

INTERMEZZO:

PARALLELS BETWEEN MIND AND MARKET. WHAT IS MIND? WHAT IS MARKET?

Years ago I lectured to young economists at an Economics School in Trieste, introducing them to complexity science and the concepts, methods, and tools of Coordination Dynamics. It was up to them, of course, to determine if any of it was useful. The economist Axel Leijonhufvud (and indeed Ken Arrow at an earlier event at UC Irvine) expressed a lot of sympathy with Coordination Dynamics, as did his colleague at the time, Vela Velupillai. In my book with David Engstrøm, *The Complementary Nature* (MIT Press, 2006), I actually used buying~selling in the market economy as an example of the complementary nature of coordination dynamics (pp. 231-234)—cycles, bistability, phase transitions, decision-making, fluctuations, etc.

So, when Patrick invited me in 2010 to become one of his external PhD-advisors I was intrigued about his idea of formalising the “market mind”. The first time we met was at an interdisciplinary conference at the University of Essex, organised by economist Sheri Markose. We kept in touch and in May 2022 I spoke at the MMH inaugural symposium in Panmure House in Edinburgh, Scotland. The present book is a beautiful realization of Patrick’s ideas, at the same time providing a stimulus and an agenda for future work. Supported by references from, Hayek, Knight, Sornette, and others, Patrick suggests the two-legged premise of mind-as-market and market-as-mind, both culminating in consciousness. Considering that we don’t properly understand markets and minds, let alone consciousness, between ourselves he has his work cut out for him. Still, though not for faint hearts, it is a worthwhile challenge from my point of view, which is that coordination is crucial for both consciousness and markets. What follows are some constructive remarks, including a few specific questions, intended to help shape the research agenda that Schotanus is building with a growing team of collaborators.

For starters, which mind are we talking about? The market mind certainly doesn’t look and sound like the mind of ordinary cognitive (neuro) science, with its neat compartments and connections that correspond to mental categories such as thinking, feeling, deciding, and moving. Instead, MMH’s market mind looks more like the brain~mind of Coordination Dynamics which studies the whole system as its various parts synergistically interact. This means identifying relevant collective variables or order parameters for particular functions and their dynamics—how brain states evolve and change--without necessarily tying a piece of anatomical structure to a function. (That’s because the same piece of anatomy is often involved in multiple functions, and different pieces of anatomy can realize the same function). In economics, collective variables could be defined in the space of buyers and sellers, whereas prices qua coordination device (and synergetic indicator) could be seen as an outcome variable that acts to couple things, like goods and services with securities. Careful attention, of course, must be paid to the correspondences involved.

Coordination Dynamics considers the concept of “intrinsic dynamics” essential, e.g. for understanding learning. New information has been demonstrated to cooperate~compete with intrinsic dynamics and determine the rate and character of learning. An obvious area for future research is that individual (within-brain) and social (between-brain) learning appear to be governed by the same dynamical principles. What corresponds to “intrinsic dynamics” in the Market Mind (Hypothesis?) If it is an element of price discovery, like discounting news, this should be further formalised. For example, there seem to be similarities between active inference (i.e. limiting free energy) and active investing (i.e. limiting free lunches), in the sense that in both cases hypotheses get continuously and reflexively tested and updated.

Regarding the emergence of consciousness in the market, to me this is no different than ‘free will’ or consciousness itself as emergent. That is, the complex assembly of simpler elements generate behaviour that is not predictable from the individual components and is describable by rules that are independent of those components (though constrained by them, i.e., as ‘upward causation’). In Coordination Dynamics (CD) this ‘complex assembly’ is called a synergy, which (along with nice properties like degeneracy and multifunctionality, common to markets) is governed by a principle called circular or reciprocal causality. Whereas synergies may be viewed as natural *compressors* of information, the nonlinear synergy dynamics *expands* the range of possibilities endowing a system with autonomy or choice (‘downward causation’). At the same time, dynamics offers a natural way to explain mood swings, like that between euphoria and despair. In CD, qualitative changes in thought and affect correspond to phase transitions triggered by specific and non-specific changes in control parameters.

Compression~expansion is just one of the complementary pairs of Coordination Dynamics. In my view, the MMH needs to better integrate the source of complementarity, namely *metastable coordination dynamics*, the synergic tendency toward dependence (integration) that coexists at the same time with the anti-synergic tendency toward independence (segregation). Cooperation~competition, individual~collective, inter~intra, micro~macro, etc. are all complementary. In the context of ‘free markets’, I would call this freedom—not being attached to one or the other, but to see their complementary relation.

This brings me to Adam Smith and his “invisible hand”. One of the most characteristic though underrecognized features of complex biological systems is their ability to spontaneously (and simultaneously) recruit and annihilate whatever degrees of freedom are needed to accomplish goals and tasks. Due again to their nonlinear coordination dynamics, patterns of coordination are assembled and disassembled with ease to accommodate functional demands. This indeed echoes Smith’s division of labour in his “butcher, brewer, and baker” sense.

Not surprisingly, there are several MMH topics and views I do not feel entirely comfortable with. For example, borrowing Hayek’s “practical dualism” is risky because any dualism implies separation. Hayek’s own emphasis on having to use it for language purposes—due to our ignorance of the “unitary order” to which the mental and physical both belong (which he acknowledges)—only compensates so much. I welcome Patrick’s attempts to further improve on it via his portfolioism as well as via optimising such language, for example, by using “exchange” instead of “interaction”. For me, however, the implication of the squiggle for mind~matter interaction can hardly be overstated,

namely--that for a nonlinear, symmetry breaking metastable coordination dynamics--mind and matter are complementary. A mouthful, but true.

Regarding 'physics envy', if economics has slavishly followed physics, the question (as previously for that of mind) is which physics? Mechanical worldviews based on Newtonian physics will not work for these kinds of complex systems. What will? There is a "mindless" (not intended to be derogatory) physics of self-organization which does not require any external or internal "homunculus-like" agent. That's great but it's not going to be enough for MMH, in which market dynamics refer to processes that are universal and shared between minds and markets. The reality is that no physics exists (yet) of 'intelligent' self-organization, in which intelligent agents and collectives of agents figure prominently. This, I would say, is a major challenge for MMH and the rest of us.

To conclude, the particularly compelling aspect of the MMH research programme is its potential to set the scene for a necessary paradigm shift in economic thinking. Despite the many challenges, I see the possibility of a remarkable scientific reconciliation between the market-as-mind and the mind-as-market that will embrace recent theoretical and empirical developments in the brain and cognitive sciences, for example in so-called 4E Cognition. I am particularly excited that my field of expertise, the science of coordination (i.e. Coordination Dynamics), with its key notion of the metastable brain~mind, may contribute to, or even play a significant role in, understanding the market mind, both in terms of individual and collective experience.

Patrick Schotanus has made a creative step. This book can be our guide for making that shift.

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