

Comments on the paper

"Macroeconomics in a self-organizing economy"

by Q. Ashraf, B. Gershman and P. Howitt

Alan Kirman

GREQAM, Aix Marseille Université, EHESS

This paper starts by putting its finger on one of the most important problems in economics that of how economic activities come to be coordinated given the limited and local knowledge of the participants. This is a theme which is recurrent in economics and was discussed by Jevons, Walras and many of their successors and underlay the debate over the relative merits of socialism and market economies in which Hayek played a prominent role. What this paper does is to propose an agent based version of the Clower-Howitt model which aims to show how the network of firms, banks and consumers self can self organise into a coordinated state.

Whilst one cannot disagree with the criticisms that the paper makes of standard macroeconomic models such as DSGE, one is left wondering whether the criticisms are fully answered by the model proposed.

In this short comment I shall first take a brief look at the nature of self organisation and its properties and then go on to look at the model that the paper proposes in the light of this. Early in the paper the authors make the appealing analogy between an economy and an anthill. As they say, appealing to the father of the idea, Adam Smith,

"It is capable of "spontaneous order," in the sense that a globally coherent pattern of transactions can result from purely local interactions, without the intervention of a central coordinator. Indeed, like an anthill, a free market economy can organize transactions into patterns that are beyond the comprehension of any of its individual participants. "

This reflects the views of entomologists such as Deborah Gordon who is worth quoting on the subject.

"The basic mystery about ant colonies is that there is no management. A functioning organization with no one in charge is so

unlike the way humans operate as to be virtually inconceivable. No insect issues commands to another or instructs it to do things in a certain way. No individual is aware what must be done to complete any colony task. Each ant scratches and prods its way through the tiny world of its immediate surroundings. Ants meet each other, separate, go about their business. Somehow these small events create a pattern that drives the coordinated behavior of colonies."

Deborah Gordon *Ants at Work*

The analogy seems to be apposite but a little closer examination shows that this is less true than it might seem. What the paper argues is that self organization achieves in the economy is a "globally coherent" pattern. By this is meant the idea that individuals driven by their own self-interest, manage to achieve, in general something close to a "socially optimal" situation. Ants have no self-interest and although their activity is coordinated there is little to suggest that it is, in any sense, optimal. This is, of course, in contradiction with the usual simplistic evolutionary analogies, which are used by economists to suggest that whatever survives must be optimal in some sense.

The message that one might try to take from the paper is that the economy somehow self-organises into an efficient or optimal state. However, the authors are careful to avoid falling into this trap. As they say,

"At the heart of all our work is a parable concerning the spontaneous emergence of a more-or-less self-regulating network of markets operated by profit-seeking business firms".

Why then do I have any quarrel with the model? The only objection is that the firms are perhaps too "rational" and that their rationality is too homogeneous. Given the tools that the authors propose it would be possible to be more adventurous in their modelling of the behaviour of the agents and to make them less uniformly purposeful and more like ants. To see what I mean it is worth taking a look at the basic model.

A model must necessarily simplify as John Kay (2012) observes in his paper "The Map is not the Territory" one should therefore see to what extent the model captures the essence of the phenomenon it is treating. Now, one can only wholeheartedly endorse the idea that how trading self organizes and its impact on allocations is an essential feature of economic life. In the light of this how does the model presented in the paper stand up? In the model shops trade the endowment good and consumption good of the owning household and open when there is a random opportunity. Is this a good simplification of

the way in which trade occurs? Do trade networks and in particular retail shops develop in this way? There are few shops that trade goods which they hold or which alternatively they produce. We examined the kiosks which sprung up in Moscow at the time of the collapse of the Soviet Union and found that they sold widely demanded consumption goods such as cigarettes and coca-cola and that these were sold at prices which were set according to different rules by different kiosk holders. The holders, as in the Clower Howitt model had no experience of shop owning previously. But the important difference was the lack of specialization. The question that arises is how important is the association of owners and households to specific goods in the model?

Although the Clower Howitt model had the great merit of being a pioneer in explaining the organization of trade perhaps it would be worth considering a model with more heterogeneous rules for the agents. For example, in the Moscow case, kiosk holders told us that they used rules such as a simple mark-up over cost, or they tried to match the average, (or lowest in some cases) of the group of kiosks around them. One could then observe to what extent a common pricing rule evolved whereas in the model presented here the rule used is uniform and one might wonder why shops should wind up with break-even prices.

Again the authors rightly insist on the self organizing nature of the economy and use their ACE model to capture this. This means moving away from the standard assumption of equilibrium at each point in time. The usual way to achieve this, in standard models, is to introduce some sort of friction, but the sort of evolution described in the model seems more convincing than some arbitrary stickiness of prices and arises out of endogenous self organisation. But to come back to the origin of shops, Guriev et al. (1996) in an early paper pointed out that as soon as the infrastructure necessary to get goods from suppliers to consumers was inadequate many individuals would become intermediaries (or shops in the terminology of the paper) with consequent costs for the economy, since these individuals were no longer directly productive. In his model a small change in the cost of transporting goods drastically diminished the number of intermediaries and significantly increased production. Such an aspect is absent in the model described here.

The model presented incorporates an analysis of the role of inflation and of the role of banks both aspects which are lacking in more standard macroeconomic models and this is a very positive feature of

the paper. One might however, quibble with the argument in favour of less regulation since the banks are, by assumption, respecting the most severe form of regulation, they are serving their basic function of reallocating the capital of others and not indulging in proprietary trading. Were they to be allowed to do so they might have a less laudable impact on the economy.

Thus the model presented is, of necessity, simplistic but there is nothing intrinsic in its construction and the tools used that would prevent its being used to investigate more realistic situations and this is the great benefit of the approach taken. ACE models move into territory which is unexplored because of the lack of analytical tractability but by so doing they allow economists to explore as Peter Howitt, in particular, has shown in a number of previous papers, the self organizing properties of economic systems which are surely more important than the sterile equilibrium assumptions usually adopted in standard economic models.

References

- Guriev S. & I. Pospelov & M. Shakhova, 1996. "Self-Organization of Trade Networks in an Economy with Imperfect Infrastructure," *Computing in Economics and Finance 1996, Society for Computational Economics*, no. 22.
- Kay J., 2012. "The Map is not the Territory" in Coyle Diane *What's the Use of Economics: Teaching the Dismal Science after the Crisis*. London Publishing Partnership, London
- Kirman A., & J. Rouchier, 2009. "Sellers learning about markets", *Mimeo GREQAM*, Marseille

Reply to Comments

Quamrul Ashraf

Williams College

Boris Gershman

American University

Peter Howitt

Brown University

We are grateful to Alan Kirman for his comments, which suggest a number of ways forward as we continue to explore the issue of self-organization from a macroeconomic point of view. It is certainly true that we have picked a very particular and stylistic representation of the way trading networks form. Our setup is intended to embody in a straightforward way some of the basic features of actual economies that we find particularly salient for the issue of self-organization, especially the fact that exchange intermediaries tend to arise when there are unexploited gains from trade, that their operations use up a large fraction of any economy's resources, and that the process of establishing oneself in business is a hazardous one. The tight connection we assumed between the goods traded in a shop and the tastes and endowments of the shop's owner is, of course, not empirically plausible. However, it is not clear to us why our results should be particularly sensitive to the details of this connection; this is a question that certainly needs to be investigated further and one that we intend to explore in future research.

The fact that our shops are highly specialized captures another aspect of reality that we think is quite salient, namely that almost all trading facilities in a modern economy deal in a sparse subset of all traded objects in the broader economy. Even Wal-Mart does not sell industrial machine parts, legal services, funerals, golf course architecture, and a myriad of other items. But clearly our model of extreme specialization is a long way from what one sees in most real trading facilities, and it should not be hard for us to allow for a broader variety in the extent of specialization across shops, and perhaps also to recognize the multiple layers of middlemen that deal in increasingly broad categories of goods as we move up the chain from producers through wholesalers, brokers, distributors, and ultimately retailers.

There is no doubt that such details are of first-order importance when exploring issues in a microeconomic context. Our explanation for ignoring them in our work thus far is that we see our work as contributing to a discipline (macroeconomic theory) in which there has been almost no representation whatsoever of the formation of trading networks until now. Having come across one representation that seems capable, at least under some ideal circumstances, of producing an orderly pattern of transactions, we have been keen to put that representation to work in addressing some of the questions that have proven particularly intractable in more conventional equilibrium approaches. Perhaps it is now time to explore the extent to which our results are sensitive to allowing for the kind of heterogeneity that Alan Kirman and others have discovered empirically in the formation of actual trading networks.

Finally, we agree completely that our model of financial regulation should not be taken seriously as making a broad case for less financial regulation, especially since we have assumed that banks already obey a "Volcker rule" - that is, they make commercial loans but do not engage in proprietary trading. Not only does this assumption limit the scope for moral hazard, it also limits the extent to which fire sales can destabilize the process of deleveraging by causing a downward spiral in asset prices, because the assets unloaded by these banks are durable commercial goods with stable market prices rather than financial assets with highly flexible prices. Nevertheless, we find it interesting that this imposing this particular regulation seems enough to make other dimensions of prudential regulation (that is, limits on loan-to-value and capital-adequacy ratios) redundant or even destabilizing (as it does in "bad times"). The result underlines a point that is easy to forget in the aftermath of a disaster created by a poorly regulated financial system, which is that what we need in order to get the most out of our financial system is not tighter regulation in general but rather more intelligent regulation - regulation that limits the behaviors of financial institutions that tend to destabilize the real economy while loosening constraints on their stabilizing behaviors. There is so much more to do.