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## Epistemological difficulties with neoclassical economics

**Conference Paper**

**Original citation:**

Originally presented at Southern Economic Association 2011, 20<sup>th</sup> November 2011

This version available at: <http://eprints.lse.ac.uk/39423/>

Available in LSE Research Online: November 2011

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## Epistemological difficulties with neo-classical economics

### Abstract

This paper addresses several related epistemological difficulties with the neo-classical micro-foundations of standard economics, and explores what these difficulties imply about the recent dominance of these micro-foundations in both economic research and applied policy and finance settings. Building on the crucial distinction made by Knight and Keynes between calculable risk and uncertainty, the paper makes a further distinction between two types of uncertainty – epistemological and ontological. It argues that standard economics underestimates how problematic the interface between theory and reality is for both economic agents and social scientists, and overlooks the impossibility of knowing the future yet to be created by innovation and the freedom to choose. The paper outlines alternative micro-foundations that capture how agents use imagination and narratives alongside market coordination to cope with uncertainty and construct the future. It also explains several research and policy implications of taking uncertainty seriously – the limits of prediction, the incoherence of many bolt-on amendments to neo-classical theory, the dangers of analytical monocultures, and the importance of discourse analysis and pluralism in modelling. Recognition that neo-classical models are inappropriate for dealing with problems characterised by widespread innovation and uncertainty should augment rather than reduce the undoubted value of these same models in many other areas of analysis.

**Key words:** ontological uncertainty, epistemological uncertainty, rational expectations hypothesis, neo-classical economics, imagination, narrative, innovation, analytical monocultures, modelling pluralism, bolt-on amendments

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## 1. Introduction

It is foolhardy at the best of times for a philosopher to approach economists to criticise their assumptions and methods. Worse still, this paper may appear to ignore two pieces of advice most of us would give students: not to tackle a topic too broad to be answered adequately in one paper and to beware contested definitional terms. So, what is the excuse for such temerity?

First, nothing is more important to a discipline aiming to explain economic activity than an understanding of the foundation and limits of knowledge facing both economic agents and social scientists. And on these matters of epistemology, it is at least plausible that philosophers have something to offer economists.

Secondly, while the modelling, research and policy implications discussed in the paper may be far-reaching, the central argument on which they depend rests on a couple of relatively simple, if widely ignored, ideas: that the interface between theory and social reality is as problematic as it is essential; and that we cannot know the future yet to be created by innovation and undetermined choice. Our beliefs about the world we live in, and the actions we take on the basis of those beliefs, are inevitably structured by the theoretical and conceptual framework we use. What is more, there can be no single right way of modelling or thinking about social reality, given its multi-faceted and pre-interpreted nature and the impossibility of capturing the whole in any one conceptual framework. The complexities of real-world problems often cannot be safely reduced to one theoretical framework and, even when they can, they frequently defy full computation in practice. Such epistemological uncertainty is challenging enough for the neo-classical project of reducing economic choice to the optimisation between known preferences and defined options under well-understood constraints. More devastating still is the ontological uncertainty implied by the impossibility of knowing even the categories and possible nature of the future yet to be created by innovative economic agents who are freely choosing between newly imagined options or making identity-defining choices between incommensurable values or indeterminate options (i.e., in cases where, by definition, there is no single rational choice).

To have coherence and avoid the charge of creating a straw man, this paper must also answer at the outset the thorny question of how to define 'neo-classical economics'. Colander has argued that the term 'neo-classical' is unhelpful because it is confusingly used to designate both an ill-defined historical period (say, 1870 to 1930), which was dominated by certain marginalist assumptions, and the broad swathe of standard modern economics; and that in practice the latter is far from monolithic or clearly dependent on the former for its underlying assumptions (Colander, 2001, 151-61). Like Fontana (2010, 585), however, this paper argues that most examples of modern standard economics share a sufficiently coherent kernel at the level of micro-foundations – and a sufficiently homogenous methodological base – to make it reasonable to use a generic label for them. At the same time, the dominant equilibrium metaphor behind most economic models entails a crucial element of continuity with the era

of 'social physics' (Mirowski, 1989) usually associated with the term 'neo-classical' by historians of economics.

As a result, this paper uses 'neo-classical' to refer to any economic model based on the micro-foundations of individual agents rationally optimising among consistently ranked preferences within given constraints so that the system as a whole tends to some determinate and predictable social equilibrium. Crucially, this broad definition includes not only the obvious 'pure' examples such as the efficient markets hypothesis and the rational expectations models of Lucas and Muth, but also those many schools within modern standard economics that use bolt-on amendments to make the central micro-foundations more plausible as the basis for predictive models. For example, this definition includes by intention most of information and behavioural economics, where they model asymmetric information, framing effects etc., as predictable exceptions to the core cases of rational optimisation and efficient outcomes. In all cases designated here as 'neo-classical', there is the assumption that individuals rationally optimise within certain easily modelled information, behavioural and cognitive constraints, with the result that outcomes are still predictable once these predictable constraints, or exceptions to perfect rationality, are taken into account.

By being used in this way, the term 'neo-classical' can also refer by extension to two important elements that enable (most of) the disparate schools of modern economics to coalesce into a standard (or 'normal science') paradigm in the Kuhn sense (Kuhn, 1996): the first is the belief that the economic system as a whole can and should be explained by models that furnish testable predictions (Friedman, 1953). Central to the modern economics paradigm is the assumption that there is always one correct answer to how rational economic agents will act given the various constraints they are under – so that once the constraints are known, and any systematic behavioural and cognitive biases have been taken into account, predictions about behaviour can be made (and tested). As we shall see, this central assumption is called into question by the prevalence of epistemological and ontological uncertainty.

The second related 'neo-classical' feature of the modern economics paradigm is the widespread tendency to explain away inconvenient counter-examples to core rationalist and equilibrium assumptions by theory mending that leaves intact the basic analytical monoculture at the level of micro-foundations. The tendency to bolt-on behavioural and other amendments to standard rationalist micro-foundations to correct for explanatory errors is reminiscent of the attempts by Ptolemaic astronomy to cope with the many exceptions to the predictions made by its core model of an earth-centred universe (Bronk, 2009, 10). For Kuhn, such Ptolemaic paradigm mending led to a monstrous system of 'compounded circles', whose 'complexity was increasing far more rapidly than its accuracy', and this was a tell-tale sign of paradigm 'crisis' (Kuhn, 1996, 68f). More importantly, such a strong commitment to one core methodological assumption caused cognitive myopia or bias and a failure to spot anomalies. This paper argues that neo-classical economics suffers the same epistemological weaknesses given its reliance on one set of core micro-foundational assumptions. Especially in conditions of uncertainty, a one-paradigm-fits-all approach – an insistence that

there is ultimately one core set of micro-foundations required to model and analyse economic reality – entails serious epistemological difficulties. In this regard, though, the paper departs from a strictly Kuhn-based approach: it does not envisage or recommend a shift to a single new paradigm designed to resolve both the Ptolemaic-style complexity of recent neo-classical models and the failure of those relying on them to spot anomalies thrown up by innovative and uncertain situations. Instead, it recommends a new pluralism in modelling and a better understanding of the boundaries of applicability of neo-classical models.

## 2. The neo-classical treatment of information problems

Whilst early 'neo-classical' economists did often assume perfect information as well as perfect rationality, the modern neo-classical position is more nuanced. At one extreme is the rational expectations hypothesis (REH) and its corollary, the efficient markets hypothesis (EMH). The REH holds that the expectations formed by economic actors will on average be correct since competitive market pressures will ensure that systematic forecasting errors are eliminated so that all useful information is taken into account. As a result, expectations will only be falsified 'through random, unpredictable errors' (Backhouse, 2010, 131). Following Muth (1961), the stronger assumption is often made that agents' expectations will reflect the predictions generated by the model of the economy (assumed to be correct) implicit in the particular theory being tested – 'an assumption that threatens to introduce a measure of circularity into the micro-foundations of those very theories' (Bronk, 2009, 220). The REH implies in turn the EMH, which posits that market prices are reliable indicators of fundamental value and available information and are only subject to essentially random variation. Implicit in both hypotheses is the assumption that the economic world is 'ergodic', meaning that (*pace* random events) 'the future is merely the statistical shadow of the past' (Davidson, 2010, 17): as a result, expectations about the future can usually take the form of calculated probabilities.

The REH and EMH lay behind much of finance and applied economic theory in the run up to 2007, but the financial crisis has not been kind to either hypothesis. Market expectations and pricing are now shown to have been misguided and even delusional for a long time, whilst the models produced by economists and internalised over a long period by most risk managers and other economic actors are revealed to have been systematically wrong, causing highly correlated 'errors' that were anything but random. Here are anomalies that even the most die-hard of neo-classical economists struggle to ignore.

Many economists included under my label of 'neo-classical' have for many years acknowledged that the REH and EMH are not plausible as general models. Instead, they have assumed that the optimisation by individuals of consistently ranked preferences, and the tendency of the market to an efficient equilibrium, are often vitiated by certain information problems – notably the problem of asymmetric information. Akerlof (1970), for example, showed that, when dealing with uncertainty about the quality of products, any asymmetry of information between buyers and sellers would lead to a market for 'lemons' or thin markets, with the market price tending to be unattractively low for sellers of reliable

products. And Stiglitz (2011, 168) among others has laid the blame for the recent predictive shortcomings of economic theory on a failure of micro-foundations to take account of 'information asymmetries and market imperfections'. Another line of attack on REH and EMH from within the economics paradigm has been to focus on certain systematic cognitive or behavioural biases – such as the framing or formulation effects isolated by Kahneman and Tversky (2000, 9f), where the wording or reference points used to frame options bias decision-making. Such biases and heuristics are modelled as exceptions to rational expectations and optimisation.

There is clearly much to these arguments, but they still beg a number of questions: are the most important information problems facing market participants those of asymmetric information rather than 'symmetric ignorance'? (Skidelsky, 2009, 45; Bronk, 2011, 8). Is it always at least theoretically possible to have perfect markets so long as we have transparency of information and more complete risk markets? And should reliance on heuristics and framing effects always be seen as a departure from fully rational choice, and one that could be corrected by attention to overcoming these biases? Only if the answer to these questions is 'yes' is the dominant 'neo-classical' strategy of bolting-on amendments to the central assumptions of rational choice and optimisation valid. But as this paper will show, the answer to each of these questions may need to be 'no' when we consider the impact of genuine uncertainty.

### **3. Knight and Keynes on calculable risk versus uncertainty**

One of the striking features of most modern standard economics is how far it ignores a central distinction made by Frank Knight (1921, 233) between measurable 'risk' (where possible outcomes can be classified in groups and probabilities calculated) and immeasurable 'uncertainty' (where no probability can be computed because, for example, the situation is unique). For Knight, uncertainty was not some regrettable market failure (to use an anachronistic expression) but an inevitable part of entrepreneurial activity (*ibid.*, 232); indeed, without uncertainty there could be no profits in a competitive system, since profits that are predictable (or probabilistically forecastable) would be quickly competed away.<sup>1</sup> Knight underscores his epistemological position as follows:

*'Profit arises out of the inherent, absolute unpredictability of things, out of the sheer brute fact that the results of human activity cannot be anticipated and then only in so far as even a probability calculation in regard to them is impossible and meaningless.'* (Knight, 1921, 311)

Keynes, likewise, focused on the problem that market valuations relating to investments in the future 'cannot be uniquely correct, since our existing

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<sup>1</sup> Note that Knight is here using the assumption of otherwise perfect competition conjoined with the fact of entrepreneurial profits to argue for the existence of uncertainty. As we might put it today, the existence of profits in a free market can only be explained – at least in the absence of monopoly rents or asymmetries of information – by the presence of uncertainty that cannot be turned into measurable risk.

knowledge does not provide a sufficient basis for a calculated mathematical expectation' (Keynes, 1936, 152). For Keynes, uncertainty (as opposed to calculable risk) was the central problem in economics and business:

*'The outstanding fact is the extreme precariousness of the basis of knowledge on which our estimates of prospective yield have to be made. Our knowledge of the factors that will govern the yield of an investment some years hence is usually very slight and often negligible.'* (Keynes, 1936, 149)

As a result, Keynes argued that investors have no choice but to rely on conventions, the emotions of confidence and fear, and 'animal spirits'. This was not because of any irrationality or any disinclination to calculate where possible, but because uncertainty gives investors no choice but to fall back on 'whim or sentiment' (*ibid.*, 163).

Notwithstanding Keynes' huge influence on economics, the Knight-Keynes concept of uncertainty has been marginalised within recent neo-classical economics and largely absent from mainstream journal articles for a long period after the 1980s (Hodgson, 2011a, 161). Uncertainty has increasingly become conflated with probabilistic and standard deviation measures of risk (Davidson, 2003, 231) – a conflation that impairs not only the micro-foundations of standard economic models but also the risk models of banks. Indeed, the whole discourse of 'risk management' frequently represents confusion between the management of actuarial risk and the management of Knightian uncertainty (Power, 2006, 26).

But to gauge how damaging this confusion and elision between risk and uncertainty has been, we need to examine further the nature, sources and prevalence of immeasurable uncertainty. And to do this it is helpful to explore a distinction made by Skidelsky (2009, 88) and Bronk (2011, 8-12) between 'epistemological' uncertainty, where relevant probabilities are in practice unknown, and 'ontological' uncertainty, where they are logically unknowable.

#### **4. Epistemological uncertainty: complexity not computed**

The epistemological uncertainty facing economic agents relates to the complexity of their predicament, in a non-technical and technical sense of the term 'complexity'. In the first instance, it relates to the enormous volume of information bombarding economic agents and the huge costs in terms of time or money that would necessarily be involved in collecting and assimilating relevant data adequately for an optimal decision to be made. Modern financial markets provide a number of good examples of this, not least the enormous complexity of collateralised debt obligations (CDOs), where typically an investor would need to master the contents of a billion pages of prospectus information to understand a single product's ingredients fully (Haldane, 2009b, 17). Such volumes of relevant information have rendered the notion of market transparency largely academic. At the same time, 'the standard idea that (at worst) one party to an exchange may be at an information disadvantage to another seems far less pertinent than the danger of symmetrical ignorance among all players' (Bronk, 2011, 10). This

is especially so when the difficulty of fathoming financial network interlinkages mushrooms as their complexity reaches thresholds of computational intractability (Mirowski, 2010, 427f).

Complexity economics, and complexity science more generally, highlights another aspect of epistemological uncertainty – the difficulty of making *ex ante* spot predictions in dynamic non-linear systems. Using ‘complexity’ in a more technical sense, economists based at the Santa Fe Institute and elsewhere have pointed to the prevalence of increasing returns and critical threshold effects, which entail that very small differences in initial conditions can snowball into radically different long-term outcomes (Arthur, 1990; Waldrop 1994; Fontana, 2010). When the result of small first-mover advantage in trade, or of initially minor financial mishaps in complex market networks, can change the course of history thanks to increasing returns and positive feedback effects, the attempt to understand economic reality resembles the uncertain study of weather systems or fish stocks rather than the mechanical use of predictive equilibrium models as furnished by standard economics. In these cases, we have to accept the practical impossibility of precise *ex ante* prediction, even if we can get better at spotting emerging patterns by using simulations of threshold effects.

Epistemological uncertainty is also a function of other ontological issues:<sup>2</sup> social reality is multi-faceted – made up of interlocking layers of physical constraints, institutional frameworks, individual cognition and action, social meaning and macro-level emergence. This ontological layering poses considerable epistemological challenges for economic actors and social scientists alike, especially as it is compounded by the impossibility of encompassing all facets in one conceptual or modelling framework without draining them of most of their true significance. As we shall explore later in the paper, economic agents and economists both have to contend with the need to exercise judgement about which of many possible models or theories to use when the only certainty is that no single theory can encapsulate everything significant and relevant to the problem at hand. But first we need to consider another order of uncertainty entirely.

## **5. Ontological uncertainty: the future is yet to be created**

Ontological uncertainty ‘implies the impossibility of knowing even the categories and possible nature of what has yet to be created or yet to evolve’ (Bronk, 2011, 9), and is endemic in fast-changing innovative situations, (Lane & Maxfield, 2005, 11). By breaking predictable links between the past and the future and disturbing previously systematic regularities, innovations ensure that the world is non-ergodic – more than a mere statistical shadow of the past (North, 2005,

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<sup>2</sup> For clarity, it is important to note that there can be issues of ontology – like the multi-faceted nature of reality and the prevalence of non-linear functions – that impact on the degree of ‘epistemological uncertainty’, in the sense of weakening the basis for precise prediction and the possibility in practice of firm knowledge. For the purposes of this paper, the term ‘ontological uncertainty’ refers to indeterminacy at the level of reality itself and to the logical unknowability of the basic categories and entities of future reality ahead of its creation.



19f). Indeed, radical innovations may inject something entirely novel into the equations and boundaries of life, and subvert the best-laid schemes of classification and prediction. Shackle wrote of our 'own original, ungoverned novelties of imagination ... injecting, in some respect *ex nihilo*, the unforeknowable arrangement of elements' (Shackle, 1979, 52); and he spelt out clearly the ontological implications of this:

*'The history-to-come which will flow from men's decisions is non-existent until those decisions themselves are made. What does not yet exist cannot now be known. The future is imagined by each man for himself and this process of the imagination is a vital part of the process of decision. But it does not make the future known. The absolute and eternal difference between the recorded past and the unformed future, despite its overwhelming significance for the very stuff of human existence, has been often overlooked in our economic theories'* (Shackle, 1992, 3f).

Shackle exaggerates the level of uncertainty we face. The future is partly predictable given our observation of socially constructed regularities in behaviour, and it is in some respects the determinate outcome of rational choice amongst well-understood constraints and options. Nevertheless, ontological uncertainty remains important. Wherever innovation exists and novel possibilities are imagined, expectations and choice cannot be purely the outcome of calculation; and consequent vagaries in the way we imagine the future, and degrees of freedom in the choice sets we face, introduce further indeterminacy. Crucially, the first-order uncertainty implied by innovation and the imaginative creation of novel possibilities is 'compounded by uncertainty about the second-order creative reactions of others' (Bronk, 2011, 9). At all points in this creative chain stretching into the future, the decisions of actors could be different without any irrationality being involved, by virtue of their imagining the options differently. Furthermore, indeterminacy and ontological uncertainty is not only a product of the human imagination and the freedom to choose between newly imagined options. It is also a feature of many complex self-organising systems, where over time non-linear reactions to small (often random) mutations can lead to the emergence of genuinely novel forms.

The implications of ontological uncertainty for economics are very significant. As Buchanan and Vanberg (1991: in Hausman, 1994, 323) note, once we see the market as a 'creative process', it makes no sense to see the future as in some sense 'out there' waiting to be discovered, nor to use the language of error for forecasts that get overturned as if 'correct' forecasts were possible. Indeed, an appreciation of the widespread and revolutionary impact of innovation and imagined futures is 'corrosive of the standard notion that forward-looking market valuations can be stable and efficiently priced – that there is a static reality 'out there' on which rational expectations will converge in response to competitive pressures' (Bronk, 2011, 9). The idea central to the REH – that systematic errors will lose out in competitive markets and be eliminated so that forecasts are on average correct – has no validity when the reality to which the expectations pertain is still a set of imagined ideas in people's minds, and when we are living in a non-ergodic world with few systematic regularities. In other

words, the assumption implicit in the REH that there is ‘an objective reality independent of the observer that serves as the anchor of the common knowledge shared by all economic actors’ is false (Nelson & Katzenstein, 2010, 51) whenever the reality concerned is a future yet to be invented. Nor can the problem of innovation be reduced to one of asymmetric information between inventor and other players. For innovations once launched take on forms that exceed the imagined conception of even the inventor, and this ontological uncertainty is compounded for inventor and others alike by the unpredictable innovative countermoves of other market participants.<sup>3</sup> In innovative environments everyone involved is groping in the dark: the future is simply unknowable and we must adapt to it as best we can as it unfolds.

## 6. Romantic post-Kantian epistemology: implications for economists

To understand fully the limits of knowledge in economics and the ways in which some of these limits can be overcome, it is helpful to consider the implications of Romantic post-Kantian philosophy. The Romantics understood that we never have some unmediated access to facts, and that our beliefs are not simply reflections of a reality ‘out there’. Rather, the world we see is partly a creation of the conceptual structures that our minds supply. In the terminology of Wordsworth (1798), we half-create the world we see. The mind plays an essential and creative role in all empirical observation by supplying a framework of interpretation (Bronk, 2009, 258) – a point made clear by Coleridge in these words spoken to a naïve empiricist of his acquaintance:

*‘You must have a lantern in your hand to give light, otherwise all the materials in the world are useless, for you cannot find them, and if you could, you could not arrange them’* (Coleridge, 1830).

This Romantic conception of the constructive role of theory and language in our observation and understanding of the world has a number of important implications. In particular, while a theory or model helps make sense of the chaos around us in the same way that a lamp helps us see in the dark, it is also true that any theory or model (like any lamp) has its limitations. If we use only one modelling or theoretical approach – one source of light – we will ‘keep stumbling on aspects of reality that are outside the area illuminated’ by our theory or model (Bronk, 2010, 103). Here then is a source of epistemological uncertainty: no single theory or model can explain everything. As Murdoch wrote in her description of Sartre’s philosophy:

*‘What does exist is brute and nameless, it escapes from the scheme of relations in which we imagine it to be rigidly enclosed, it escapes from language and science, it is more than and other than our descriptions of it’* (Murdoch, 1999, 42).

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<sup>3</sup> When cell-phone manufacturers first included the function of texting in their revolutionary products, they could not have foreseen many of the novel uses of this medium that would be made by consumers, nor the way that it would help transform the nature of social interaction. I am grateful to Nicholas Barr for this example of how the ontological uncertainty implied by innovation is deepened by the creative countermoves of other players.

Our hope of capturing the multifaceted nature of reality is especially poor if we remain wedded to one theoretical framework, one conceptual language – if, that is, we eschew modelling pluralism. It is for this reason that even the hard natural science of modern physics no longer relies solely on one theoretical framework: it still makes use of Newtonian mechanics where relevant alongside more modern theories; and there is to date no unified theory that can encompass the additional respective insights of relativity theory, quantum mechanics and chaos or complexity theory. And if there is no unified theory in physics, how much more forlorn is the project of finding such a unified modelling framework to describe and adequately explain the multi-faceted socio-economic world in which we live? As Diamond argues:

*'The complexity of the economy calls for the use of multiple models that address different aspects ... [T]aking a model literally is not taking a model seriously. It is worth remembering that models are incomplete – indeed, that is what it means to be a model.'* (Diamond, 2011, 1045f)

The inappropriateness in economics of relying on one set of models (and treating them as encapsulations of the truth rather than as merely throwing a partial light on a problem) is not only the result of epistemological and ontological uncertainty and the complexity of social reality; it is also a function of the need for economists to interpret a pre-interpreted world.

Herein lies the second important implication of Romantic philosophy for economists: our theoretical and conceptual frameworks structure our actions as well as our beliefs, and so have the power to transform social reality (Bronk, 2009, 260). In other words, the behaviour that economists study is already partly constructed by the socially formed narratives and economic theories that individual actors have internalised. This means that economists cannot fully explain or predict economic and market behaviour unless they have learned to empathise with (the better to interpret) the various mindsets and conceptual structures that influence actors' beliefs and reasons for action.

At first sight, recognition of the transformative impact of theory on action might not seem to present too much difficulty for neo-classical economists: indeed, they are generally only too happy to admit that their theories work best where they are 'performative' (Backhouse, 2010, 17) and have been used to construct markets that resemble more closely 'the ideal world of theory' (*Ibid.*, 76). At the same time, the REH makes a virtue of assuming that market participants internalise the (one true) model of the economy that happens to be the same as that proposed by the economists modelling the situation (Cassidy, 2009, 99; Frydman & Goldberg, 2011, 57f). It does not require much analysis to understand the theoretical construction of agents' beliefs and actions if they have no choice in competitive markets but to internalise the correct theory the economist concerned happens to be working on. There is no need to understand why the French or the Swedes may in fact see the world differently, because they will soon have to learn the error of their ways or be eliminated in competition with those who have internalised the correct economic model.

It is only necessary, of course, to spell out these (generally implicit) steps in REH-based reasoning to see that they are fallacious. First of all, as we have seen, there is (in a world of innovation and ontological uncertainty) no single efficient outcome out there in the future yet to be created on which rational expectations must converge. And, secondly, no theory can shine a light on more than certain aspects of what is going on. Moreover, the performative nature of theory presents huge pitfalls for the neo-classical scientific project. For while it is true that a whole set of economic agents internalising a theory such as the efficient markets hypothesis will make markets conform more closely to the theory for a time (if, for example, they all structure and price financial products in accordance with the theory), this does not prevent the model failing when these same agents bump up against dynamics not captured in the model. Furthermore, early apparent confirmation or plausibility of a theory resulting from actors having internalised it, and so behaving accordingly, may only serve to blind economists to the failure of the model to capture other effects. It is not healthy for the rigorous testing of a theory to have it tested in conditions where the sample's behaviour is structured in accordance with the model. Such was the fate until recently of most finance theory based on the efficient markets hypothesis.

## **7. The limits of reason**

It should now be clear how damaging the prevalence of uncertainty is for the core rationalist assumptions of neo-classical economics. Lucas is often quoted for his view that 'in cases of uncertainty, economic reasoning will be of no value' (Lucas, 1977, 15: quoted in Fontana, 2010, 590; Hodgson, 2011b, 193). And, as discussed above, the rational expectations hypothesis is rendered problematic once we accept that economic agents cannot, except in restricted circumstances, have access to one correct model that captures everything significant about their predicament. At the same time, the REH notion that at least systematic errors in agents' forecasts will be eradicated by competition loses its force when we accept that, in conditions of widespread innovation and emergent novelty, much of future reality is neither predetermined at the moment of decision nor subject to systematic regularities.

More damaging still, in conditions of epistemological uncertainty, the most basic neo-classical assumption – that rational economic agents seek to optimise their preferences within given constraints – becomes dubious. For in many complex situations, where the costs of collecting the information necessary to make a valid prediction or an optimal choice are too high, optimisation may simply not be a feasible or effective strategy. This is especially true when there is significant legitimate doubt as to which of several modelling frameworks best captures the essence of the situation – necessitating the need to keep several interpretive frameworks in play and exercise judgement between them. The dictates of economic Rational Choice make superhuman demands on the computational and imaginative capacities of individual economic agents (Bronk, 2009, 216). Moreover, in many cases, these information problems affect all market participants symmetrically – making it less than obvious how even in theory the 'market failure' or 'imperfection' could be solved. Finally, where it exists,

ontological uncertainty makes the plight of the would-be optimiser essentially hopeless: for then she has no way of knowing for sure even the nature of the options she faces, let alone the likely emergent outcomes of the creative interaction of her choices with those of other innovative agents.

Even the axioms of rationality that form the bedrock of neo-classical economic optimisation models may be challenged by ontological uncertainty: why should the consistency and transitivity of preferences (especially over time) be privileged when our preferences relate to an uncertain and indeterminate future. It may not be worth placing our preferences in rank order at any moment, let alone assuming their consistency over time, when the options open to us are in a constant state of flux. 'This renders the very notion of optimal choice in future-directed action suspect; and it renders forlorn attempts to predict behaviour in uncertain conditions on the basis of indifference curves constructed from preferences revealed at one time' (Bronk, 2009, 238).

Uncertainty does not imply that there is no role for reason, of course. But, as we shall see, it does imply that reason has to work hand in hand with the imagination – for example, stress-testing the options we imagine. It also implies that we will often have to be content to make judgements for reasons that are ultimately inconclusive because, given the indeterminacy of options or the incommensurability of modelling frameworks, there is no one right answer to be had. As Cassidy (2009, 176) puts it: 'Rationality isn't a binary variable; it exists on a continuum'. There is much reasoned thought to be had in the space between pure deductive logic and complete irrationality. Reason does not imply certainty.

## **8. The limits of prediction**

As a paradigm, neo-classical economics is strongly committed to 'model-based prediction' and 'the rhetoric of prediction' (Hodgson, 2011a, 164f). One of the discipline's canonical texts is Friedman's famous essay in which he argued that the task of 'positive' economics is 'to provide a system of generalisations that can be used to make correct predictions', and that its status as a science depends on its ability to test these predictions for their 'precision, scope, and conformity with experience' (Friedman, 1953: in Hausman, 1994, 181). It is partly this conception of what being a science entails for their discipline that leads neo-classical economists to be so wedded to micro-foundations assuming that actors engage in rational optimisation within given constraints on the basis of rational expectations. For these micro-foundations allow them to model markets as tending towards some determinate and predictable equilibrium outcome (Bronk, 2009, 131). This project of having testable predictions remains firmly intact if economists bolt on amendments to these core micro-foundations to model predictable exceptions to the rule as a result of information asymmetries or systematic behavioural and cognitive biases. Indeed, it remains intact so long as they refuse to admit the importance of any uncertainty that cannot be turned into calculable risk or treated as an isolated market imperfection; and so long as any departure from rational choice is assumed to be a systematic bias that can be built into the predictive model.

As this paper makes clear, however, uncertainty should not be ignored by economics unless it wants to limit itself to the study of narrowly focused ergodic systems, where the future is a shadow of the past. If economics is to be used to explain what is going on in complex systems and innovative markets, it will have to accept different standards of proof than the rigorous testing of *ex ante* spot predictions (Bronk, 2009, 27). Indeed, the very failure of most predictions in the area of macroeconomics and finance theory over the last decade should itself prompt questions and render attractive this downgrading of the status of apparently precise predictive models. As Hodgson (2011b, 191) puts it, the 'underlying error lies in overestimating the importance and possibility of prediction.' Nor does economics need to be embarrassed about any loss of scientific credentials if it relies on models that explain and simulate rather than predict precise outcomes. After all the queen of modern natural sciences – biology – rarely attempts to predict the future with any precision, recognising the central importance of random mutations, threshold effects and increasing returns. And there are many who would argue that the time has come for economics to take more inspiration from biological metaphors, and 'follow biology in embracing complexity and downgrading prediction in favour of the primary goal of causal explanation' (*Ibid.*, 192).

Downgrading prediction does not, of course, mean giving up any hope of using economics models to help us peer into the unknowable future. Just as there is no binary distinction between reason and irrationality, so there is no binary distinction between prediction and being clueless about the future. We can and should use models as 'diagnostic' tools (Sutton, 2000, 16) for teasing out such systematic tendencies as there are in the apparent chaos of markets; and we can use models to help us spot emerging patterns and simulate the possible impacts of crossing certain thresholds. But if we want to use economics models in this way to enable us to read the future as it unfolds (as well as refine our explanations of the past) we need access to new models (alongside those of neo-classical economics) – models that move beyond the paradigm of 'fully predetermined models' involving a 'mechanistic notion of rationality' (Frydman & Goldberg, 2011, 22, 51). Complexity economics is one obvious source, modelling markets as spontaneous self-organising systems at the edge of chaos (Waldrop, 1994), characterised by positive feedback effects and threshold effects. But we also need to develop an alternative set of micro-foundations that is the counterpart of seeing markets in this way and can help explain at the level of the individual how decisions are made in conditions of uncertainty. As Beckert puts it:

*'The goal is not to develop a more accurate theory of prediction but rather a theory of the unpredictability of the world and of how intentionality unfolds despite this unpredictability of outcomes.'* (Beckert, 2011, 24)

## **9. Alternative micro-foundations: imagination, narrative and emotion**

In conditions of uncertainty, the expectations on which decisions are based depend upon imagination as well as reason, are mediated through narratives and

stories, and involve feelings and sentiments. For micro-foundations to reflect this, we need to replace *homo economicus* with *homo romanticus* (Bronk, 2009).

It was Shackle who first pointed out the vital role played by the imagination in conditions of economic uncertainty, a role he summed up in the aphorism: 'Valuation is expectation and expectation is imagination' (Shackle, 1992, 8). Because we have only 'fragmentary and confusing evidence' of what tomorrow will bring (*ibid.*), we must build up a picture of what is coming with the help of the imagination. In an economic setting, choice is rarely a matter of choosing between well-defined options, but instead involves creating, 'by conjecture and reasoned imagination on the basis of mere suggestions offered by visible or recorded circumstance,' a picture of the options we face and the goals we aspire to (*ibid.*, 96). Imagination and creativity, that is, are not only a major cause of ontological uncertainty; they are also our main tools for coping with that uncertainty. Imagination fills the void left by the indeterminacy created by innovation and the freedom to choose between novel options; it sketches out visions of how the world might be and how we would like it to be. It provides warnings and goals; it constructs possible options. And none of this is antithetical to reason. Indeed, imagination must rely on reason to stress test its visions of the possible for their likely feasibility and desirability in the light of past experience (Bronk, 2009, 221).

Imagination also plays a role in keeping economic agents open-minded about the nature of their predicament and creative in switching between different cognitive spectacles. For the poet Keats (1817), the essence of the imaginative genius was the quality of '*negative capability*: that is, when man is capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason,' of 'remaining content with half-knowledge' (Keats, 1817). And for entrepreneurs and other economic actors trying to chart their way through the unknown future, it is likewise helpful to remain alert and imaginatively receptive to pointers as they emerge rather than strain to predict the unknowable future or impose a standard interpretation on the incomplete evidence before them. But such passive imagination is not enough. Since no single model or metaphor can capture all important facets of a situation, the successful economic agent is also likely to be the one adept at experimenting with different metaphors and perspectives, with different theoretical frames. It is from the 'generative friction' of using multiple perspectives and evaluative principles side by side that we derive both our capacity for innovative thinking and useful hints about how 'to navigate through uncharted territory' (Stark, 2009, xvi, 16-19).

A full understanding of the frequently ignored role of the imagination in economic decision-making and cognition is a helpful antidote to narrow and deterministic models of rationality and rational expectations. But, in itself, it may not help much in the creation of new analytical techniques and models for economists nor explain why economic actors make a particular decision. For these purposes, it is helpful to focus on the way in which imagination finds more determinate expression, namely through the creation of new narratives and through the use and recombination of existing narratives.

It has long been recognised outside economics that narrative is ‘one of the important devices humans use to give meaning to life’s activities,’ and ‘to create the commitment to act’ (Tuckett, 2011, xvii). We are especially reliant on ‘narrative structure’, when we need to ‘keep ontological uncertainty at bay’ (Lane & Maxfield, 2005, 4). Faced with an uncertain future, we generally choose to characterise it according to one of a number of possible narratives; and the narrative or script chosen provides us with an understanding of the role we should play (*ibid.*). These action-guiding narratives are often supple in the sense that we engage in ‘narrative shifting’ (*ibid.*, 16f) when we bump up against aspects of emergent reality significantly at odds with the story we have told ourselves. The narratives used by economic agents are in essence imaginative ‘fictions’, but they ‘provide parameters for decision-making and thereby provide orientation *despite* the uncertainty inherent in the situation’ (Beckert, 2011, 5). And crucially it is ‘through their story-structure that imaginings of future states become determinate’ (*ibid.*, 7). Narratives are not, of course, merely a product of the individual imagination. Most of the narratives we use to structure our beliefs about the future and give us reasons for action are socially constructed – the product of conventional narratives. And in conditions of uncertainty, ‘conventional expectations are perfectly rational’ (Skidelsky, 2009, 93). Conventional narratives or scripts are also often consciously crafted by economic actors such as central banks wishing to channel expectations in a certain direction (Beckert, 2011, 8), or by advertising companies wishing to create the need for a product by embedding it in a meaningful narrative.

Before exploring more fully the implications of the role of narrative for both economic theory and the way economic analysis is carried out (see sections 10 and 11), it is helpful to examine also the role of emotions. Among economists, it was Keynes who most famously focused attention on the importance in conditions of uncertainty of emotions and the sentiments of confidence and fear ‘where no solid basis exists for a reasonable calculation’ (Keynes, 1936, 154). In recent years there has been a renewed upsurge of interest in how emotions colour our judgments and even help us make choices in conditions of uncertainty by acting as an ‘Emotional Positioning System’ (Brooks, 2011, 21). Tuckett (2011, 18f) advocates an ‘emotional finance approach’ that analyses how emotional states alter the ways in which we process ‘ambiguous information about an uncertain future’; and he is at pains to point out that emotions do not always mislead. Instead, emotions and gut feelings may ‘quickly and efficiently facilitate good decision-making in uncertain but urgent situations’, making it inappropriate to see the role of emotions as a bias or departure from rationality as it is normally portrayed by behavioural economics (*ibid.*, 13f).

Perhaps the most important aspect of emotions from the point of view of modelling micro-foundations is how they interact with narratives and the products of economic agents’ imaginations. Emotions are both the vectors and products of narratives: confidence and fear can make economic agents more receptive to particular narratives, and the narratives may in turn instil in agents higher or lower levels of confidence or fear. Moreover, emotions – and the stories with which they are intertwined (Tuckett, 2011, 1) – are socially contagious; they spread ‘like viruses’ and can be modelled with the help of



models borrowed from epidemiology (Akerlof & Shiller, 2009, 56). Narratives can also be accepted and retained past their sell-by date for emotional rather than logical reasons. The 'grand narrative of risk management', for example, has been so beguiling because of the 'illusion of control' it fosters for management (Power, 2007, viii, 98); and many apparently scientific narratives can act as a talisman against insecurity, a tranquilizer against anxiety (Beckert, 2011, 22).

Emotions also attach to the idealised products of the imagination: the pleasure we derive from day-dreaming about life with a new car or another holiday motivates us to purchase them now – a dynamic well understood by the advertising industry (Campbell, 1987; Bronk, 2009, 213, 250). Indeed, emotion and imagination together are essential even to the individual pursuit of self-interest. As Hazlitt argued two centuries ago, we imagine the interest that we would feel in the imagined outcome of action we are contemplating today and this imagined interest excites in us an immediate 'emotion of interest' sufficient to propel us to act (Hazlitt, 1805; Bronk, 2009, 200). Looked at this way, even the quintessentially economic act of pursuing our own self-interest becomes an imaginative and emotional enterprise. It is emotions attaching to both public narratives and private visions that motivate us quite as much as rational calculation of likely consequences.

## **10. What do prices tell us?**

The efficient markets hypothesis assumes away epistemic uncertainty and posits that market prices reflect all available information and fundamental values (Cassidy, 2009, 86f; Frydman & Goldberg, 2011, 81f). It ignores the fact that in a complex world agents individually and collectively come to rely cognitively and emotionally on certain heuristics, models and narratives that make some sense of their predicament, but necessarily tell only part of the story. More crucially, it ignores the central truth that in a world of ontological uncertainty, the market cannot form 'the "best" possible estimate' of value, 'because this "best" estimate does not exist' (Orlean, 2008, 15): we cannot rely on market competition to ensure that prices are on average correct by eliminating systematic 'errors' in forecasting, because there is no objective reality in the future yet to be created against which to judge estimates at the time they are made. But this still begs the question of what market prices do tell us and how much they can help in solving the epistemological problems faced by economic actors.

To answer this question, it is useful to start by recalling the insights of Hayek. Hayek did not believe that the market ever reached an optimal equilibrium (Gamble, 1996, 69), and he would have been impatient with the claims of the efficient markets hypothesis. But he did believe that the price system in a free market is an unrivalled 'marvel' in its function as a coordination mechanism for communicating decentralized information (Hayek, 1945, 526f). Hayek argued that it was this role of market prices in helping each of us discover more about our uncertain predicament that made it so superior to socialist attempts to calculate our needs. For him, the central problem was one of what I call epistemological uncertainty. As he wrote:

*' ... the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form, but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess.'*  
(Hayek, 1945, 519)

Hayek's argument was that the signals given by market prices communicate summary information based on the innumerable decisions of individuals and so reflect key attributes of the dispersed and contextualized knowledge frequently available only to those individuals. For Hayek the market was a 'discovery procedure' (Hayek, 1978) for solving the problem of knowledge; and it was the very pluralism of individual perspectives that helped give the system epistemological robustness and importance.

Few doubt that Hayek was articulating a very important truth here, one that was underlined by the repeated failure of communist economies to find solutions to consumer and corporate needs without the help of a functioning price system. But recent events in world markets have also confirmed that it is only a partial truth. Since 2007, we have come to accept that market prices can often be profoundly misleading and their movements positively destabilising. This paper helps to understand why. It builds on Keynes' central insight that, in conditions of uncertainty (where no basis exists for 'calculated mathematical expectation'), investors frequently fall back on a conventional approach to valuations, or upon 'whim or sentiment' (Keynes, 1936, 152, 163). Market prices do not simply reflect fundamentals as perceived by dispersed agents; they also reflect dominant narratives, group emotions of confidence and fear, and stories of new possibility. And herein lies the potential for prices to be profoundly misleading.

As this paper has argued, there is no correct version of the future, since it is still to be determined by innovations not yet conceived and choices not yet made; and, in this space of possibilities, current prices can only reflect our best guesses, preferred narratives, and fleeting sense of optimism or pessimism. So long as market prices are the summation of heterogeneous perspectives and narratives, varied emotions and different dreams, then they may at least help us work out emerging patterns in the underlying economy, since the multiple perspectives and intuitions reflected are better than one. But all too often market prices do not reflect the decentralized knowledge that Hayek assumed but a homogeneous narrative and a shared emotional state. Markets are not inhabited by the lone rangers assumed by the methodological individualism that is central to neo-classical economics, but rather by social animals who prefer to share a dominant script, a collective image of the future. And this collective cognition, homogeneity of belief or convention, and tendency to 'groupfeel', can threaten the smooth workings of markets (Tuckett, 2011, 19) by driving market prices so far in one direction that they fail to reflect ignored elements of emerging fundamentals. Since, in conditions of ontological uncertainty, we cannot assume – as the REH does – convergence on one true model (because there is as yet no truth about the future to act as an anchor for expectations), convergence on a dominant model may simply imply a gathering collective delusion, and thereby sow the seeds for a bubble and subsequent crash. This is one of several ways in which the epistemological arguments in this paper can add to our understanding of why

markets are prone to bubbles and subsequent crashes – a phenomenon largely ignored by neo-classical theory (Stiglitz, 2011).

### **11. Monocultures, bubbles and the need for discourse analysis**

Prior to a bubble, there is usually a spate of innovation that introduces ontological as well as epistemological uncertainty. In the resulting period of uncertainty, investors generally cling to a mixture of conventional expectations and confidence-inspiring 'new era stories' (Akerlof & Shiller, 2009, 55). These conventions and new era stories have two effects. The first is a phenomenon referred to by the legendary investor, Soros, as 'reflexivity': the partial and distorted narrative (or new era story) is reflected in investor behaviour and therefore in market prices, and these price movements in turn serve to reconfirm the increasingly dominant narrative in 'reflexive feedback loops' that can lead markets way out of line with fundamentals (Soros, 2010, 14-16). The second effect complements the first: if a convention or story becomes dominant enough, it leads to an analytical monoculture, which ensures that the inevitable partial distortion implied by reliance on this one narrative or model leads to a generalized cognitive myopia and a destabilising homogeneity of behaviour (Bronk, 2011, 15). The result is not only blindness to the unexpected but very high correlations in behaviour. Prices are driven in one direction for a long time, until elements of brute reality ignored by the dominant narrative or model become so salient that they call the narrative into question. At that point, a crash is only a matter of time.

The recent financial crisis provides a good example of all these aspects. In the decade leading up to it, there was a whole spate of financial product innovations, relating to the securitization and repackaging of mortgages in ever more exotic derivative instruments. These innovations changed market dynamics forever and upended previously systematic regularities of behaviour. Market participants, though, initially had no problem coping with the resultant uncertainty, thanks to reliance on convention and new era stories, which in this case were closely linked: the dominant market and regulatory convention became that uncertainty could (contrary to the forgotten teachings of Knight and Keynes) be turned into calculable risk (Skidelsky, 2009, 87), even in the face of rampant innovation. Indeed, it was assumed that financial markets had entered 'a new era' of 'simultaneously higher return and lower risk', resulting from 'a shift in the technological frontier of risk management' (Haldane, 2009a, 4). In the good years before this 'new era' convention was proven to be catastrophically misguided, it had two related effects. First, it influenced market behaviour and caused financial groups to take positions that they genuinely believed to be 'risk controlled' but in fact represented huge speculative uncertainty. And, secondly, the growing monoculture of risk management caused blindness to the problems unfolding and dangerously high correlations in market behaviour. With everyone in the market pursuing a similar strategy and using essentially the same risk models, prices responded accordingly, apparently confirming the strategy and dominant new era narrative. But the seeds of disaster were there, not least because one factor missing from the risk models was the destabilising rise in correlations caused by the internalisation by all players of the same business

strategies and the same new-era risk models (Bronk, 2011, 15). The rest is history.

The implication for the discipline of economics is clear: economists (like risk officers) need to pay close attention to the narratives that market participants are using. To explain the past, or spot what is currently unfolding, economists should use discourse analysis to capture the modeling frameworks and narratives that structure the beliefs and actions of economic agents. Economists have no choice but to interpret a pre-interpreted world. But this is not the end of their task. It is also their civic as well as academic duty to be willing to employ different models from those internalised by the actors themselves and so be able to spot anomalies the actors have missed. Economists should constantly warn against the lazy dogma of 'best practice' (or 'best model') that implies one right way of looking at the world. They must remember, and remind the rest of us, that in a world of Knightian uncertainty, we cannot know *ex ante* what best practice or the best model will be (*ibid.*, 17).

## **12. The dangers of bolt-on amendments and the case for pluralism in modelling**

Many economists have grappled piecemeal with some of the issues raised in this paper. The dominant research strategy, however, has been to bolt on amendments to the core rationalist micro-foundations of neo-classical economics – in the hope of correcting for manageable information problems and systematic cognitive biases without losing the predictive power of the models in question. But as this paper suggests, this bolt-on strategy has a number of problems if intended as a bid to counter the uncertainty facing both economic agents and economists. By way of conclusion, it is helpful to rehearse the most important of these problems.

In the first place, it is far from clear that the central assumptions of neo-classical economics – individuals rationally optimising consistently ranked preferences within given constraints on the basis of rational expectations – have any explanatory role in conditions of either ontological or deep and symmetrical epistemological uncertainty. As a result, when dealing with problems characterised by uncertainty (as opposed to calculable risk), it makes little sense to treat departures from rational choice assumptions as biases or errors that can be systematically modelled and bolted onto rationalist micro-foundations. For, an economic agent facing uncertainty as opposed to risk has no choice but to rely on imagination, emotions and narratives to make sense of her predicament. Any attempt to optimise her situation is doomed to failure.

A second and related point is that bolt-on amendments can lead to logical incoherence at the heart of models. A good example of this is Endogenous Growth Theory, which in a stylised fashion builds into its models creative destruction and increasing returns to research and development, but still relies on micro-foundations that assume that economic agents are driven by rational probability-calculating expectations and the goal of maximising their consumption or profit potential (Bronk, 2009, 80). Given the ontological

uncertainty engendered by innovation, it is hard to see how the agents concerned are supposed to go about maximising consumption or profits on the basis of probability calculations. Likewise, as Fontana (2010, 585, 593f) argues more generally, the neo-classical paradigm cannot stretch to accounting for complex economic phenomena, and the uncertainty central to them, without 'losing its analytical and theoretical coherence.'

The bolt-on project also betrays a conviction that it is possible to have one best modelling framework – the product of continuous linear progress in knowledge and the slow accretion of wisdom. But, as we have seen, it is impossible to reduce all the multi-faceted aspects of reality to one perspective without losing much of its significance and texture. Moreover, in an indeterminate world of constant innovation and the emergence of genuine novelty, there can be no systematic elimination of errors and convergence on truth (Budzinsky, 2007, 315). Given our uncertain predicament, we can never know *ex ante* what the best model or paradigm will be. The bolt-on amendments of today – even assuming they worked to patch up the predictive power of our models for now – may still leave us unable to spot and explain the problems of tomorrow. Faced with permanent uncertainty, it makes sense to have a number of analytical toolkits at hand. For this reason, it may actually pay to reverse engineer the discipline of economics more often and engage with the research questions and methods of economists in the past. We have much to learn, for example, from Knight, Keynes and Hayek about the implications of uncertainty – implications that were perhaps more obvious in the turbulent 1920s, 1930s and 1940s than in the relative economic calm of the late twentieth century. The history of economics provides a ready-made source of such alternative perspectives and modelling approaches.

Rather than constant theory mending, economists would be better advised to embrace at least a measure of pluralism in modelling and to vary the cognitive spectacles with which they analyse social reality. This will not only increase their chances of making sense of the multi-faceted nature of today's social reality, but also help them spot the novel problems of tomorrow. Moreover, such eclecticism can and should be disciplined in two important ways: it should seek to match theories to problems for which they are suited; and it should focus on establishing clearer boundaries of applicability for the models available (Bronk, 2009, 296). Neo-classical models will gain a new lease of life if we use logic and experience to learn where they are likely to be analytically fruitful and where they are not. In conditions of uncertainty, innovation, and increasing returns, they have little to offer; but elsewhere they have proved themselves to be among the greatest intellectual achievements of social science. Epistemological and ontological uncertainty do not imply the need for a paradigm shift away from neo-classical micro-foundations to another modelling monoculture, but rather a new respect for disciplined eclecticism and the use of several paradigms side by side.

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