy, Politics and Economics*, Chicago: University of Chicago Press.
- Hayek, F. A. (2011), *The Constitution of Liberty*, ed. by R. Hamowy, Collected Works of F.A. Hayek (Hardcover). Chicago: University of Chicago Press.
- Hayek, F. A. (2017), *The Sensory Order and Other Writings on the Foundations of Theoretical Psychology*, ed. by V. J. Vanberg, Collected Works of F. A. Hayek. Chicago: University of Chicago Press.
- Howard, E. S. (2008), 'A joint pursuit: the unique epistemic project of Friedrich Hayek and Michael Polanyi', in *Polanyi Society Conference Paper*.
- Infante, G., G. Lecouteux and R. Sugden (2016), 'Preference purification and the inner rational agent: a critique of the conventional wisdom of behavioural welfare economics', *Journal of Economic Methodology*, **23**(1): 1–25.
- Jacobs, S. and P. Mullins (2011), 'Relations between Karl Popper and Michael Polanyi', *Studies in History and Philosophy of Science Part A*, **42**(3): 426–435.
- Lynch, M. (2013), 'At the margins of tacit knowledge', *Philosophia Scientiæ: Studies in History of Sciences and Philosophy*, **17**(17-3): 55–73.
- McKenzie, C. R. M., M. J. Liersch and S. R. Finkelstein (2006), 'Recommendations implicit in policy defaults', *Psychological Science*, **17**(5): 414–420.
- McKenzie, C. R. M. and J. D. Nelson (2003), 'What a speaker's choice of frame reveals: reference points, frame selection, and framing effects', *Psychonomic Bulletin and Review*, **10**(3): 596–602.
- Morel, C. (2002), *Les Décisions Absurdes: Sociologie Des Erreurs Radicales Et Persistantes*, Paris: Editions Gallimard.
- Mullins, P. (2010), 'Michael Polanyi's use of gestalt psychology', in T. Margitay (ed), *Knowing and Being*, Newcastle-upon-Tyne: Cambridge Scholar Publishing, 10–29.
- O'Driscoll, G. P. and M. J. Rizzo (2014), *Austrian Economics Re-examined: The Economics of Time and Ignorance*, London: Routledge.
- Oguz, F. (2010), 'Hayek on tacit knowledge', *Journal of Institutional Economics*, **6**(2): 145–165.
- Polanyi, M. (1949), 'Review of individualism and economic order', *Economica*, **16**(63): 267–268.
- Polanyi, M. (1958), *Personal Knowledge: Towards a Post-Critical Philosophy*, Chicago: University of Chicago Press.
- Polanyi, M. (1959), *The Study of Man: The Lindsay Memorial Lectures 1958*, London: Routledge and Kegan Paul.
- Polanyi, M. (1962), *Personal Knowledge: Towards a Post-Critical Philosophy*, London: Routledge and Kegan Paul.
- Polanyi, M. (1966), 'The logic of tacit inference', *Philosophy*, **41**(155): 1–18.
- Polanyi, M. (1969), *Knowing and Being: Essays by Michael Polanyi*, edited by M. Grene, Chicago: University of Chicago Press.

- Polanyi, M. (1981), 'The creative imagination', in D. Dutton and M. Krausz (eds), *Society, Economics and Philosophy: Selected Papers*, London: Routledge, 91–108.
- Polanyi, M. (2009), *The Tacit Dimension*, Chicago: University of Chicago Press.
- Polanyi, M. (2016), 'On popular education in economics (unpublished Lecture of 1937)', *Tradition & Discovery: The Polanyi Society Periodical*, 42(3): 18–24.
- Popper, K. R. (1972), *Objective Knowledge*, Oxford: Clarendon Press.
- Rizzo, M. J. (2005), 'The problem of moral dirigisme: a new argument against moralistic legislation', *New York University Journal of Law and Liberty*, 1(2): 781–835.
- Rizzo, M. J. (2017), 'F. A. Hayek and the rationality of individual choice', *Revisiting Hayek's Political Economy - Advances in Austrian Economics*, 21: 21–39.
- Rizzo, M. J. and G. Whitman (2009), 'The knowledge problem of new paternalism', *BYU Law Review*, 2009 (4): 905–968.
- Rizzo, M. J. and G. Whitman (2020), *Escaping Paternalism: Rationality, Behavioral Economics, and Public Policy*, Cambridge: Cambridge University Press.
- Rizzo, M. J. and G. Whitman (2023), 'The unsolved Hayekian knowledge problem in behavioral economics', *Behavioural Public Policy*, 7(1): 199–211.
- Ryle, G. (1949), *The Concept of Mind*, London: Hutchinson's University Library.
- Scott, W. T. (1971), 'Tacit knowing and the concept of mind', *The Philosophical Quarterly (1950-)*, 21(82): 22–35.
- Simon, H. A. (1996), *The Sciences of the Artificial, 3rd Edition*, vol. 1, MIT Press Books. Cambridge, MA: The MIT Press.
- Smith, B. (1997), 'The connectionist mind: a study of Hayekian psychology', in *Hayek: Economist and Social Philosopher: A Critical Retrospect*, F. F. Stephen (ed), London: St. Martin's Press, 9–29.
- Sugden, R. (2023), 'How Hayekian is Sunstein's behavioral economics?', *Behavioural Public Policy*, 7(1): 189–198.
- Sunstein, C. R. (2016), *The Ethics of Influence*, Cambridge, MA: Cambridge University Press.
- Sunstein, C. R. (2023), 'Hayekian behavioral economics', *Behavioural Public Policy*, 7(1): 170–188.
- Thaler, R. H. and C. R. Sunstein (2021), *Nudge: The Final Edition*, New York: Penguin Publishing Group.
- Turner, S. (2012), 'Making the tacit explicit', *Journal for the Theory of Social Behavior*, 42(4): 385–402.
- Viale, R. (2019), 'Architecture of the mind and libertarian paternalism: is the reversibility of system 1 nudges likely to happen?', *Mind & Society*, 18: 143–166.
- Whitman, D. G. and M. J. Rizzo (2015), 'The problematic welfare standards of behavioral paternalism', *Review of Philosophy and Psychology*, 6(3): 409–425.