Review by Richard Bronk of Samuel Johnson's paper:
'Towards a cognitive science of markets: economic agents as sense-makers'

I wanted to like this discussion paper more than I did in the end. There is much of interest in it and its avowed topic – the (potential) contribution of cognitive science to (behavioural) economics – is important. But the paper has two flaws: first, it's style and format are uneven – varying from being an amusing and engagingly written opinion piece to a learned review of literature to an exploration of a few of the author's pet research themes. And, secondly, the paper's coverage is so broad that it results both in some questionable generalisations and a few obvious lacunae. I would suggest that any subsequent iteration of the paper should resolve whether it is trying primarily (a) to provide a comprehensive review of academic literature in the field(s), or (b) to discuss a few aspects of the author's own research within an overarching thematic framework, or (c) to provide a literary think piece for a wider readership on the role that has or can be played by cognitive science in expanding our understanding of economics. All three potential papers could be valuable.

It is also a shame in a paper examining how economic agents make sense of the uncertain future that there is very little discussion of the role of imagination in constructing novel futures (thereby contributing to uncertainty) or of the psychological and physiological drivers of agents' use of contingent social imaginaries (and stories) to help make sense of the future and decide how to act.

Let me make a few more substantive comments and criticisms on the paper before outlining my own view about the contribution that cognitive science could make to economics:

- At least since the ground-breaking work of Kahneman and Tversky (2000), it has become a commonplace to argue that economics has a lot to learn from psychology and cognitive science. In this sense, Johnson is exaggerating how novel his call for the two sets of disciplines to talk to each other is.

- Nevertheless, the author is onto something important when he criticises the *positivist* slant of modern economics – its lack of interest in *internal* mental states (because such states cannot be measured or verified from outside), and its lack of interest in the psychological *source* of preferences, biases and, dispositions. Economic models and theories pride themselves on being parsimonious and resting on testable hypotheses; and, as a result, they often resemble the proverbial black-box explanations of behaviour. But the author needs to explain more why this is problematic – because, in important areas, standard economic models have signally failed to explain or predict what is going on, particularly where economic agents are coping with radical uncertainty. The lack of psychological realism of economic models only matters for users of economics because it is implicated in those models' failure to explain or predict economic behaviour in complex and innovative markets.

- Johnson is also correct to argue that behavioural economics 'builds off' the 'skeletal vision of human nature' (p4) implied in standard economic models – or, as I put it (Bronk, 2009; Beckert and Bronk, 2018), it contents itself with providing 'bolt on' amendments to standard theory and its core model of agents as rational optimisers. The reason for this is that, by limiting itself to bolting on predictable observed biases

and framing tendencies, behavioural economics promises to allow standard economic models (so refined) to remain predictive of future behaviour. In a passage (p4) that appears to refer back to Kuhn's vision of a monstrously complex mature science like Ptolemaic astronomy, incorporating multiple exceptions to a core (false) assumption (Kuhn, 1996), Johnson argues that the behavioural economics programme builds a 'grotesque assemblage of disembodied organs grafted onto the skeleton of *homo economicus*'. More crucially, he argues that by limiting itself to adding qualifications to the core model of agents acting as rational optimisers of utility, behavioural economics fails to build in other positive (indeed, essential) drivers of economic behaviour and sense-making. So far, so good.

- From page 5 onward, the paper starts to glance at a dizzying array of important intellectual issues without being able to do justice to many of them: collective action problems; the importance of intellectual pluralism; the relative merits of lab and field experiments (p6); the distinction between risk and uncertainty (p7); institutions and why they matter for economic behaviour (p17); etc. It would have been much more effective to have discussed these issues only in relation to the core themes of the paper – the contribution of cognitive science in understanding the role of heuristics and stories in guiding economic behaviour. So, for example, Tuckett (2011) Beckert and Bronk (2018) demonstrate why economic agents faced with radical uncertainty (as opposed to risk) – where the agents cannot calculate objective probability functions – are much more prone to relying on simplistic stories or contingent imaginaries and the emotional solace and confidence they inspire. It is above all when studying behaviour in conditions of uncertainty that economics needs to supplement its core models with new ones informed by psychology and cognitive science. If the author had homed in on this topic, he could have demonstrated the need for the two disciplines to talk to each other (and build in findings from his own research) without any requirement to make huge sweeping generalisations about the nature of economics and cognitive science in the round.

- I applaud the author's core focus on 'the human capacity to make sense of the world around us', which – given the uncertainty, novelty, and complexity of the environment in which economic agents operate – is both more challenging and imperative than standard economics assumes. And I agree with Johnson's insistence (p10) on the need to understand how we do in fact succeed in discerning clues about what is going on in situations where we are unable either to predict the future in probability terms (as economics assumes) or to update prior hypotheses and probabilities in a Bayesian manner. Much of what Johnson says about the role of heuristics (and the challenges faced in using them to choose between different hypotheses) is useful and interesting. But his discussion does not really integrate the full cognitive (and social science) challenge implied by novelty and radical uncertainty and their mental correlate – the human imagination.

- Johnson correctly mentions that agents must often *create* hypotheses rather than *infer* from them the data before them (p10), and that they operate under information constraints and are often unable to assign probabilities to different hypotheses (p11). What he does not spell out is that these information constraints

are not merely due to our shortcomings as knowing agents nor to the complexity of the environment – both constraints that can be somewhat lessened by learned strategies. Instead, the information constraints on economic decision-making are due above all to the *radical indeterminacy* of any economic environment characterised by constant innovation and novelty – works of the imagination – and by the *contingent imaginaries* generated to envisage the reality that might as a consequence emerge (see Beckert and Bronk, 2018). The future is not already 'out there' waiting to be discovered but has yet to be created by how we collectively imagine and will the future to be. To quote Shackle (1992 [1972]), 'What does not yet exist cannot now be known'.

- One of the intellectual mysteries is why economics and psychology have so far largely ignored the role of imagination both as a cause of uncertainty (imagination is the ultimate source of mutations in thought and behaviour) and as our greatest tool for coping with that uncertainty (through the contingent imaginaries and options we construct and share). It is the newly imagined options, shared imaginaries, and contingent interpretations we generate (about how others will react to these novelties) that ensure that the future cannot be a statistical shadow of the past – and that we must seek creatively to make sense of the future as it emerges. It is the human imagination that makes the standard-economics assumption of *homo economicus* – a mere calculating machine – particularly inappropriate. It follows that the great challenge for cognitive scientists who want to help economists make sense of our dynamic economic environment is to show how the human mind generates imaginaries and uses them in conjunction with calculation to generate the conviction to act – see Tuckett (2011) etc.

- One way that imaginaries become determinate enough to coordinate action (and be a suitable object of study by social scientists) is by being crystallised in shared narratives or stories. And such stories are one of the tools of sense-making that Johnson correctly focuses on. There is now a lot of work on the role of narratives in economics – in texts mentioned in this article and well beyond (e.g., Beckert, 2016). Some of this work looks at how government agencies like central banks use narratives to structure the expectations of others (e.g., Holmes, 2014), and there is much interesting work to be done in studying what are the key psychological drivers of the success or failure of group narratives as an expression of political, market, or technocratic power. Above all, though, no psychological account of the role of narratives in helping us make sense of the world can be complete without considering their *social* construction and the *social* roles they play in conferring legitimacy and confidence. There is very little mention of social psychology (or the contribution of sociology) in this paper – beyond telescoped references to herding and social networks (p15).

- One of the most original and interesting parts of the paper discusses how a propensity to zero-sum thinking might be responsible for a number of politically and economically salient preferences (against free trade etc). Here, though, it would be interesting for the author to go beyond discussing why this is important in policy terms to present experimental or physiological evidence for whether or not such a

disposition actually exists and why (psychologically) this might be so. Particular care needs to be taken to distinguish *social* (learned) from (innate) *physiological* conditioning of response and preferences.

- In this case and more generally, cognitive science will be more likely to influence economics if it is seen to rest – in a market context – on clear systematic evidence and well-understood social, psychological, and physiological processes rather than merely an alternative set of interesting general hypotheses and anecdotally or contingently-observed tendencies. How, for example, has the new science of brain plasticity changed the argument about the reversibility of socially-learned cognitive behaviours in a market context due to changes in policy or narrative? What is the psychological or physiological explanation for why narrative frames appear to condition expectations and decisions more effectively than undigested available data? Does the evidence suggest that human beings have an innate or socially conditioned psychological tendency to minimise their recognition of the degree of uncertainty they face? Are they physiologically hard-wired to prefer group narratives to constant individual experimentation with diverse explanations for emerging patterns? And is there any consistent evidence for these hypothesised cognitive tendencies? Johnson is right that cognitive science has much to offer economics in the years to come.

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