Brief Report

Title of submission: "Toward a cognitive science of markets: economic agents as sense-makers" by Samuel G.B. Johnson, for publication in the special issue "Bio-psycho-social foundations of macroeconomics"

(i) Is the contribution of the paper potentially significant?

I can see that the submission makes a reasonable contribution to a broad readership. The main point it makes is that Economics and early psychology (behaviourism) have had their problems. More specifically, the piece makes the argument that there are limitations in both because they simply look at observable behaviour and just look at the conditions under which behaviour is shaped and maintained to make inferences about how the two are related, without saying anything about the contents of the black box, namely the mind. This isn't a new argument[1], but the added value of the piece is that it takes an interesting narrative position in describing where the limitations have existed in psychology and economics in order to advance the argument that cognitive science and behavioural economics are the way forward. The point being that both cognitive science and behavioural economics have much to gain from each other, and should make greater efforts to converge in their methods and theoretical/computational modelling approaches. By framing the piece in such a way as to introduce the disciplines to each other in the context of dating is a novel spin, though on this note, there are many sentence where the author takes some artistic license that forgoes the accuracy of the details for an entertaining and engaging characterisation of the disciplines it discusses.

It is a long piece, and it attempts to cover a lot of ground, but it might be best improved by being a little more focused. One way it might achieve this is by taking a phenomenon that has been explore in economics and in psychology, and to show what the consequences have been in taking an approach that focuses only on observable factors (e.g., conditions of the environment, choice behaviour). From this it can then illustrate how research in behavioural economics or cognitive science (though I'm not sure how that would be achieved since cognitive science spans many disciplines, and there are new off shoots such as Decisions Sciences which do the job of the what the author is proposing in his concluding section) has helped mitigate the limitations because they provide richer models for predicting behaviour based on models that precisely characterise the internal cognitive process that guide behaviour. Doing something like this might help the reader see how the different areas of research that the piece covers (e.g., heuristics and biases, moral psychology, causal cognition, evolutionary psychology, cognitive constraints, developmental psychology, decision-making under risk/uncertainty etc…) specifically inform a set of stylized facts in economics/psychology that have been hampered by a narrow focus on observable.

The concluding section makes the point that the where cognitive science and behavioural economics might usefully converge could lead to the "cognitive science of markets". It isn't clear what role macroeconomics plays in this union, presumably it should be involved in the collaborative relationship being proposed at the end. More to the point, in proposing something akin to a cognitive science of markets, I'm not sure what exactly the objectives/questions are that it would address; it seems like there are other disciplines that are not mentioned would be relevant and contribute to this new discipline, such as social psychology, sociology, political science,

[1] Meder, B., Le Lec, F., & Osman, M. (2013). Decision making in uncertain times: what can cognitive and decision sciences say about or learn from economic crises?. Trends in Cognitive Sciences, 17(6), 257-260.

management, organisational science. In other words, if we are to understand market behaviour, then it makes sense to have some basic idea of social cognition, and social behaviours, and there are many disciplines that do this outside of the very broad remit of cognitive science. The piece doesn't talk much about social cognition but clearly economic behaviour is informed by social aspects of our behaviour, and if one goes down the route of including moral cognition as the author does, then by extension one is also saying something about social behaviours[2].

In short, the piece does say some interesting things, and raises some interesting points, but could benefit from being more focused. It isn't quite a review, and it isn't quite a thought piece, or opinion piece, but instead seems to a hybrid of these three. If the author considers going down the opinion piece route, which I think it ought to be, then it is more obvious that the piece is a reflection of what the author's personal take is on various issues, that way the author is somewhat protected from criticism regarding the precision of some of the points made, and the author's depiction of the sciences.

(ii) Is the analysis correct?

My answer to this has in part been addressed by some of the points I made in response to the first question. However, I can highlight some examples to illustrate the types of inaccuracies I've observed. And, the extent to which these should be addressed depends on the way in which the piece should be revised. As an opinion piece it might be easier for the author to assert that how he is characterising the different disciplines is based on his take, rather than a reflection of how others might see things.

For instance, behaviourism is presented in a significantly unfavourable light.

"But both fields eventually fell prey to behaviorism—the idea that the only ultimate target of explanation is observable behavior, and that internal mental states cannot enter into such explanations—probably under the joint influence of logical positivism, popular in early 20th century philosophy of science." (page 3).

"A consequence of behaviorist tendencies in psychology was an absurdly impoverished vision of human nature as governed solely by patterns of reward and punishment. This vision was demolished by a series of results that demonstrated, even in non-human animals, internal states such as cognitive maps (Tolman, 1948) and motivations beyond material reward-seeking (Harlow, 1958)." (page 3).

Given the different movements in psychology, in terms of key changes in thinking, it is of course true that behaviourism (or some of its forms such as radical behaviourism) was a counter point to movements such as introspectionism (William James), Psychodynamic psychology (Freud), and Gestalt Psychology. But, it isn't the case that these movements have no relevant bearing on psychology today, or other related disciplines for that matter. Behaviourism has given rise to associative learning/reinforcement learning, which is foundational to many models that cognitive psychologists use to model and predict behaviour, and these same models can be found in behavioural economics, neuroeconomics, and in the decision-sciences. Moreover, there are elements of behaviourism that feature in popular areas of interest in behavioural economics and psychology/cognitive science at large, such as behavioural change frameworks (e.g., nudging). In fact, the insights from behaviourism were relevant to behavioural change programs in the 50's, and

[2] Osman, M., & Wiegmann, A. (2017). Explaining moral behavior: A minimal moral model. *Experimental psychology*, *64*(2), 68- 81.

many famous behaviourists, such as Watson, were employed to provide insights to help develop behavioural interventions that were tested in marketing and consumer research; much in the same way that applied psychologists advise on behavioural interventions that are employed by government today.

The distinct disciplinary boundaries and research approaches that are described in the piece don't reflect the much more opportunistic approach that researchers take in psychology, behavioural economics, cognitive science etc… So, it isn't the case that behaviourism is defunct, it has mutated and is very much alive in current research efforts across a broad range of disciplines. Also, another example of an inaccurate description of the history of psychology and cognitive science is that cognitive psychology through Chomsky wasn't the only trigger to cognitive science. Cognitive science has its origins in other disciplines, and has also mutated (in the direction of decision sciences, or behavioural science) and has become much more inclusive (e.g., subsuming neuroscience and neuroeconomics). Because of this, it might be useful for the author to provide illustrations of where the disciplinary boundaries lie as the author might see them so that the reader has a clearer idea of what the author means, so that they don't have to take their comments on face value without evidential support.

For instance, researchers at many conferences that are badged as behavioural economics are cognitive scientists that are invited to present their work there, and many psychologists that are considered as behavioural economists (e.g, Camerer, Ariely, Loewenstein, Kahneman, Thaler, Sunstein) present at a range of different conferences that are not exclusively behavioural economic/economic in flavour. So, there is more cross speak between disciplines than seems to be purported in the piece. For this reason, I return to the point that I made in response to the first question, which is that it might help the reader if the piece focus on some core examples to illustrate where mutual efforts to share methodological approaches and theoretical insights between behavioural economics and cognitive science would target the limitations that area currently faced by not collaborating.

By Magda Osman, Queen Mary University of London, UK