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Are conventions solutions ?
Contrasting visions of the relationship between convention and uncertainty

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Contrasting visions of the relationship between convention and uncertainty. [1]

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Abstract:

This paper maps out different conceptions and dynamic accounts of convention developed within game theory, Post Keynesian economics and the économie des conventions. These accounts are distinguished in terms of the way in which they conceive of uncertainty (as probabilistic or radical).

Résumé:

Ce texte compare les différentes conceptions de la notion de convention développée au sein de la théorie des jeux, de l'approche post-keynésienne et de l'économie des conventions. Cette comparaison permet de montrer que la manière de comprendre la dynamique des conventions dépend de la forme d'incertitude retenue (probabilisable ou radicale).

In recent years there has been a significant increase in economic research on social conventions motivated by the work of economists such as H. Peyton Young (1996, 1998a) and Robert Sugden (1986) who build on the early contributions of the philosopher David Lewis (1969). Prior to this surge in interest, discussions of convention in economics had been tied to the analysis of John Maynard Keynes's economic and philosophical writings. More specifically, convention had been studied almost exclusively by 'radical Keynesian' economists'[5], building principally on the *Treatise on Probability* (1921), Chapter 12 of the *General Theory* (1936), and Keynes's *Quarterly Journal of Economics* article (1937). These

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[5] We use this terminology for convenience in order to refer to the Post Keynesian school and the Economie des Conventions, both of which draw their inspiration from Keynes's *General Theory*, and neither of which endorses the mainstream interpretation of Keynes's work.

two literatures are distinct and have very little overlap: game-theorists make sparse references to Keynes if any at all.

Yet, this confluence of interests raises some interesting methodological questions. Does the use of a common term such as convention denote a genuine set of shared concerns? Can we identify anything that differentiates the mainstream game theoretic models from the heterodox Keynesian accounts? This article maps out the three most developed accounts of convention within economics and discusses their relations with each other in an attempt to provide an answer.

Some preliminary conceptual clarification is essential before we can develop our argument. Given the relative novelty of the economic study of conventions, it is perhaps no surprise that there is no 'standard' definition of the concept. Fortunately, at least four general features of convention appear to be widely accepted by economists and give a certain coherence to the existing literature:

1. Conventions involve coordination between agents
2. Conventions involve regularities in behaviour
3. Conventions are arbitrary
4. *Conventions are responses to uncertainty*

There is little dispute about the significance of features 1-3. It can safely be assumed that most economists understand roughly the same thing when they speak of regularities in behaviour and coordination[6]. The idea that conventions are arbitrary can also be stated in uncontroversial terms: conventional coordination is peculiar in the sense that – for every actual conventional practice – one or more equally desirable alternatives could have been adopted. Uncertainty, on the other hand, has been interpreted in different ways and has been the locus of fierce debate between the heterodoxy and the mainstream since the early 20th century (Knight 1921).

We contend that the controversy surrounding uncertainty is the key to understanding recent discussions of convention since the Keynesian conception of uncertainty is essential for the explication of the split between heterodox and mainstream theories. We will show that, despite significant developments in game theory, the mainstream account of convention remains committed to conceptualising conventions as *solutions* to the 'problem of

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[6] Though this should not be taken to imply that these ideas are unproblematic in themselves (Latsis 2005, p. 715, pp.719-20).

uncertainty'. Their role is to facilitate coordination by reducing players' perceptions of the risk of default or cheating. It is essential for our argument to distinguish the concept of 'solution' from the related ideas of 'equilibrium' and 'stability'. In referring to game theoretic conventions as solutions we are drawing attention to their mathematical properties (as solutions to equations) and to their relationship with uncertainty. In the remainder of this paper the term 'solution' *is not* equivalent to the notion of equilibrium employed by mainstream economists[7]. Conventions may introduce (temporary) *stability* but they are not solutions because they do not eliminate uncertainty from social situations – they merely transform agents' representations of it.

In this framework, uncertainty is understood in probabilistic terms. However, developments in the study of uncertainty within Post Keynesian economics have outlined a conception of 'true uncertainty' in terms that distance Post Keynesians from the mainstream view of uncertainty as risk. In a parallel development, another radical Keynesian school of thought – the économie des conventions – has investigated how true uncertainty transforms social practices, challenging the mainstream view of conventions as solutions. We conclude our paper by reflecting on what these contrasting approaches to convention reveal about the state of pluralism in economics and the distinctions between heterodox and mainstream approaches.

Part I

The game theory of conventions

Game theory appears to support the case for the renewed openness of mainstream economics towards the study of social phenomena that were once ignored by the discipline. At the same time, game theory's language and proximity with mathematics have helped to establish it within economics. It has often been deployed at the frontier of traditional theory to study the paradoxes of rationality, equitable allocations and reciprocal and tit-for-tat strategies. Thus it

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[7] One way of understanding equilibrium is to relate it to the notion of gravitational centres (Harcourt 1982; Eatwell 1996). The latter can be seen as the implied empirical outcomes of a system where the persistent, non-accidental, and non-temporary forces present are allowed to fully work themselves out. They are not, and do not need to be, consistent with observed empirical patterns, but they must exercise regulatory control over those variables.

is no surprise that game theorists have been amongst the first economists to apply economic modes of reasoning to the study of new phenomena.

A central problem of economics concerns how the multiple and decentralised actions of economic agents can come to coordinate at a unique equilibrium and game theorists suggested a way out: they began to investigate how they might use convention as a solution concept. With the introduction of convention, game theory introduced a foreign idea into its standard formal framework, a nomadic concept that represents common forms of social behaviour as non-reflective (that is to say not based on sophisticated rational expectations). This is how Sugden (1986, p. 32) introduces the concept of convention before going on to define it more strictly in terms of an equilibrium in a game.

> Consider what we mean when we say that some practice is a convention among some group of people. When we say this, we usually mean that everyone, or almost everyone, in the group follows the practice. But we mean more than this. Everyone eats and sleeps, but these are not conventions. When we say that a practice is a convention, we imply that at least part of the answer to the question 'Why does everyone do X ?' is 'Because everyone else does X'. We also imply that things might have been otherwise : everyone does X because everyone else does X, but it might have been the case that everyone did Y because everyone else did Y. If asked 'Why does everyone do X and not Y ?', we may find it hard to give any answer at all. Why do British drivers drive on the left rather than the right ? No doubt there is some historical reason why this practice grew up, but most British drivers neither know nor care what it is. It seems sufficient to say that this is the established convention. I shall define a convention as : any stable equilibrium in a game that has two or more stable equilibria. (Sugden 1986, p. 32)

Sugden's strict definition is shared by all game theoretic models of convention. By definition, a convention is an equilibrium in a co-ordination game – that is to say a game with multiple equilibria – and to follow a convention is a social process of equilibrium selection. *A convention is a solution*. The relevance of convention to economics is directly attributable to its beneficial consequences (as a stable equilibrium) as it permits successful co-ordination where co-ordination might not have been possible due to the existence of multiple equilibria. Young (1998b) follows exactly the same logic: convention is introduced by the theorist because of its desirable economic consequences for the actors.

> To capture the social dimension of convention, we could say that a convention is equilibrium behavior in a game played repeatedly by many different individuals in society, where the behaviors are widely know to be customary. […] What, though, is the relationship between social convention and economic welfare ? At one level

the answer is simple enough : conventions reduce transaction costs by coordinating expectations and reducing uncertainty. (Young 1998b, p. 823)

This second definition is more specific. The game must be repeated within a given population of players in order to reproduce the necessary behavioural regularity: it marks out Young's approach as evolutionary game theory. Moreover, Young redescribes the problem of equilibrium selection as a problem of choice under 'uncertainty' and provides an economic raison d'être for conventions as an aide to co-ordination under uncertainty.

A review of the different types of games proposed by game theorists of convention serves to illustrate how models place varying emphasis on uncertainty. Consider the class of co-ordination games where two players have the same two strategies and where payoffs are such that there are multiple, pure Nash equilibira. Depending on the value of the payoffs, the equilibria vary and the properties of *payoff dominance* and *risk dominance* of these equilibria also vary (Harsanyi and Selten 1988). Thus the diversity of equilibria and their properties determine the degree of uncertainty in co-ordination.

The rendezvous, stag hunt, driving, telephone, crossroads and hawk-dove games are six different types of co-ordination game, each with two Nash equilibria. In the first three types of game the players must choose the same strategy (in the rendezvous game they must go to the same place to meet; in the stag hunt they must hunt the same prey; in the driving game they must drive on the same side of the road). In the other three games, the players must choose opposing but complementary strategies (in the telephone game one must call back whilst the other waits; in the crossroads game one slows down and the other maintains speed; in the hawk-dove game one plays hawk the other plays dove). There is no sense in which there is a 'better' strategy that can be systematically adopted by one player: in each of these games, the players choices are interdependent. It is the absence of such a strategy, due to the multiplicity of equilibria, that creates what game theorists such as Young have called uncertainty.

The rendezvous and stag hunt games are co-ordination games where the equilibria are payoff and risk dominant. In these games uncertainty boils down to the well-known problem of co-ordination failure (Cooper and John 1988): players can co-ordinate at a sub-optimal equilibrium if they are not sensitive to the property of payoff-dominance of one of the two equilibria. They can only follow the established convention. Coordination is assured at the cost of efficiency. In the stag hunt the risk of co-ordination failure is higher because the payoff dominated equilibrium is risk dominant. This means that once there is a doubt about

the other player's move, the strategy of hunting hares becomes the less risky option even though the stag is more nutritious if caught (i.e. it provides a higher payoff). In this case the convention stabilises a behaviour that is globally inefficient though less susceptible to non co-ordinated outcomes.[8]

In the other four games, properties of payoff and risk dominance cannot be used in equilibrium selection, hence there is heightened uncertainty. In fact, the driving and telephone games are of pivotal importance as they are the only pure co-ordination games where the players are completely indifferent between strategies. These games are crucial to the game theoretic literature on convention because they bring out the arbitrariness of convention. On the other hand, in the crossroads and hawk-dove games the players are faced with Stackelberg equilibria which present conflicts of interest between them: each player has a preference for a particular equilibrium. The hawk-dove game is the most conflictual of the two in that the dove player has a strict preference for the other player to play dove as well. In this context the convention no longer resolves pure uncertainty, rather it resolves a situation of conflict by stabilising an order of priority between the players.

In all these cases the convention provides a solution that allows agents to avoid further layers of higher order calculations and expectations. Individuals who co-ordinate by following a convention do not submit to a particular law or prescription, nor have they signed a contract. The convention is a pre-established solution, an existing regularity that is of an entirely different nature to a law or a contract. The role of the convention is to select an equilibrium amongst several, because whilst agents have the capacity to calculate the equilibria, they fail to co-ordinate on one of them (Rabin 1994).

David Lewis, the pioneer of the game theory of conventions, claims to reconcile rationality and convention. His research proposed to develop a response to the language paradox articulated by his mentor, Willard Quine[9]. His aim was to show that rational agents would follow conventions and that they could do so without agreement, purely on the basis of precedent (Lewis 1969, pp. 35-42). But there is a logical incompatibility between the rationality postulate as formulated by mainstream economics and the idea that agents might follow precedent. Economic rationality has difficulty accounting for the type of salience that is essential to Lewis's account of convention (Gilbert 1990; Miller 1990) because this

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[8] For a more recent example, consider the following situation discussed by Goyal and Janssen, where the convention concerns the choice of a network technology. An inferior technology β can drive out a superior technology α if β communicates better with α than α does with β (Goyal and Janssen 1997).

[9] The paradox was this: do we need language to agree on the meaning of words (the basic conventions of language) in order to create a language ?

rationality is exclusively forward-looking (Janssen 1998): a strategy is rational at time *t* if and only if it maximises expected utility from *t* into the indefinite future. Precedent could, of course, allow agents to co-ordinate their expectations, but once the rationality of agents is common knowledge in a given population, expectations will be based on the canons of rationality rather than the reproduction of past behaviour[10]. All equilibria – not just the incumbent one – are consistent with rational behaviour under these conditions, so economic rationality and convention following cannot co-exist.

This diagnosis explains the fact that within mainstream economics the concept of convention has been developed in evolutionary game theory (Young 1993) rather than the classical game form that Lewis first suggested. In evolutionary game theory agents are backward-looking, so that they base their present decisions only on the observation of past regularities. Not only are they backward looking, but they are also naïve: period after period agents choose their strategies reacting purely to the past states of the system and thus only unintentionally contributing to its evolution (Mailath 1998). The agents of evolutionary game theory have bounded rationality: they follow precedent blindly, unaware of alternative courses of action. The spontaneous order achieved is the product of this limitation imposed on their cognitive capacities, it is not planned or premeditated (Sugden 1989).

Nevertheless, evolutionary game theory retains a form of bounded rationality that remains calculative. Its major innovation is to limit the data upon which these calculations are based to information from past periods whilst excluding all knowledge of the future. The decision rules applied by players in evolutionary games fundamentally rely on expected utility calculations that are conditional on the prior states of the system. In this case, the 'uncertainty' surrounding equilibrium choice is resolved through the calculation of a weighted average of past behaviours in the population. Thus the limited rationality postulated by evolutionary game theorists does not expose agents to genuine uncertainty. Instead, adaptive

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[10] A rational agent is not bound by her past action (Miller 1990, p. 25). As a rational convention follower, my own past conformity is not in itself an adequate reason for present conformity. And I will not expect another rational convention follower to conform in the present just because she has conformed in the past. Gilbert (1990, pp. 10-11) describes the case of an interrupted telephone call where each agent has the option of calling back or waiting to be called (the telephone game). Previously, Betty and Sue solved their problem: the original caller called back. But what now? Betty might reason as follows:

> *"I should conform to precedent now, if Sue does. And Sue will realize that it is obvious that she should conform to precedent if I do. She will therefore ask: 'Will Betty conform to precedent?' If Sue starts reviewing my reasoning she will soon see that reason-replication will get her no further than it gets me!"*

Therefore, common knowledge of precedent will not, by itself, automatically generate expectations of conformity or conformity on the part of rational agents in the game-theoretical sense (Gilbert 1990, p. 10).

behaviours are propagated through the population in response to individual interactions in an environment characterised by probabilistic risk.

This construction is formalised as a dynamic system (Kandori, Mailath and Rob 1993) in which the modeller can predict which out of a number of alternative behavioural regularities will emerge as the dominant one in a given population. Deviant behaviour is possible within this framework: a random noise variable means that individual agents can 'mutate' and adopt any alternative equilibrium strategy. However, the system as a whole converges on a unique convention in the long run. In this way, evolutionary game theory explains the emergence of convention without relying on individual strategic behaviour or standard models of economic rationality. The historical emergence of a behavioural regularity is described in terms of a self-organising ergodic system whose dynamics are both independent of historical contingency and perfectly predictable (Young 1993).

Game theory introduces conventions as solution concepts in an attempt to construct a stable social order in an uncertain environment populated by agents with bounded rationality. Superficially, this appears to distance the game theorists from mainstream accounts of social order. However their in-depth analysis of the properties of stochastic dynamics is very much in keeping with the modelling focus of mainstream theory. Moreover, their attachment to the mathematical tools of modern economics has two important consequences for their approach: i) convention cannot be understood independently of its status as a solution; ii) the calculative rationality of the agents transforms uncertainty into a probabilistic choice between perfectly known alternatives (i.e. the multiple equilibria of the game).

Part II

Uncertainty and convention in Post Keynesian economics

As noted in Part I, both mainstream and heterodox approaches to convention recognise the relationship between convention and uncertainty. We have already seen that, in the case of game theory, probabilistic accounts of uncertainty are standard. Our contention is that the refinement of the concept of uncertainty undertaken by Post Keynesians[11] provides an alternative that underpins a contrasting heterodox approach to convention. As we shall see, this alternative framework prepares the ground for another radical break with the economic orthodoxy: it challenges the very idea of conventions as solutions.

The role of uncertainty in Keynes's system is complicated by an unusual aspect of his work: he wrote two influential books that touched on the topic, one in philosophy (*A Treatise on Probability*) and one in economics (*The General Theory of Employment, Interest and Money*). The exact relation between these texts is a matter of debate amongst interpreters of Keynes. Within the Post Keynesian literature there is a noticeable difference between those seeking to discover what Keynes 'really' thought[12] and those aiming to appropriate and develop his insights for current analytical usage. It is principally the latter group that interests us in this article since assessing the Keynesian pedigree of Post Keynesian ideas is not part of our argument. Nevertheless, some of the analytical developments of the Post Keynesian concept of uncertainty stem from the history of thought literature and we shall refer to these as and when it is appropriate.

There is a well-established interpretation of Keynes's later economic writings that emphasises what Post Keynesians call *true (or radical) uncertainty*. The key sources of textual evidence for this interpretation are in Chapter 12 of the *General Theory* (*GT*) and the 1937 *Quarterly Journal of Economics* article (*QJE*). In the *GT*, uncertainty is introduced in the discussion of long-run expectations. More specifically, Keynes emphasises the barriers to establishing confidence in expectations concerning the future value of investments.

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[11] The boundaries of Post Keynesian economics are difficult to determine precisely. In spite of wider usage in the period following Keynes's death, the label 'Post Keynesian' has come to be associated with a dissident group of heterodox economists since the 1970s. This community identifies itself as Post Keynesian and has its own journals, conferences and seminars. The label has often been used to stress differences with mainstream economics and, in particular, the rejection of the neoclassical synthesis (King 2002, p. 6).

[12] Though the latter project undoubtedly plays a valuable part in the PK literature, our primary interest here is in the analysis and development of the concept of uncertainty that it has engendered rather than its accuracy as an interpretation of Keynes.

> The outstanding fact is the extreme precariousness of the basis of knowledge on which our estimates of prospective yield have to be made. (Keynes 1936, p. 149)

He uses examples such as the ten-year yield of a railway, a copper mine, or the goodwill of a patent medicine, to show that the grounds of our forecasts are either flimsy or absent. He goes on to describe how the transition from an 'entrepreneurial' economy to a 'speculative' economy can exacerbate this problem since the division of management and ownership and the speed and frequency of transactions, threatens the stability of the economic system (Keynes 1936, p. 151). So investment decisions have dynamic effects on the level of current investment; they increase the likelihood of market fluctuations and make consistently accurate forecasting impossible.

A year later in the *QJE*, Keynes juxtaposed his position with the 'classics'. He claimed that though they allowed for change, they only incorporated it in cases where agents' expectations could not be disappointed. Mathematically calculable probabilities described the likelihood of past, present and future events in exactly the same manner.

> The calculus of probability, though mention of it was kept in the background, was supposed to be capable of reducing uncertainty to the same calculable status as that of certainty itself... (Keynes 1937, pp. 112-113)

Keynes believed that in many cases, our expectations about the future did not fit this framework because they could not be the subject of probabilistic calculation.

> About these matters there is no scientific basis upon which to form any calculable probability whatever. We simply do not know. (Ibid, p. 114)

The exact meaning of these citations is still a matter of some dispute, but the belief that they introduce a fundamental distinction between calculable probability (or risk) and true uncertainty is now widespread amongst Post Keynesians.

Post Keynesians have discussed the topic of uncertainty since at least the 1970s (Davidson 1972, p. 102n). More recently, as some have turned from policy questions to methodological reflection, the recognition of true uncertainty has been viewed as one of the fundamental characteristics of the Post Keynesian school. In a 1996 literature survey in the *Cambridge Journal of Economics*, Philip Arestis cited three fundamental traditions upon which Post Keynesianism draws, the first of which, 'stresses uncertainty, which is thought of as an inherent aspect of events viewed in historical time'. He goes on to specify what he

means, putting forward a version of true uncertainty that has become dominant within the tradition. First, he claims that the future is *unknown* to agents, stressing their epistemic frailty:

> The future is unknowable in advance and agents cannot construct objective probability distributions, because past distributions are non-stationary even if they exist (i.e. economic events are *time*-dependent). (Arestis 1996, p. 113)

Later, he explains this epistemic frailty by reference to the nature of the social world and outlines the implicit ontology of Post Keynesianism:

> The essence of *uncertainty* in post-Keynesian economic theory is grounded in a non-ergodic, non-deterministic world understood as an open system. (ibid, p. 117)

Arestis's position is repeated in subsequent accounts of the role of uncertainty in Post Keynesian economics (McKenna and Zannoni 2000, p. 331). A recent comprehensive history of Post Keynesianism confirms the centrality of true uncertainty by devoting an entire chapter to the discussion of 'Uncertainty, expectations and method' (King 2002, pp. 181-202). Like Arestis, King draws attention to both the epistemic and ontological component of the concept (ibid, pp. 184-189). King's book also draws particular attention to two authors within the Post Keynesian tradition who dedicated a significant part of their careers to demonstrating the importance of uncertainty for the analysis of economic processes: George Shackle and Paul Davidson.

Shackle was a crucial forerunner of the Post Keynesian discussion of uncertainty. He was the originator of the 'radical subjectivist' approach to economics which claimed that agents cannot possess *any* knowledge about the future (1955; 1972, pp. 155-229). His approach emphasised the epistemic limits of decision-making and their roots in Keynes's economics.

> The deliberate self-deception of business, in supposing its investment decisions to be founded on knowledge and to be rationally justifiable; the insecurity of its faith in its own judgements, which the awareness of this self-deception engenders; the paralysis of decision and enterprise which can result when the structure of pretended knowledge is violently overthrown by events; this central core of the *General Theory* is to be found in Chapter 12... (Shackle 1967, p. 132)

Shacklean agents do not possess probabilistic estimates about future states of the world. Instead, when faced with a decision, they use their imaginations to construct possible

alternatives: they create rather than discover. In this framework agents are aware that their predictions are conjectures and that their plans are susceptible to the imagination of other independent agents; they are conscious of uncertainty. Moreover, their forecasts are affected by their desires (leading to optimism) and their fears can lead them to ignore crucial elements of their situations.

Shackle was never closely affiliated to the Post Keynesian community and worked mostly on his own. This meant that, despite his groundbreaking contribution, he had relatively little direct influence on the development of Post Keynesian research (King 2002, p. 187). On the question of uncertainty his influence was felt partly through the contributions of Paul Davidson. Davidson remains one of the most influential Post Keynesian economists and is largely responsible for stimulating the more detailed analysis of true uncertainty. He began from a critique of classical and neoclassical economics, claiming that both assume a long run equilibrium that is independent of initial conditions (the *ergodic hypothesis*, which is also found in the evolutionary game theory of Young). The ergodic hypothesis serves to rule out path dependent processes by assuming that they have no effect on the eventual stable state of the economic system. Its employment effectively makes all contingent events – and consequently history – analytically irrelevant to economics (Davidson 1982-83).

In emphasising the difficulty of prediction and the creative aspects of choice, Post Keynesians explicitly deny a crucial assumption of mainstream economics: that past probabilities can provide us with grounds for predictions of future events (Davidson 1991, p. 130). Davidson's agents suffer from the same epistemic frailty as Shackle's:

> ... [in cases of true uncertainty] the economic agent believes that during the time between the moment of choice and the payoff, unforeseeable changes will occur. The decision maker believes that *no* information regarding future prospects exists today and therefore the future is not calculable. (Davidson 1991, p. 131)

But Davidson is also explicit in developing the ontological component of Post Keynesian uncertainty. It is not simply that agents are unable to predict future events due to cognitive or other impediments, the economic system as a whole displays non-ergodic qualities[13];

> For Keynes and the Post Keynesians, long-run uncertainty is associated with a nonergodic and transmutable reality concept. (Davidson 1996, p. 492)

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[13] According to Davidson this is one of three characteristics that distinguish Post Keynesian economics from the mainstream. The other two are the non-neutrality of money and the lack of gross substitutability between money and other goods.

So far we have suggested that there is a significant convergence in the Post Keynesian literature around the distinction between probabilistic calculation and true uncertainty in line with Davidson's emphasis on non-ergodicity. Indeed, this appears to be the case for the majority of Post Keynesians who have appropriated Keynes's ideas in order to further their theoretical projects. However, the contributions discussed above have been supplemented by a large secondary literature on Keynes's philosophy that grew out of the compilation of his collected works in the 1980s (King 2002, p 181-182). Research by Lawson (1985; 1988), Carabelli (1988), Fitzgibbons (1988), O'Donnell (1989), Runde (1990), Bateman and Davis (1991) and Bateman (1996) departs from prior Post Keynesian approaches by focussing on the re-reading of Keynes's *Treatise on Probability* (*TP*) and a number of unpublished student papers by Keynes that had recently been discovered in the Marshall Library in Cambridge. This philosophical work is particularly concerned with the connection between the conception of uncertainty that emerges from his later economic works and Keynes's theory of probability. The analysis of uncertainty within the interpretative literature is also essential to a dispute about the consistency between Keynes's early and mature beliefs that has been dubbed 'the continuity debate'.

Keynes's theory of probability is unusual in that he conceives of probability as a logical relation between propositions. Though it incorporates deductive logic as a special case, the principal target of Keynes's theory is the relation of partial implication. In other words, he is concerned with rational but non-conclusive argument (Keynes 1921, p. 56). In *TP*, probabilities link some set of evidential premises (h) to a conclusion (a) and can be represented by the formula a / h (which should be read as 'a relative to h'). Agents 'perceive' probabilities, making their judgments relative to the available evidence[14]. Nevertheless, probabilities themselves are judged to be objective and their objectivity is derived from logic rather than nature (ibid, p. 4)[15]. It is also important to note that Keynes's theory diverges significantly from subsequent purely mathematical treatments of probability. All probabilities lie on a continuum stretching from certainty (where $a / h = 1$) to impossibility (where $a / h = 0$). However, according to Keynes, few can be expressed in numerical terms (ibid: 70) and

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[14] Not all individuals possess the same logical intuition or ability, thus preventing some from seeing probability relations 'accurately'. This element of Keynes's system is taken as evidence of his commitment to some form of Platonism about probabilities (O'Donnell 1989; Bateman 1991; Gillies 2003).

[15] That is to say, they do not represent stable patterns in events to be discovered in nature. This distinguishes Keynes's view from the frequentist interpretation of probability, which also posits objective probabilities.

many cannot be ordinally compared either (ibid, p. 73)[16]. A final element of Keynes's theory deserves mention in connection with uncertainty: *the weight of argument*. Weight provides an alternative method for comparing arguments that is independent of probability. In *TP*, Keynes tells us that:

> One argument has more weight than another if it is based on a greater amount of relevant evidence. (Keynes 1921, p. 84)

Whilst comparisons of probability rest on judgments about the balance of evidence for and against a particular argument, any evidence (whether favourable or unfavourable) increases weight.

Proponents of the continuity thesis attempted to anchor Post Keynesian uncertainty in the overlapping concerns of the *TP*, *GT* and the *QJE* article. Lawson (1985, p. 914) and O'Donnell (1989, p. 78) point towards situations in which both numerical measurement and ordinal comparison are impossible – either due to a failure of perception or the absence of a probability relation – as key to the Keynesian conception of uncertainty[17]. This interpretation of Keynes's theory of probability dovetails with the Post Keynesian tradition and re-affirms the view that Keynes's position is consistent with the Knightian distinction between uncertainty and risk presented in our introduction[18]. Some proponents of the continuity thesis such as Runde (1990) and O'Donnell (1989, pp. 67-80) interpret Keynes's concept of the weight of arguments as another form of uncertainty. Runde speculates that a slightly modified conception of weight could fall with the accumulation of relevant, unfavourable evidence. If Runde is correct, then a plausible parallel can be established between weight and the 'state of confidence' discussed in Chapter 12 of the *GT* and explicitly noted by Keynes (1936, p. 148n). The discussion of weight in connection with Keynes's philosophy should also be seen as lending support to the established Post Keynesian emphasis on the state of confidence for the analysis of uncertainty.

However, as we hinted earlier, some commentators have not been convinced by the continuity thesis. Bateman (1991; 1996), Davis (1994; 1996) and Gillies (2003) have argued for a decisive break between Keynes's early and later work based on the impact of Frank

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[16] This may coincide with, but is not equivalent to, a probability being 'unknown' in the sense that individuals cannot perceive a probability relation due to a failure of logical insight (O'Donnell 1989, p. 51).

[17] O'Donnell use of 'uncertainty' is wider in that he identifies three types of uncertainty corresponding to the three possible objects of knowledge in *TP*: probability, weight and unknown probability.

[18] There is one proviso, however. In some cases of Knightian uncertainty – where probabilities are not mathematically calculable – agents may still have knowledge of or access to non-numerical probability relations (Runde 2003, pp. 47-48).

Ramsey's critique of *TP*. Proponents of the discontinuity thesis claim that Keynes abandoned his early theory of probability when faced with Ramsey's claim that there could be no objective basis for probability, and instead adopted (some form of) subjectivist view that was immune to the critique. In support of this point, proponents of discontinuity have emphasised the influence of G. E. Moore's neo-Platonist ethics on the young Keynes (Bateman 1996, pp. 19-37) and its subsequent translation into his theory of probability (Bateman 1996, pp. 48-49; Gillies 2003, p. 115). Bateman then draws on textual evidence to claim that Keynes abandoned his youthful neo-Platonism and conceded defeat to Ramsey on the question of objective versus subjective probabilities (Keynes CW X, pp. 437-438)[19].

Whatever the historical merit of these claims they have led to a tentative subjectivist framing of uncertainty within the broader Post Keynesian literature. This move was necessary because a subjectivist (or intersubjectivist) account renders the Knightian distinction between risk and uncertainty very difficult to sustain. On a standard interpretation of subjectivism, probabilities are the degrees of belief of individuals, measured by their willingness to place bets on the likelihood of future events and – by the Dutch Book argument – these bets can be interpreted as mathematically tractable probabilities (Gillies 2003, pp. 117-118). This has two consequences for the Post Keynesian position on true uncertainty. Since it cannot be related to the basis of knowledge, uncertainty must be regarded as a psychological phenomenon rather than something that agents necessarily or even occasionally face; a position clearly at odds with the ontological element of true uncertainty as emphasised by Davidson and other Post Keynesian authors. A second consequence is that – shorn of the support of the non-formalistic interpretation of probability found in *TP* – Post Keynesian resistance to the mathematical analysis of true uncertainty becomes more difficult to sustain[20].

The subjectivist interpretation of Keynes's later account of uncertainty is a minority position in the interpretative literature (Bateman 1996, p. 8) and, as we have shown, has had limited impact on theoretical contributions within Post Keynesianism. In spite of the existence of competitors, the emphasis on *true uncertainty* as non-calculable, ontologically grounded and epistemically manifested is at the very core of the Post Keynesian research programme. But, as Post Keynesians have pointed out, Keynes's account of *how people act* in situations of uncertainty is couched in terms of convention. In the absence of determinate and calculable

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[19] These interpretative claims are hotly disputed by proponents of the continuity thesis (O'Donnell 2003).

[20] Though this is not impossible. Davis (2003, p. 109) in particular, argues both for the cogency of the discontinuity thesis and for the centrality of 'radical uncertainty' in Post Keynesian thought.

knowledge concerning the results of all possible actions, *conventions* form the basis of rational action.

Instead of providing a general definition of convention, Keynes offers a number of illustrations. The *QJE* article gives the most extensive account of the range of conventions that can be found in financial markets. In that piece, Keynes delineates three principal types:

> (1) We assume that the present is a much more serviceable guide to the future than a candid examination of past experience would show it to have been hitherto. In other words we largely ignore the prospect of future changes about the actual character of which we know nothing.
> (2) We assume that the *existing* state of opinion as expressed in prices and the character of existing output is based on a *correct* summing up of future prospects, so that we can accept it as such unless and until something new and relevant comes into the picture.
> (3) Knowing that our own individual judgment is worthless, we endeavour to fall back on the judgment of the rest of the world which is perhaps better informed. That is, we endeavour to conform with the behaviour of the majority on average. The psychology of a society of individuals each of whom is endeavouring to copy the others leads to what we may strictly term a *conventional* judgment. (Keynes 1937, p. 114)

Some commentators have suggested that these three examples are perhaps best understood as Keynes's account of the *resources* used by investors trying to cope with the overwhelming uncertainty of volatile financial markets (Bibow, Lewis and Runde 2003). Post Keynesians have long pondered their implications for economics, but few have tried to work out what Keynes was trying to pick out with the introduction of the concept of convention. What do the three aforementioned examples have in common? Keynes never offered an account of what a convention is, and why and how it might tie these cases together. Post Keynesians have mostly remained faithful to Keynes by following his description of market conventions but refraining from adding a substantial theory of convention to it. As we have already seen, they have concentrated on the analysis of uncertainty. Some, of course, have ventured tentative elaborations, but these do not go much beyond citations of Lewis (1969) and brief references to 'structures of interdependent expectations' (Davis 1994, pp. 171-176); or 'structures of interdependent judgments' (Davis 1997, p. 210 and the concept remains relatively under-researched within the Post Keynesian tradition.

It remains clear, however, that the conventions outlined in the *QJE* article are qualitatively different from the conventions discussed by game theorists because, whilst they may constitute responses to uncertainty, they are certainly not solutions in our sense. With

some significant exceptions[21], Post Keynesians have resisted defining the emergence of conventions as a simplistic systemic or functional response that 'reduces' or eliminates uncertainty. There are two reasons for this. First, the recognition of true uncertainty means that most Post Keynesians are deprived of a metric for determining whether or how much uncertainty has been reduced. Second, even when Post Keynesians conceptualise conventions as stabilising a particular social arrangement, they do so *contingently*[22]. The stabilisation afforded by conventions and institutions does not resolve the problem of uncertainty as a rule, indeed, it may sometimes exacerbate it (Dequech 2004, p. 372n). At best, then, conventions and other stable social arrangements tend to be described quite explicitly in the following manner:

> In the Post Keynesian vision the world remains non-ergodic, but there are ways to cope with the disastrous outcomes when they occur. (McKenna and Zannoni 2000, p. 342)

That is to say, they are viewed as coping mechanisms. And, as we have seen, this is a view that has strong echoes in Keynes's economics[23].

Another heterodox school in economics has taken up the challenge of analysing conventions in more detail: the économie des conventions (EC). As with the Post Keynesians, one of the founders of the EC finds inspiration in Chapter 12 of the *GT* and the *QJE* article for what he calls Keynes' 'radical project'. According to Favereau (1985, 1988, 2005, 2008), this project consists in generalising the true uncertainty found in Keynes's account of financial markets to all economic interactions. His contribution and others within the EC tradition represent a reformulation of the Post Keynesian project with a particular emphasis on the forms of coordination that result from the operation of true uncertainty.

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[21] Kregel (1980, p. 46) lapses into the functionalist view that 'the economic system abhors uncertainty' and reacts by producing uncertainty-reducing institutions.

[22] See Dequech (2000; 2004) and McKenna and Zannoni (2000) for some recent work in this area.

[23] We thank an anonymous referee for pointing out another interesting recent argument from the institutionalist literature that emerges from and complements the Post Keynesian debates. Mirroring the claims of the EC below, Wilson claims that the institutions (conventions) of a particular society can transform uncertainty within in it (2007, pp. 1100-1101). In this framework, whether institutions eliminate or reduce uncertainty depends, as far as we can see, on whether institutions generate numerically tractable probabilities or not.

Part III

The economics of conventions: a further step in the Keynesian argument?

The starting point of the EC project is the recognition that there are a variety of forms of evaluation and action. True uncertainty is one consequence of this variety. One of the principle aims of the EC is to show that competing (and antagonistic) accounts of co-ordination from economics and sociology, can be integrated into a more general framework of co-ordination using a new set of analytical tools. The concept of 'convention' is central to this framework, since each of these accounts of coordination may be redescribed as a convention. Conventionalists depart from the game theoretic tradition and redefine convention as a range of consistent interpretations and practices that agents assume to be shared (to some degree) by the other participants in the interaction.

In discussing the EC's approach to convention we invoke practices rather than 'behavioural regularities' that have been emphasised in the first two parts of this paper. In a radical break from mainstream economics, conventionalist analyses have emphasised the interpretative capacity of individuals. The traditional emphasis on behavioural regularities was introduced by Lewis precisely in order to circumvent this interpretative level: consistency in observed behaviour is all that is required for coordination[24]. In contrast, conventionalists claim that the similarity judgments allowing varying degrees of reflexive control are crucial to coordination. These judgments are, in turn, dependent on the agents' representations of the group or community they belong to. Such acts of interpretation allow individuals to identify appropriate conventional actions that are irreducible to any specific behaviour pattern. These interpretations and practices that agents assume to be shared transform uncertainty without neutralising it: the supposition that a convention is in fact in place is reinforced by successful coordination, but never guaranteed.

Coordination can however be further supported through external qualified objects and mechanisms endowed by *form-giving operations*. The notion of investments of form (Thévenot 1984; Eymard-Duvernay and Thévenot 1985) is used to make sense of the totality of these operations of form-giving. Investments of form produce equivalence across time and space through the existence of objects that can consolidate social relations and thus make

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[24] At least this is the standard interpretation of Lewis's position based on his first definition of convention. Favereau (2008) shows that in a second version, formulated shortly afterwards in 1971, Lewis came to include representations in his account.

them less dependent on the perceptions of the people that create them. The notion of investments of form provides a theoretical analysis of the real cost of moving from an indeterminate thing associated to a simple behavioural regularity to a qualified object associated to a formalised rule. Labels of quality provide an excellent illustration of the process. Once established, they create an equivalence class linking previously diverse objects in an attempt to draw attention to manufacturing standards as opposed to other indicators of quality such as personal recommendations or brand loyalty.

Conventions, insofar as they involve representations of a collective, are bound up with normative judgments about the correct or acceptable functioning of the collective. Exploring this normative dimension of coordination, Boltanski and Thévenot (2006) showed that different conceptions of justice, each relying on its own conception of the common good, can be associated with the most general forms of observed coordination. Consequently, the EC develops and defends six generalisable conventions (or "orders of worth"). Each of these corresponds to a specific form of coordination and a specific conception of worth. Market transactions are placed in the context of a plurality of possible forms of agreement rather than holding the privileged position they do in mainstream economics. For a concise presentation of the orders of worth see Boltanski and Thévenot (1999), from which the following table is drawn[25]:

Orders of worth	*Mode of evaluation (worth)*	*Format of relevant information*	*Elementary relation*	*Human qualification*
Inspired	Grace, nonconformity, creativeness	Emotional	Passion	Creativity, ingenuity
Domestic	Esteem, reputation	Oral, exemplary, anecdotal	Trust	Authority
Civic	Collective interest	Formal, official	Solidarity	Equality
Opinion	Renown	Semiotic	Recognition	Celebrity
Market	Price	Monetary	Exchange	Desire, purchasing, power
Industrial	Productivity, efficiency	Measurable: criteria, statistics	Functional link	Professional competency, expertise

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[25] A more detailed account can be found in Boltanski and Thévenot (2006).

In practice, these six main constitutive conventions (or orders of worth) and their attendant forms of coordination tend to get mixed and combined with each other. But they are also mixed with small-scale, local conventions that are less transposable to other contexts. That is why, in addition to the first plurality of orders of worth, there is a second type of diversity in the forms of coordination discussed by the EC: a distinction between different "regimes of engagement" (Eymard-Duvernay, Favereau, Orléan, Salais and Thévenot 2005). Regimes of engagement rank interactions according to the extent to which they can be extended to different people and situations ranging from no possible extension to universal generalization (the orders of worth).[26]

This brief presentation of the concept of convention as understood within the EC tradition will allow us to return to our argument where we left off at the end of Part II. It is now a matter of showing how the dynamics of this reformulated notion of convention rely on the transformation of uncertainty[27].

According to the EC, a convention can be distinguished from a subjective representation because it is hypothetically shared and this 'sharedness' is subject to a test. Tests serve, amongst other things, to introduce a dynamic element to the study of conventions. Conventionalists speak more generally of a test when an action and its consequences serve to establish or discredit a particular collective representation and its associated hypotheses: the existence of a convention is verified by the success or failure of coordination. Success can be evaluated in a number of different ways ranging from the presence or absence of behavioural adjustments to the achievement of external quantifiable goals through the use of objective indicators. In this last case for example, the test would normally be achieved through the use of an external device.

Thus, coordination can be a continuous process of testing. However, what agents count as tests also depends on the convention insofar as it determines their perception of uncertainty. In other words, the definition of (epistemic) uncertainty – from the agents' perspective – becomes conventional itself. Following Knight, Salais and Storper (1997) suggest two ways of apprehending uncertainty: specialisation and consolidation. Consolidation is the process by which agents aggregate things into a class or group and then measure the deviation from the overall tendency probabilistically. In other words, the agents reduce uncertainty to risk – though only at the epistemic level. In Part I we showed how this

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[26] For a concise presentation of the regimes of engagement, see Thévenot (2000).
[27] For a presentation of these dynamics that focuses directly on the normative dimension of convention see Boltanski and Chiapello (2007).

reduction of uncertainty to risk was taken for granted at an ontological level by game theorists thereby excluding the dynamic account proposed by the EC.

Specialisation, on the other hand, is a process that recognises the uniqueness of things. True uncertainty is maintained from the agents' perspective since they remain aware of the fundamental uncertainty that characterises their interactions with each other. In practice, small gaps between expected outcomes and actual behaviour do not necessarily lead to the collapse of conventions because repeated success in coordination leads to increased confidence in the established practices and reduces the need for interpretation and questioning. Thus, when new problems or impediments to coordination eventually arise, there is a tendency to discount their importance and stick to the established practice. In this manner conventional coordination leads to a weakening of the critical capacities of agents to the point where they are less reflective. According to conventionalists it is this process that accounts for the automatic feel of some conventional behaviour: 'hardened' conventions become routines (Salais and Storper 1997; Favereau and Le Gall 2002).

In contrast, the equivalences that underpin the different orders of worth and their respective tests can be the subject of continuous debate. Cases where coordination breaks down and past actions and assumptions are critically investigated are usually the result of perceived injustices felt by all or part of the community concerned. Outside of these cases of disagreement however, people are usually engaged in much more peaceful and cohesive collaboration. Under these conditions their reflective capacities are more likely to be engaged when faced with tests of worth which are quite often routine elements of daily life (such as annual reviews at work and salary negotiations).

These variations in agents' degrees of reflexivity make convention and uncertainty fundamentally dynamic concepts. Conventions are the current states of a reversible process of consolidation or deconstruction depending on whether they are automatic or subject to questioning. Throughout this process individual perceptions of conventions can vary from a highly naturalised view (that they are immutable facts) to a constructivist view (that they are up for grabs). In positing reflexive agents capable of seeing their coordinated activities as constructed and therefore also capable of doubt and change, the EC has extended the role of true uncertainty as proposed by the Post Keynesians. Nevertheless, perfectly reflexive agents who are unable to see at least some established practices as natural would be faced with chaos and would consequently be incapable of action. Conventionalists redress this problem by adopting a more realistic theory of limited reflexivity (Bessis 2008).

We have also highlighted that, in speaking of conventions as states of a process governed by variation in the degrees of reflexivity of agents, conventionalists refer both to the way in which conventions are understood by agents (an epistemic dimension) but also to the actual variation in conventional practices (an ontological dimension). Even if conventions are understood naturalistically, actual behaviour can be sufficiently diverse to produce a multitude of variations of the same convention[28]. These can be seen as small adaptive variations based on the fact that a given situation is never reproduced identically. Once seen as constructed however, conventions can be changed consciously and deliberately. There is a qualitative difference between these two types of change: whilst the former is a process of adjustment, the latter introduces the possibility of historical novelty.

Conclusion

We have shown how contrasting visions of the relationship between uncertainty and convention are crucial to the demarcation between self-consciously heterodox and mainstream theories of social coordination. On the one hand, game theorists employ mathematical tools to generate and maintain stable outcomes in their models. These are inevitably presented as solution concepts, and one of their principle aims is to reduce or eliminate uncertainty. We have seen how this tradition, for all its mathematical sophistication, relies on an interpretation of uncertainty as risk and cannot accommodate the conception of true uncertainty as described and developed by the Post Keynesians. Finally, we have sketched an alternative theory of conventions that takes true uncertainty seriously and departs from the conception of conventions as solutions. We now conclude with some observations on the implications of this study for the question of pluralism in economics.

Significant developments within economics, principally through the rise of game theory, have contributed to widening the scope of economic analysis. The case of convention is a prime example of this. A phenomenon like convention, which might have been considered either uninteresting or perhaps threatening to an earlier set of neoclassical theoretical concerns, has been brought much closer to the core of mainstream research. In terms of theoretical interests, the overlap with the heterodoxy has undoubtedly become significant. Nevertheless, doubts about compatibility can immediately be raised upon closer examination of the details of heterodox and mainstream theories of convention.

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[28] Which remains *the same* convention precisely because it is not subject to questioning and further interpretation by the agents.

Our analysis reveals a clear cut divergence in methods: a modelling emphasis in the case of classical and evolutionary game theory; and a more descriptive and historical focus in the case of the two radical Keynesian positions. The methodological disparity is justified by a more fundamental split. Post Keynesians and conventionalists defend both the ontological and the epistemic components of true uncertainty, whilst game theorists deny them. Our analysis suggest that, whilst the study of convention shows that there has been significant change in the aims and scope of mainstream economics, the transformation of convention from social phenomenon to solution concept in the hands of game theorists demonstrates a commitment to methodological monism. In this case at least, apparent theoretical diversity is not accompanied by genuine pluralism of methods.

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