Cognition and Sentiment: from Adam Smith to the future of economics

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Abstract

There is a growing sense that standard mainstream economics is limited by its closed-system methodology. While behavioural economics has challenged the narrow mainstream economic notion of rationality, possibilities have been constrained by a methodology that requires a dualistic separation of cognition (as reason) from sentiment. Yet, at the beginnings of modern economics, Adam Smith (with David Hume) had developed a theory of human nature, including a theory of mind, as providing the basis for all knowledge under conditions of uncertainty. His open-system approach allowed for interdependence rather than separation, between cognition and sentiment and between the individual and society. Modern heterodox economics similarly takes an open-system approach, challenging the mainstream view of science based on logical positivism. This challenge draws on a range of ideas about knowledge and action which find an early articulation in Adam Smith. Here we attempt to take these ideas forward in order to address the systemic and structural issues faced by modern economies. The reference point for this discussion is the Market Mind Hypothesis, including the notion of a practical mind/body duality.

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Introduction

Economics faces unprecedented challenges in the form of a series of crises having real personal, social and physical consequences. While economics itself has been said by some on previous occasions to be in a state of crisis, current circumstances have provoked a more wide-ranging and profound examination of the dominant mainstream approach to economics. This has occurred at the level of society, prompted by moral outrage at the perceived part played by economists in the financial crisis in particular and in the contributions by economists to dealing with that crisis, as well as the health and environmental crises. It has also occurred critically among the upcoming generation of economists who have set up unprecedented institutional structures and developed new materials to take forward examination of the discipline and how it might most usefully move forward.

Attention is paid quite properly to theories and methods in economics. But here we focus more on the philosophical level since it determines the conceptual basis for theory and method. It has proved to be critical to debate within economics how terms, such as rationality, are understood variously according to different philosophical approaches. This has been particularly evident in discussion about one of the most important developments in mainstream economics in recent decades, behavioural economics.

The aim here is to explore differences of approach to economics in terms of closed and open systems, at the ontological and epistemological levels. This provides the basis for a discussion of the meaning and significance of dualism in economics, a key concept for the Market Mind Hypothesis (Schotanus forthcoming). At another level we focus on the different meanings given to cognition and sentiment in different approaches.

The discussion starts with mainstream economics as a closed-system approach. Open-system approaches are then traced back to Adam Smith and the Scottish enlightenment. The different, closed-system and open-system conceptualisations of cognition and emotion are explored and connections made with respect to modern economics.[1]

The topic is approached from an economics perspective. Issues of difference of approach and associated differences in conceptualisation apply equally to other fields – here, to philosophy and psychology. The focus on Adam Smith is particularly apposite since he was a moral philosopher for whom the emerging fields of economics and psychology were applications. The hope therefore is that the closed-system/open-system framework allows some transcendence of disciplinary boundaries, thus rendering the economics focus less limiting than it might otherwise be.

[1] The discussion draws on Dow (2010) and Dow (2011, 2013) which focus on cognition and sentiment with respect to financial instability and behavioural economics respectively.

The methodological limitations of mainstream economics

It has been common to define mainstream economics by its method. Indeed since this method is deemed by mainstream economists to be the most scientific, economics itself is seen as being defined by the mainstream method (see e.g. Becker 1976). That method is epitomised by the central role of formal deductivist models. Not only are theories represented by these models but, crucially, the outcomes of models are regarded as definitive complete arguments. There is acceptance that the models abstract from institutional detail, political judgement, etc, but attending to these matters is seen as separable from theorising, only entering at the later stage of practical application (Colander 1992).

When mainstream economic models failed to predict or explain the financial crisis, the reaction was therefore to seek better models. There is always scope for improving models, and indeed there have been constructive moves in the direction of incorporating features relevant to the financial crisis, such as a financial sector. But there has been no questioning within mainstream economics of its exclusivist positivist deductivist method.

These models need to satisfy a range of conditions in order to generate complete arguments, as in a closed system. Formal deductivist models are themselves closed systems, such that the following conditions specified by Chick and Dow (2005, p.367) need to be satisfied:

1. All relevant variables can be identified.
2. The boundaries of the system are definite and immutable; it follows that it is clear which variables are exogenous and which are endogenous; these categories are fixed.
3. Only the specified exogenous variables affect the system, and they do this in a known way.
4. Relations between the included variables are either knowable or random.

In order for these conditions to be satisfied for an economic system, further conditions apply to the component parts of the system:

5. Economic agents (whether individuals or aggregates) are treated atomistically.
6. The nature of economic agents is treated as if constant.
7. The structure of the relationships between the components (variables, subsystems, agents) is treated as if it is either knowable or random.
8. The structural framework within which agents act is taken as given.

Such systems are built on the concept of separation at different levels. At one level individual agents are atomistic, i.e. separable from each other (or interrelated in a fully-specified way) within a structure which is fixed (or which evolves in a fully-specified way). In Lawson's (1997) terms the system is thus characterised by intrinsic and extrinsic closure respectively. This separability follows from a dualistic mode of thought (Dow 1990), such that neither dual entails the other.[2] Variables are endogenous or exogenous, structures are knowable or random, agents are rational or irrational, and so on, all in an immutable way. Further the scope of economics itself is understood in terms of separation: economics deals with rationality,

[2] McCloskey (1983) catalogues a range of duals which characterise the mainstream approach to economics.

psychology with irrationality (or emotion); economics is positive in the sense of not dealing with values, and so on. As Loasby (2003: 286) puts it:

> economists are trained to rely on a peculiar concept of rationality: It is only a slight exaggeration to say that what an economist . . . regards as a 'rational decision process' is what a psychologist might regard as 'habitual behaviour'; while what a psychologist regards as 'rational choice', an economist would refuse to regard as 'rational' at all.

The dualistic mode of thought of mainstream economics has important consequences for the conceptualisation of both cognition and sentiment. As with many such terms, meaning follows from the particular ontology and epistemology being applied. There is a wide range of definitions of both cognition and sentiment. Of these mainstream economics employs the narrow sense of cognition which refers to information processing, associated with rational decision-making in a strictly-defined sense. In such an approach, sentiment is located in the (unexamined) preferences to which rationality is applied. Cognition and sentiment are clearly separated, conforming to a closed-system mode of thought.

Mainstream methodology has increasingly been the focus of the various forceful critiques of mainstream theorising. In particular the presentation of economics as a value-free technical discipline reserved for experts has come up against moral outrage on the one hand and severe doubts about capacity to encompass the complexity of human behaviour and social institutions on the other. As Lawson (1997) argues, a closed system epistemology implies that the subject matter is itself a closed system. Yet most economists would agree that not all of conditions 5 to 8 above can be sustained, i.e. the socio-economic world is an open system. It only takes one condition for closure not to be met for the system to be open (Chick and Dow 2005). So there are many possibilities for openness.

Closure and openness are therefore not a dual since there are different kinds and degrees of openness. Indeed any system entails some closure. As an early contributor to the open-system/closed-system conceptualisation, Loasby (2003) argues that, given the full range of possible connections, a system is defined by the selection of connections to be closed off. He therefore warns against a strict dualistic interpretation:

> Rather than contrasting openness and closure, I suggest that we think of dimensions and degrees of closure. Completely closed models are obviously limiting cases in terms of degree, but human cognitive powers require a drastic restriction on the number of dimensions in order to secure closure – as is illustrated by the practice of economists. Partial closure is necessary for any exploration of openness (Loasby 2003: 294).

Closure and openness within open systems therefore conform more to the way in which the concept of practical dualism is employed by the Market Mind Hypothesis than the exclusivist dualism of mainstream economics. It reflects a choice of categorisation which is provisional, mutable and permeable. Yet categorisation is necessary for any theorising or indeed for any discourse.

Thus while the distinction is made between cognition and sentiment in order to structure thought, the two are not regarded as an absolute duality. Within an open system of thought both are understood in a much broader sense than in mainstream economics. Cognition in the broad sense refers to the mental processes employed in building knowledge while sentiment in the broad sense refers to emotion which may be expressed in a judgement, or way of thinking, about knowledge. There is clearly scope for overlap and integration between cognition and sentiment within an open-system mode of thought. Further, while mathematics might be used to represent some of this relationship as a contribution to a broader analysis, the relationship defies full capture in a closed mathematical system.

In any case, at one level the incompleteness of deductive mathematical systems itself prevents absolute closure, challenging the positivism of mainstream economics. Beyond Gӧdel's theorems there is the necessity to ascribe real meaning to economic terms. Mainstream positivism nevertheless treats meaning as fixed, allowing data to be treated as independent of theory: 'facts'. Evidence then conforms more to 'information' than to 'knowledge'. Further, meaning is presented as detached from values, yet the formal mainstream structure in fact embodies a series of critical values around optimising behaviour, atomistic agents, the conceptualisation of social welfare and so on. Indeed the unofficial discourse of mainstream economics of necessity employs a pluralist approach to argument (and persuasion) even though the official discourse exclusively requires deductive mathematical argument (McCloskey 1983).

Mainstream economics persists in aspiring to a pure form of closure as an ideal. This has been made explicit in recent debates about the integrity of mainstream macroeconomics, given the logical disparities between pure theory and applied macroeconomics. These disparities have arisen from pure theory being a closed system while application for policy purposes requires accepting the openness of the system to which theory is applied. The resolution of the debate over this logical conflict has taken the form of a commitment to reaffirming the closed-system ideal, with an aspiration to absorb applied macroeconomics into pure theory (Dow 2021a).

In the meantime behavioural economics has sought to amend the structure of mainstream theory by modifying the representation of rationality in the light of experimental evidence. But attempts to incorporate the rich understanding of cognition and sentiment available in the psychology literature has come up against the constraints imposed by mainstream methodology and the conceptualisations it allows. The dominance in economics of the mainstream approach has proved to be influential in how behavioural economics has evolved.

Camerer et al. (2004, p. 1, emphasis in the original) introduce their substantial behavioural economics reader by treating the mainstream economic approach as their benchmark for a more empiricist approach:

> At the core of behavioral economics is the conviction that increasing the realism of the psychology underlying economic analysis will improve the field of economics *on its own terms*—generating theoretical insights, making better predictions of field phenomena, and suggesting better policy. This conviction does not imply a wholesale rejection of the neoclassical approach to economics based on utility maximization, equilibrium, and efficiency. The neoclassical approach is useful because it provides economists with a theoretical framework that can be applied to almost any form of economic (and even noneconomic) behavior, and it makes refutable predictions.

Similarly Hong and Stein (2007, p. 126) advocate developing behavioural finance to conform to standard mainstream methodology:

> The enduring appeal of classical asset-pricing theory over the last several decades owes much to its success in forging a consensus around a foundational modelling platform. This platform consists of a core set of assumptions that have been widely-accepted by researchers working in the field as reasonable first-order descriptions of investor behaviour, and that—just as importantly— lend themselves to elegant, powerful, and tractable theorizing. If behavioural finance is ever to approach the stature of classical asset pricing, it will have to move beyond a large collection of empirical facts and competing one-off models, and ultimately reach a similar sort of consensus.

Accordingly Delavigna's (2009) survey of empirical work in psychology and (behavioural) economics (describes the field in terms of 'deviations from the standard model'. But this undue narrowing of subject matter due to methodological constraints has come under substantial critique from within psychology (see e.g. Berg and Gigerenzer 2010). Psychology has its own division between open-systems and closed-system approaches.

But economics was not ever thus. We turn now to considering the economy and economics as open systems by going back to the philosophical approach of Adam Smith. In the process we explore his thinking on the meaning and relative roles of cognition and sentiment, and of the individual and society, in the decision-making process.

Adam Smith's open-systems approach

Adam Smith's economics emerged as one aspect of his thought which laid the groundwork for a range of disciplines. Smith was first and foremost a moral philosopher. He applied moral philosophy by developing theory within the philosophy of science and within the field of rhetoric in relation to epistemology. Along with David Hume, Smith identified human nature as the foundation for all fields of enquiry. As Foucault (1972) argues, the emerging age of representation put man and the unconscious mind at the centre of knowledge.

This was an age of categorisation in the form of separation. But Foucault identifies Smith and Hume as being on the cusp of that new episteme, still holding elements of the previous organicist age of resemblance. For all the strong intellectual influences on Scottish thought from the continent, arguably it was the particular context of eighteenth-century Scotland that forged these characteristics of the Scottish enlightenment (Dow 2009b). The continuing influence of Highland culture, which conformed more to the organicist age of resemblance, sat alongside Lowland culture which absorbed external influences more in keeping with the modern age of representation.[3] The very presence of cultural difference, both within Scotland

[3] Typically these are treated as mutually-exclusive duals, in line with the modern episteme, whereas in reality the two were arguably integrated in a complex way.

and between Scotland and England, must have been an important contributor to their recognition of the plurality of ontologies and epistemologies.

While the separation of the world of the mind from the world of experience is a characteristic of the age of representation, for Smith and Hume the separation was at the abstract level. It was a useful categorisation which facilitated analysis rather than a mirror of reality. In practice, sentiment, imagination and reason operated together in the organic fashion more associated with the age of resemblance.

Both had therefore considered Descartes's deductivist approach to physics to be unsatisfactory. While Descartes's theory of fluxion was persuasive for almost a century, Smith (1762-3, ii.134) regarded it as 'one of the most entertaining romances that have ever been wrote', 'tho it does not perhaps contain a word of truth'. Hume's (1739-40) conclusion on the limits to reason as a basis for knowledge led him to develop his theory of human nature. Here he developed a theory of the mind as providing justification for belief (Biro 2009): 'all our reasonings concerning causes and effects are deriv'd from nothing but custom; and that belief is more properly an act of the sensitive, than of the cogitative part of our natures' (Hume 1739-40, p. 183, emphasis in original).

Smith's theory of cognition was similarly based on the view that knowledge is the product of the mind (Dow 2010), where reason is only one of several faculties employed. The mind also draws particularly on experience, imagination and sentiments. The core faculty which provided the motivation for science (or indeed any action) was sentiment, or the passions. The discomfort at the inability to fit phenomena into a pattern and the subsequent delight at achieving a plausible generalisation encouraged scientific exploration. But moral sentiment could also constrain action. Smith (1759) saw the impartial spectator, understood through the central faculty of the imagination, as the locus for moral sense which, along with self-command, constrained self-interest (Montes 2004, Dow 2010).

But scientific enquiry could not produce demonstrable truth. While real experience provided the basis for identifying patterns, the organic complexity of underlying processes was such that there could be no guarantee that such patterns would persist. This was Hume's problem of induction (Dow 2002). Smith and Hume shared an open-system ontology such that belief played a large part in cognition. Smith in particular is known for his innovation with respect to thinking in terms of systems, in society and in knowledge (Skinner 1976). Further, given the openness of these systems, and thus the inability to demonstrate truth, new theories were accepted or not as a matter of persuasion. This involved the exercise of rhetoric and the appeal to the imagination as well as to experience (Smith 1762-3). Under Hume's influence, Smith thus focused on the psychological question of how people come to accept the truth of certain propositions (Loasby 2003, p. 296).

Smith drew a distinction between the philosopher (scientist) and the general population in terms of the division of labour (Skinner 2001). As a result of educational circumstances and psychological drive to understand novel experiences, the philosopher brings the same range of faculties to forming knowledge. More use is made of reason in order to challenge socially-conventional knowledge. But the initial motivation from sentiment, the use of the imagination and recourse to other social beliefs persist; reason alone cannot substantiate knowledge (Smith 1795).

For Smith cognition was not an individualistic affair, given the social nature of human identity as explained in his *Theory of Moral Sentiments* (Smith 1759). Here he explored 'the human tendency to look for guidance from others in resolving difficulties and to behave in ways which seem to merit approval' (Loasby 2003, p. 297). Knowledge in the form of belief relied on social convention, on intersubjective expectations. For example market behaviour involved employing social conventions, including moral sentiments, which included using the imagination in the exercise of sympathy to gauge how a price offer might be received. This profoundly social nature of market behaviour, even if directed at some form of personal interest, is an indication of the market mind.[4]

Cognition and sentiment were thus intertwined because of the limits to human knowledge. This intertwining had a crucial basis in conventional belief at the social level. Smith employed a conceptual distinction between cognition and sentiment, but one which did not require separability. Similarly his treatment of the application of the imagination to consideration of patterns emerging from evidence also avoided any sharp separation between objectivity and subjectivity. His distinctions conformed more to a practical dualism.

Open-systems approaches in modern economics

Alongside the closed-system mainstream approach to economics there sits a range of open-system approaches which can roughly be categorised as making up heterodox economics.[5] Although the connections back to Adam Smith are not routinely spelt out, the open-system/closed-system discourse makes the connections explicit (see e.g. Loasby 2003). Such analyses at the philosophical level have been attracting increased attention among the upcoming generation of economists dissatisfied with the poor performance of mainstream economics in relation particularly to the financial crisis (Dow 2021b). There is now more awareness of the significance of different approaches to economics which can no longer reasonably be dismissed out of hand as 'unscientific'. But it continues to be a challenge to spread more widely an awareness that different conceptualisations really matter.

As Kuhn (1962) pointed out, conceptualisations do not change overnight, but rather evolve. However, viewed from one paradigm to the next, different conceptualisations are incommensurate. What prompts the change is not only a glaring anomaly which cannot be accommodated by the ruling paradigm but also the availability of an alternative paradigm which is more satisfactory in explaining the anomaly. The financial crisis was one such anomaly and the alternative heterodox analysis was provided by Minsky (1975/76. 1984, 1986) and those working in the Minsky tradition. It is instructive to consider Minsky's alternative theory, the financial instability hypothesis, but also his alternative methodological approach.

[4] More generally Smith and Hume analysed how the emergence of commercial society encouraged greater refinement through increased and more sophisticated socio-economic interaction, though they were also conscious of threats to moral sentiments.

[5] This characterisation of heterodox economics is not uncontroversial.

In doing so we will see common ground between Minsky and the Market Mind Hypothesis as set out by Schotanus (forthcoming).

Minsky built his theory on a different ontology from the mainstream and a consequently different epistemology. Where the implied mainstream ontology focuses on economies in equilibrium, and processes which normally ensure equilibrium, Minsky understood the norm for monetary production economies as being instability propelled by systemic forces. The socio-economic system was thus open and evolving. While the systemic forces generated a roughly cyclical pattern, the nature and timing of the cycle would differ from one context to another. In particular the factor which would puncture confident expectations in a boom phase, and the timing of that puncturing, were indeterminate. While for Alan Greenspan the bubble burst because of a purely psychological shift from greed to fear, for Minsky it occurs usually when some event is startling enough to change understandings of reality (Dow 2011).[6] Since knowledge is fundamentally uncertain there is no 'true' quantitative measure of risk. Following Keynes, Minsky instead saw social-conventional judgement as playing a large part in price setting, particularly in financial markets. But without an equilibrium anchor, these judgements were vulnerable to discrete changes.

In the *Treatise on Probability*, Keynes (1921) explored how we establish reasonable grounds for belief as the basis for action. Because uncertainty inhibits the ability to establish knowledge with reason alone, we use what direct knowledge we have, along with indirect (theoretical) knowledge, conventional knowledge, and expert advice. But, as he explained with respect to the valuation of assets and the investment decision, this knowledge is never enough to justify action. Rather it must be supplemented by instinct, and a psychological urge to action ('animal spirits').

Yet borrowers and lenders each form expectations which are necessarily uncertain but with real consequences, notably a cyclical pattern of production. The financial cycle proceeds as credit creation follows changing patterns of expectations, with leveraging increasing as optimistic expectations become ever-more confident, creating ever-more financial fragility. This process is aided by the evolution of the financial structure. The financial innovation which fuels the cycle is designed to take market advantage of increasing confidence and at the same time to subvert new measures by the authorities designed to curtail credit growth. But any disappointment of expectations hits cash flow, particularly for production companies, with knock-on effects for lenders. In the meantime any slowdown in asset-price growth hits the cash-flow of financial companies encouraging a reining-in of credit with knock-on effects for production companies.

Minsky's epistemology, and thus methodology, were heavily influenced by Keynes. Like Keynes he used formal models to explain his theory, relying often on diagrammatic treatment. But in spite of the increasing pressure from the discipline, particularly from the 1980s, he held back from building a complete formal system as the full expression of his theory (Foley 2001). His models were intended as a guide to thought. But, since his emphasis was on structural

[6] This evolution of knowledge can be analysed in terms of Keynes's (1921) concept of weight of argument, whereby new evidence can actually reveal ignorance and thus reduce weight.

change, evolution and discretely shifting expectations, all varying according to context, these models could only provide partial arguments to be set alongside other types of argument.

For Minsky cognition and sentiment take on the broad meanings discussed above in relation to open systems, whereby cognition refers to the mental processes employed in building knowledge while sentiment refers to emotion which may be expressed in a judgement about knowledge. Mainstream theory of financial instability associates equilibrium with the rational processing of knowledge and deviations from equilibrium with emotion (such as the basis for herding behaviour). For Minsky financial market players make judgements under uncertainty by drawing on reason and evidence but substantially also on conventional, peer or expert judgement. The aim is to build knowledge, but the mechanism requires making judgements about uncertain knowledge.[7]

Tuckett and Taffler's (2008) psychological analysis of finance emphasises the emotional content of decision-making. Tuckett (2011) argues further that persuasion as to the merits of an investment strategy requires a compelling narrative. This accords with Smith's rhetoric of persuasion whereby the merit of a scientific explanation is conveyed by connecting to something already known by the audience, and in particular which fits with their real experience. While Descartes could be persuasive in spite of not connecting with real experience, it was ultimately experimental evidence which prompted attraction to an alternative astronomical theory. Aesthetic appeal could not withstand contrary evidence indefinitely.

According to Smith, social theories cannot fly in the face of experience for such a long time. Ultimately experience was a forceful arbiter in theory selection, but for natural philosophers the evidence was assessed according to experience only within the scientific community:

> Natural philosophers, in their independency upon the public opinion, approach nearly to mathematicians, and, in their judgments concerning the merit of their own discoveries and observations, enjoy some degree of the same security and tranquillity (Smith 1759: III.2.20).

But moral philosophy (from which political economy was emerging) was different:

> A system of natural philosophy may appear very plausible, and be for a long time very generally received in the world, and yet have no foundation in nature, nor any sort of resemblance to the truth ... But it is otherwise with systems of moral philosophy and an author who pretends to account for the origin of our moral sentiments, cannot deceive us so grossly, nor depart so very far from all resemblance to the truth (Smith 1759: VII.ii.4.14).

Minsky derived inspiration from Keynes (1936, ch. 12) who had earlier explored the different dynamics of the production and financial sectors. Since then the financial sector has increased in relative size to a dramatic extent, taking on a life of its own even more detached from the real economy (involving production and labour) than in Keynes's time. There is always a central role for judgement, and thus emotion, in the narratives surrounding investment strategy

[7] Not all market behaviour conforms to a sociologically-grounded urge to follow convention. There is scope for agency among those individuals with the psychological make-up to choose to buck trends.

about the performance of real sectors. Yet, even given the size and dynamics of the financial sector, reality still breaks through at critical points, subverting conventional expectations and causing crises. Further the institutional structure of finance, including the role of the state, is itself a form of reality which impinges on financial markets.

Minsky's financial instability hypothesis thus illustrates the interdependence between cognition and sentiment in his epistemology of financial markets. The two concepts are distinguished as different categories for the purposes of analysis but they do not conform to an absolute dual. Similarly knowledge and the real economy are distinguished as different categories but are shown to interact in a fundamental way which defies strict dualism. As we have seen from Smith's theory of rhetoric and the emotional finance literature on narrative, how the real economy is understood cannot be divorced from sentiment, which in turn feeds back into the real economy.

At the same time, further ideas from psychology and neuroscience lend weight to the understanding of cognition and sentiment as being interdependent. Thus for example Gigerenzer (2000, 2007) sets out the evidence that decision-making is based primarily on heuristics and gut feelings rather than calculative rationality (see also Simon 1975, 1986). Indeed Damasio (1994) argues that emotion is necessarily an integral element in decision-making, based on evidence of people who have lost the use of the emotional part of their brains. Further, social psychologists have identified the part of the brain that registers experience of emotion (the medial prefrontal cortex) as also being the location of the formation of attitudes and of inference of the contents of others' minds, which are essential features of social cognition (Mitchell, 2009). Even in these physical terms, then, cognition and emotion are fundamentally interrelated.

Concluding remarks on the implications for the future of economics

All of this really matters for the sharp end of economic analysis in the form of policy recommendations. Is policy to rely on financial incentives at the individual level or on moral sentiments, as in trust in government for example? Should governments rely on market incentives to produce good social outcomes, as with cryptocurrencies or carbon capture technologies for example, or encourage and facilitate new practices while regulating against those which flout moral prerogatives? How far should the emphasis be on promoting freedom for the exercise of individual rationality and how far on developing institutional structures to promote stability in the face of uncertainty?

We have seen in this discussion that the key to drawing on psychology in economics lies in epistemology. If, as in the benchmark mainstream model knowledge is held with certainty, or certainty-equivalence, or with clearly-specified imperfections, then it is possible to identify 'correct' prices based on measurement of risk. This in turn requires the subject matter to conform to something close enough to a closed system to justify a closed-system epistemology. Then the appropriate theory of mind involves a dualistic divide between a strict form of rationality on the one hand and sentiment which explains market deviations from equilibrium on the other.

If on the other hand the subject matter is fundamentally open, then structures and behaviour evolve and undergo discrete shifts in ways which defy certainty of expectation. Then market pricing depends on strategies to cope with uncertainty: gathering whatever information is available, forming an assessment about risk, drawing on social-conventional and expert judgment and employing reason to weave it all into a persuasive narrative. Action then involves following along with conventional sentiment or else exercising agency motivated by individual sentiment ('animal spirits'). The relevant theory of mind therefore involves the interaction and integration of reason and sentiment and of the individual and the social.

In order to discuss cognition and sentiment we therefore need to go back to the meanings of these two terms and how these meanings differ depending on ontology and epistemology. These meanings themselves entail either separation or interdependence. We have also seen that the meaning of dualism is also dependent on ontology and epistemology. What is an exclusive, all-encompassing divide in a closed system is a provisional and shifting distinction in an open system. Here we have focused on the distinction between the psychology of economic behaviour and the real environment as a more general duality than the mind/body duality of the Market Mind Hypothesis.

Mainstream economics is characterised by a pure duality distinguishing emotional biases in market pricing from 'true' valuations derived from the real economy. In heterodox economics such distinctions are drawn provisionally for analytical purposes. Yet the analysis goes on to explore the evolving interactions and interdependencies between expectations under uncertainty, market pricing and the real economy. Not only do uncertain understandings of the real economy (with a basis in social convention) affect expectations, but the real consequences, in the form of the effects on debt, investment, output and employment and also policy responses by the state, feed back into expectations. As Smith argued, human nature and the resulting interrelated cognition and sentiments expressed in market behaviour are at the core of the economy and society.

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