

THE GLOBAL FINANCIAL CRISIS AND THE METHODOLOGY OF ECONOMIC RESEARCH PROGRAMMES

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Abstract. Following the failure of standard economic models to predict the global financial crisis, interest in competing research programmes has increased. This paper seeks to critically assess the state of four distinct economic research programmes (the neoclassical synthesis; complexity economics; prospect theory; and neuroeconomics) using the methodology of scientific research programmes (MSRP). Two central conclusions are drawn. Firstly, complexity economics can be judged as progressive *in light of the global financial crisis*, whereas new variant theories in the protective belt of the neoclassical synthesis remain to be empirically corroborated. Secondly, the global financial crisis cannot be used to argue for either the progressivity or the degeneration of either prospect theory or neuroeconomics, since neither of these programmes predicts novel *macro-economic* phenomena.

INTRODUCTION

“I can sum Lakatos up in five words: he has revolutionised my thinking.”

(Sir Karl Popper, in correspondence with Sir Isaiah Berlin, 16th February 1964)

Last November would have been the 90th birthday of Imre Lakatos. His methodology of scientific research programmes (MSRP) continues to influence the philosophy of science half a century after it was first articulated. This paper is a contemporary application of MSRP to the field of economic science.

The global financial crisis has become the defining economic event of recent times. However, it was not predicted by standard macroeconomic models. Since the crisis, many non-standard research programmes in economics have been refreshed by the imperative for more accurate models of economic phenomena. However, there is widespread disagreement about the fruitfulness of these programmes, with discussion often boiling down to methodological criticisms (frequently propagated on the blogosphere) (see, for example, Kirman 2012).

This paper seeks to critically assess the state of economic science using Lakatos’ methodology of scientific research programmes. As such, I hope to clarify the economists’ debate about a methodology that is informed by the philosophy of science. The paper is structured as follows: Part I introduces the concept of MSRP informed by a discussion of the philosophy of science; Part II establishes four distinct scientific research programmes in contemporary economic science (the neo-classical programme, complexity economics, prospect theory, and neuroeconomics);

Part III critically assesses these programmes in light of the global financial crisis. Unfortunately, it lies beyond the confines of the present paper to give a more general critique of progress in economics as a whole, but focusing on macroeconomics and the global financial crisis in particular will allow us address some immediate concerns. Part IV concludes.

I. THE METHODOLOGY OF SCIENTIFIC RESEARCH PROGRAMMES

“Philosophy of science without history of science is empty; history of science without philosophy of science is blind.” (Lakatos 1970: 91)

Lakatos (1968, 1970) proposed his methodology of scientific research programmes along the following lines:

- a) A scientific research programme is defined as a set of theories T, T', T'' ... divided (exhaustively) into two non-empty subsets: the *hard core* and the *protective belt*. The hard core constitutes those theories that are integral to the scientific research programme, and which, according to the programme, cannot be falsified. The protective belt refers to those theories of the programme that are specified as falsifiable.
- b) Whenever a prediction of a scientific research programme is falsified, the *negative heuristic* is a methodological command that points the arrow of falsification firmly in the direction of those theories that lie in the protective belt and away from the hard core. In addition, the *positive heuristic* of a scientific research programme specifies ways in which new and refutable variants of the programme's theories can be produced.
- c) A scientific research programme is defined as *theoretically progressive* if each new theory (as produced by the positive heuristic) predicts novel facts not predicted by its predecessors. A research programme is defined as *empirically progressive* if those predicted novel facts are then corroborated. If a programme is both theoretically and empirically progressive, then it is called, simply, *progressive*. If a programme is not progressive, then it is defined as *degenerating*.

This methodology of scientific research programmes was proposed in response to the perceived flaws in the two existing accounts of scientific method that were dominant at the time: the Popperian approach and the Kuhnian approach. Popper's approach provided a logic of theory refutation, but did not adequately account for theory rejection, which often happens (or is reversed) long after a particular theory is refuted (see, for example, Agassi 1966). On the other hand, while Kuhn provided a powerful narrative of how scientific revolutions occur, he did not provide an adequate logic of theory-appraisal (Nickles 2009). Lakatos's approach attempts to combine the relative merits of both accounts. To this end, the unit of appraisal in MSRP is no longer a single theory, but a set of theories. Thus, Lakatos is able to maintain the rationality of scientific development through the use of falsification, theoretical progression, and empirical

corroboration that takes place in the protective belt, all the while maintaining the dynamic progression and degeneration of scientific programmes that arises from a dogmatic commitment to a hard core.

The original application of MSRP was in the domain of the natural sciences, especially physical science (see Lakatos 1970). However, several authors have successfully applied MSRP to the social sciences, and economics in particular (see, for example, the collection of case studies in Latsis 1976).

II. IDENTIFYING CONTEMPORARY RESEARCH PROGRAMMES IN ECONOMIC SCIENCE

Having introduced the concept of MSRP, I now proceed to identify contemporary research programmes in economic science to which the logic of MSRP may be applied (see Table 1). The following is not an exhaustive treatment of all possible candidates. However, I do identify the most significant research programmes, highlight their most salient features, and provide a justification for choosing these programmes over others.

a. The neoclassical synthesis

The first (and perhaps most obvious) research programme in contemporary economics is 'the neoclassical synthesis' (Blaug 2010). This research programme can be considered as the dominant standard approach to modelling economic behaviour. Specifically, the hard core of the neoclassical programme consists of tenets such as the theory of economic equilibrium, the theory of the firm, and the (weak) axiom of revealed preference, as well as many other theories (Weintraub 1985). The hard core theories of this research programme distinguish between private agents, firms, and the government, as well as the theoretical environments of perfect and imperfect competition, perfect and imperfect information, and perfect and bound rationality. The protective belt of the neoclassical synthesis includes theories such as relative purchasing power parity and the DSGE models that are used to forecast macroeconomic trends (Backhouse 1998). The positive heuristic of the neoclassical programme demands that new theories in the protective belt are cast in terms of agents, firms, and the government, that they use techniques such as constrained optimisation to attain equilibrium, and that they ultimately predict, and are corroborated by, novel *choice* data (ibid.).

b. Complexity economics

The increase in computational power over the last two decades has fostered an emerging programme in complexity economics (Beinhocker 2006). Essentially, complexity economics seeks to model economic phenomena in terms of the interactions between multiple agents using environment-free computer programme simulations.

	The neoclassical synthesis	Complexity economics	Prospect theory	Neuroeconomics
Hard core	<ul style="list-style-type: none"> • Theory of economic equilibrium and comparative statics • The theory of the firm • Axiom of revealed preference • Long run neutrality theory of money 	<ul style="list-style-type: none"> • Agent-based modelling: the economy as an organism • Bounded rationality • Reiterated transactions engender reinforced learning 	<ul style="list-style-type: none"> • Agents characterised by their biases and heuristics • Agents' evaluations are relative to a neutral reference point • The theory of loss aversion 	<ul style="list-style-type: none"> • Economic behaviour is, in principle, reducible to neuronal activity • Non-choice data are essential to explaining economic behaviour
Protective belt	<ul style="list-style-type: none"> • Theory of relative purchasing power parity • Dynamic stochastic general equilibrium (DSGE) models 	<ul style="list-style-type: none"> • Financial market 'herding' => pro-cyclical leverage cycles • Continuous economic boom and bust 	<ul style="list-style-type: none"> • Theory of conformity to default option (and other theories of <i>Nudge</i>) 	<ul style="list-style-type: none"> • Not well established with respect to macroeconomic phenomena • Reference-dependent utility theory
Positive heuristic	<ul style="list-style-type: none"> • Use choice data to evaluate hypotheses • Use tools such as constrained optimisation and equilibrium analysis to model economic phenomena • Entities in new models must come in the form of either agents, firms, or the government 	<ul style="list-style-type: none"> • Characterise agents as engaged in a learning process such as Q-learning • Use computer programmes to simulate multiple agent interactions in arbitrary environments 	<ul style="list-style-type: none"> • Use basic prospect-theoretic model to articulate new theories • Evaluate new theories in light of psychology/ decision experiments 	<ul style="list-style-type: none"> • Use fMRI and other neurological techniques to evaluate economic models, in addition to choice data

Table 1 Scientific research programmes in contemporary economics

Agents are constantly adapting to, and as a result of, the interactions they engage in. In this sense, complexity attempts to capture the full intricacy of the economy as a living organism that does not necessarily tend towards equilibrium. As such, its hard core constitutes a commitment to agent-based modelling and the theory of continuous adaptation (see Holland and Miller 1991 for an example of this approach). The protective belt in complexity economics includes, most notably, the theory of ‘herding’ in financial markets, which is derived from the hard core commitment to adaptive learning through repeated interactions (Rosser 1999). Generally, the positive heuristic in complexity economics emphasises the need to model economic phenomena using multiple agents engaged in repeated interactions in a computer simulation upon which no exogenous factors act. Given this interpretation of the methodology of complexity economics, it can be considered as a distinct scientific research programme that is not incorporated by the standard neo-classical programme and its dependence on equilibrium analysis.

c. Prospect theory

Prospect theory has largely arisen out of results in behavioural economics not predicted by standard expected utility theory. The basic theoretical framework is outlined in Kahneman and Tversky (1979). The hard core of prospect theory consists of the commitment to the principle of loss aversion and evaluation relative to agents’ neutral reference points. The protective belt of prospect theory is perhaps best exemplified by the theories and predictions laid out by Sunstein and Thaler (2009). These include theories such as non-adaptation to changes in default states which predicts that people will not respond to being opted-in to previously opt-out employee retirement schemes. The positive heuristic in prospect theory commands new theories to be constructed in terms of reference points, losses and gains, and the automatic-deliberative distinction in cognitive processes (Kahneman 2011). Given these commitments, prospect theory clearly constitutes a very different kind of scientific research programme to that of either neo-classical economics or complexity economics.

d. Neuroeconomics

Neuroeconomics is essentially the application of neurological insights to explaining and predicting economic phenomena (Camerer et al. 2005). By using data from neuroscientific techniques such as fMRI, researchers infer details about how the brain works and use this both to create better models of economic decision-making and to directly test economic hypotheses. The hard core of the radical neuroeconomic programme consists of ‘learning based on consumption experiences’, the theory of automatic processes, and the theory of emotion (affective) systems (Camerer et al. 2005: 10-11). Owing to the relatively new emergence of neuroeconomics, it is hard to define very precisely what constitutes its protective belt, although Gul and Pesendorfer (2010) have argued that reference-dependent utility theory is a typical falsifiable theory of the neuroeconomic research programme. The positive heuristic in neuroeconomics is very clear in

commanding the use of neurological data, in addition to choice data, as a tool for developing and testing new neuroeconomic theories. As such, these features distinguish radical neuroeconomics from the other economic research programmes described above.

In addition to the four programmes above, many scholars have identified new-Keynesian economics as a separate research programme (see, for example, Backhouse, 1998). However, it is debatable how distinctive the new-Keynesian programme is relative to the new-Classical programme. In particular, since Lucas (1972) and Prescott and Kydland (1977) there has been significant conversion between the two schools of thought (see the discussion in Akerlof, 2007). As such, the respective explanations of the global financial crisis as provided by both new-Classical economics and new-Keynesian economics are very similar. The purpose of this essay, as explained in the Introduction, is to evaluate contemporary economic research programmes *in light of the global financial crisis*. For these reasons, therefore, I treat both new-Classical economics and new-Keynesian economics as constitutive of one central scientific research programme: the neo-Classical synthesis.

One could identify several further economic research programmes, including many sub-programmes of those already mentioned; the level of abstraction is ultimately an artefact of the MSRP and determined by the methodologist with reference to the purposes of her case study. For the purposes of this essay, it is necessary to focus discussion on the four programmes outlined above, as they will give us a sufficient idea of the state of contemporary economic science in light of the global financial crisis without creating an overly-complex analysis.

III. IDENTIFYING PROGRESSIVE AND DEGENERATING RESEARCH PROGRAMMES IN LIGHT OF THE GLOBAL FINANCIAL CRISIS

Having identified four distinct scientific research programmes in contemporary economics, I now proceed to critically assess the relative progressivity/degeneration of these programmes in the light of the global financial crisis (GFC).

Under ‘global financial crisis’ is meant the period from August 2007 (when BNP Paribas first suspended withdrawals from three of its hedge funds) to April 2009 (the date of the London G20 summit). This period was characterised by a ‘credit crunch’ in international liquidity markets and the failure of several global systemically important financial institutions (G-SIFIs), including Lehman Brothers. Despite its intensity and duration, the global financial crisis was not predicted by standard economic models (Krugman 2009)¹. As such, the GFC can be said to have falsified the

¹ Some economists may wish to argue that the neo-Classical synthesis may not actually have been falsified by the observation of the GFC. In particular, if we take recourse to the efficient markets hypothesis (EMH) then the neo-Classical synthesis remains unfalsified because EMH predicts that financial markets cannot be predicted. However, this would constitute theoretical degeneration since EMH predicts phenomena that cannot be falsified. Thus, from the viewpoint of MSRP and for the purposes of this essay, EMH does not constitute a valid scientific theory).

empirical predictions of the neo-Classical synthesis. Under MSRP, the arrow of this falsification is directed towards theories in the protective belt. In particular, the standard theory of financial intermediation is falsified. The existing theory of financial intermediation hypothesised that the financial sector acts simply as a 'veil' between savers and investors (Brunnermeier et al. 2012). As such, dynamic stochastic general equilibrium models (DSGE models) did not model the financial sector at all, prior to the crisis. This falsified theory is now in the process of being replaced by a new variant in the protective belt. Adrian and Schin (2010) and Geanakoplos (2010) have integrated financial intermediation into standard DSGE models and thus have sought to capture observable dynamics in the financial sector. Thus, it could be argued that the research programme is theoretically progressive because the new theory in the protective belt predicts novel phenomena (such as 'the leverage cycle').

Nonetheless, it remains to be seen whether or not this theoretical progression is complemented with the empirical corroboration of these new phenomena. For the moment, without empirical corroboration, the neo-Classical synthesis can be characterised as a degenerating research programme with respect to macroeconomic phenomena such as financial crises. Several authors have suggested that the commitment to equilibrium analysis in the hard core and positive heuristic of the neo-Classical synthesis renders the programme unsuitable for analysing endogeneity in the macroeconomy (Ormerod 1994, Kirman 2012, Taleb 2010). If this is the case, then there is reason to suspect that the neo-Classical synthesis will continue to be empirically falsified with respect to phenomena like financial crises.

Complexity economics, on the other hand, does not have a hard core commitment to equilibrium analysis. Thus, when predicting phenomena such as financial crises, it may be that complex systems analysis are better able to predict sporadic cycles of boom and bust that result from no significant exogenous shock to the international macroeconomy (Hahn 1991). Indeed, the Economic Complexity Index has already demonstrated greater accuracy than standard DSGE models used by the World Bank to predict future rates of economic growth (Hausmann et al. 2011). In particular, the positive heuristic in complexity economics, with its focus on endogeneity and constant adaption, perhaps makes complexity economics a more fruitful research programme with respect to economic phenomena such as financial crises.

It is not entirely clear how the status of both prospect theory and neuroeconomics as scientific research programmes is affected in the light of the financial crisis. Many commentators have argued that these programmes are vindicated by the crisis (Krugman 2009, Taleb 2010). However, it is not obvious why this is the case, particularly given that both of these research programmes are primarily concerned with explaining and predicting micro-economic behaviour. For example, prospect theory attempts to explain why individuals often violate the principle of expected utility. In Koeszegi and Rabin (2004), the domain of application is a single individual's choices between various risky prospects. Thus, even if both of these programmes are progressive in

the light of psychological and laboratory experiments, there is a further analysis to be made for the progressivity of these programmes with respect to the global financial crisis and other macroeconomic phenomena. In this way, MSRP clarifies the economists' debate by highlighting the fact that in order to be considered progressive in the light of the global financial crisis, a scientific theory has to make falsifiable predictions about the relevant phenomena. Neither prospect theory, nor neuroeconomics currently make such predictions about macroeconomic phenomena. Thus, using the global financial crisis to argue for the progressivity of either prospect theory or neuroeconomics is not valid according to MSRP.

IV. CONCLUSION

In this paper, I have presented an updated application of Lakatos's methodology of scientific research programmes to the field of economic science. In particular, I have focused discussion on the progressivity of four central economic research programmes in the light of the global financial crisis. Two central conclusions can be drawn from such an analysis. Firstly, complexity economics can be judged as progressive in light of the global financial crisis, whereas new theories in the protective belt of the neoclassical synthesis remain to be empirically corroborated. Secondly, MSRP demonstrates that the recent trend of using the global financial crisis to credit or discredit the progressivity of either prospect theory or neuroeconomics is illegitimate. Neither theory provides falsifiable macroeconomic theories and thus cannot be judged in light of macroeconomic observations such as the global financial crisis.

This paper has not provided an exhaustive treatment of all possible scientific research programmes in light of the global financial crisis. For the purposes of clarity and focus, I have concentrated on those four competing research programmes that have been most closely associated with the renewed diversification of (and debate within) economic methodology since the crisis. In addition, future research will need to expand the scope of economic events in the light of which we assess the progressivity of distinct research programmes. Here I have focused solely on research programmes *in the light of the global financial crisis*. However, it is feasible that there are other relevant events in recent economic history in the light of which we need to reassess the methodology of economic research programmes.

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