PART II

Methodology and History of Thought

2. Recent developments in Post Keynesian methodology and their relevance for understanding environmental issues

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INTRODUCTION

Until quite recently, Post Keynesian economics has had relatively little to say about the economics of the environment (Mearman, 2005a, 2005b). Much of this new work stems from a methodological critique of neoclassical economics, borrowing heavily from the philosophy of science as well as economic methodology, and from increased awareness of and concern for the environment.

The methodological developments are located in three main literatures, all of which have a potential impact on how Post Keynesians understand environmental issues. First, the recent rediscovery of Keynes's writings on philosophy and ethics have led to a fresh interpretation of his economics. Especially important is the *Treatise on Probability* (Keynes, 1921), which contains a critique of existing theories of probability and develops an alternative theory. This work has led to a better understanding of methodology, of uncertainty, and of assorted theoretical issues, such as the role and existence of money in the economy.

Two literatures, both inspired by Keynes, are more controversial. These are not universally accepted by Post Keynesians, many of whom regard them as incorrect, or at best distracting from theoretical and empirical work.

Babylonianism,[1] developed principally by Sheila Dow, holds that science does not search out great truth claims; rather, the aim of theory is explanation and understanding. The nature of reality, comprising organic, complex and open systems, dictates that complete explanations are impossible. The Babylonian approach shares much with that of Keynes. Indeed, Keynes's approach might be described as Babylonian; he even used the term to describe Newton's actual approach to scientific enquiry (Keynes,

1972a, p. 364). However, it should be noted that many Post Keynesians view Babylonianism with suspicion, claiming it is insufficiently rigorous, eclectic and incoherent (Davidson, 2003–04; Dow, 2005; Holt, 2007).

Even more controversial has been Critical Realism, a philosophy developed by Roy Bhaskar (1978, 1979). Bhaskar provided an argument for a reality existing independent of our present conception of it, which has depth, and is open. Observable events and experiences, the initial focus of science, are thus the products of causal mechanisms operating 'beneath' the observable surface reality. Both the social and natural sciences seek to identify these mechanisms. Critical Realism has been brought to economics by Tony Lawson (1997, 2003). It shares many concerns of Keynes and Babylonianism. Its main contribution to economics has been to urge that a greater prominence be given to ontology. Lawson (1997) uses Critical Realism to argue against mathematical and statistical techniques (except in highly unlikely circumstances). There are, of course, critiques of Critical Realism; one prominent criticism is that it is unable to inform empirical work (Downward, 2003).

This chapter examines these methodological developments and draws out their implications for a Post Keynesian economics of the environment. It is beyond the scope of this chapter to argue for a single Post Keynesian methodology for environmental economics or to contrast this with existing alternatives, such as (neoclassical) environmental economics or (non-neoclassical) ecological economics.[2] Rather, we consider several common themes that straddle the Post Keynesian methodological literatures: (1) a focus on realism and ontology; (2) a view that reality is organic and comprises complex 'open systems'; (3) how recent methodological developments reinforce the Post Keynesian concept of uncertainty; and (4) the implications for choice of method, specifically arguments for pluralism and the mixing of methods. Each of these will be considered in turn and related to a Post Keynesian economics of the environment.

REALISM AND ONTOLOGY

There is considerable debate about the extent of realism (as opposed to subjectivism) in Keynes's theory of probability (Keynes, 1972b; Bateman, 1987); but both Babylonianism and Critical Realism adopt the precept of both common sense and scientific realism that there is a reality existing independent of our particular investigation of it. They agree that while it is reasonable to argue that our perceptions of reality, our actions upon it, and our understanding of it, are complex, there is a reality to be studied. It would seem strange to argue that tigers or ecosystems or pollution are

social constructions. Yes, our understanding of them is mediated by social activity; for example, our concern for, and actions towards, tigers reflect the value put on them by society.[3] But that is not the same as claiming that our theories about them actually create them. Nevertheless, it is worth restating this basic realist principle because of the influence of constructivist thought in economics, which sometimes argues that reality is purely a social construct with no material element. A Post Keynesian environmental analysis must take this realism seriously, which means engaging in ontological analysis.

Recognizing the importance of ontology reinforces the Post Keynesian belief that theories should be realistic – they must refer to real things and have some basis in reality. In that sense, Post Keynesian economics shares one of the main strengths of ecological economics, which is that an understanding of the object of knowledge and of ecological concepts informs economic concepts. Existing economic concepts are rejected if they are unable to illuminate ecological factors. Post Keynesians claim that its realism is an advantage in environmental economics. Orthodox treatments accept that there is a reality, but are less concerned that their theories are realistic; they are happy to use convenient fictions, such as the notion of a rational economic person maximizing their utility. A similar concern for realism exists in ecological economics. For example, Gowdy (2007) argues that models of the consumer in environmental analysis should capture behavioural regularities supported by experimental results.

How might this affect a Post Keynesian economics of the environment? The capital controversy of the 1950s and 1960s (see Harcourt, 1972) provides a suggestion. The controversy focused on the possibility of an aggregate production function, and on the possibility of valuing aggregate capital and the profit rate independently. This debate showed that calculating capital stock depends on the profit rate, which itself depends on the valuation of the capital stock. As a result, aggregate capital stock was considered infeasible along with aggregate production functions. While the capital controversy centred on several theoretical curiosa, an essential element of the debate was an ontological concern about whether capital was homogeneous and perfectly malleable in historically reversible ways. Neoclassical economists advocated such a conception, whereas Post Keynesians argued that capital is more inflexible and heterogeneous.

The capital controversy may have implications for the concept of natural capital. 'Natural capital' is a term developed mainly by ecological economists. It means: 'the whole endowment of land and resources available to us, including . . . the ecological life-support systems that make economic activity . . . possible' (Harris, 2002, p. 122).[4] Natural capital may be useful for measuring whether natural resources and ecosystems are being eroded,

and therefore whether development is sustainable. Ecological economists also distinguish between critical and non-critical natural capital, to stress how crucial some resources are (Spash and Clayton, 1997, p. 148).

From the perspective of the capital controversies, however, we must question the notion of natural capital since it attempts to measure the aggregate stock of a vast number of heterogeneous objects. While man-made capital is reproducible in an identical form, natural capital is not. Further, when some natural capital is critical, and other natural capital is not, how could they be compared and measured? The natures of natural capital and man-made capital might be so different as to render them incommensurate. Likewise for different types of natural capital.[5] Further problems arise in trying to value such a stock. All this creates difficulties for environmental analysis. Such criticisms significantly undermine further concepts, such as weak sustainability, which holds that man-made physical and natural capital can be easily substituted. Weak sustainability is undermined as a concept, because it holds that a decrease in natural capital should be compensated for by an increase in physical capital. However, if the two types of capital are essentially different, it is difficult to see how they could be compared and even further how we could substitute one for another.

ORGANICISM AND OPEN SYSTEMS

Realism also has implications for studying the environment: particularly in relation to organicism and open systems. As his work on probability evolved, Keynes adopted an organic ontology. Drawing on Winslow (1993), we can imagine Keynes's ontology as involving internal (necessary) relations. An internal relation is one in which an entity A is defined (partly) in terms of another entity B. Thus, we can talk of internal relations between polluter, pollutant and polluted, predator and prey, input and output, invader and invaded, and so on. Social examples of internal relations include landlord–tenant, master–slave and employer–employee. Babylonianism also explicitly adopts organicism. There may be parallels between this literature and ecological economics; for example, Norgaard (1984, p. 169) notes that neoclassical approaches assume the separability of factors of production.

The concept of organicism has now been superseded by the concept of open systems. While Post Keynesians freely use the term 'open systems', its meaning is far from clear and varies considerably among users. Indeed, there are a number of different treatments of open systems, all with distinct advantages. Their nature is discussed further below. Open systems are

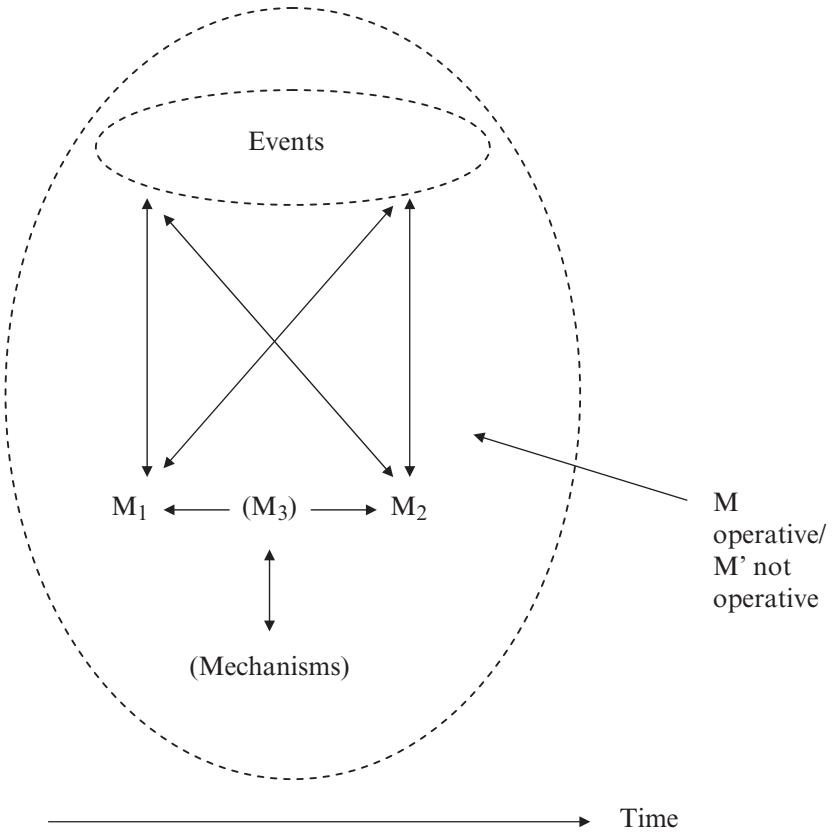


Figure 2.1 An open-system ontology

consistent with organicism, with Keynes's position, with Babylonianism, with Critical Realism, and with other Post Keynesian perspectives such as Davidson's work on nonergodicity, complexity theory and general systems theory.

Figure 2.1 displays a possible way to conceptualize open systems. This example is only illustrative; it is perhaps most useful as a vehicle for discussing some of the main characteristics of open systems and their implications.

The system has a boundary, which is permeable and shows how system throughput is normal and necessary for the system's survival. The permeable boundary allows the impact of external causal factors to be felt inside the system. There is no assumption that external factors can be excluded, and so the objects inside the system are not isolated. In contrast, economics

tends to treat outside factors as an inconvenience for their models. This is justified as a necessary abstraction, but in fact they make assumptions that deny the nature of the system in question.

Systems are sets of entities and the relations between them. From organicism, we know that some relations may be internal; and from complex adaptive systems, we know that some relations may be internal, while others are external. Because the system moves through time, entities within the system evolve over time, as do relations between them. Furthermore, over time the entities may act in different ways, combine in different ways and create new emergent phenomena. The history of the system therefore matters in understanding its current state. For this reason, the system is shown with a time arrow. Of course, the importance of history to economic analysis has been emphasized by Post Keynesian economists (for example, Robinson, 1980). Similarly, ecological economics has stressed history – for instance through the co-evolution of systems (Norgaard, 1984, 1988).

As stated above, one aspect of recent work in Post Keynesian methodology has been to shift the focus of analysis onto ontological concepts, such as structure and mechanism. In the system being discussed, the entities found may be structured. These structured entities may be very different from each other in nature. For example, a human and a fish are both structured entities but are very different. Causal mechanisms or processes (such as M_1 and M_2 in Figure 2.1) may be contained within these structures. They may act independently, or (and perhaps differently at different times) in combination, creating events. Other events also may trigger mechanisms to operate; this is why the vertical arrows shown in Figure 2.1 are two-way arrows. Furthermore, the objects may be internally related (or organic), and this relationship itself may have a causal function (M_3). For example, in trying to explain fish stocks, one mechanism may be the actions of the fisherman and another mechanism the actions of other fish; these relationships affect the final outcome.

However, these mechanisms may not always operate. Mechanisms inside the system may operate intermittently, thereby creating uncertainty about and within the system. Similarly, mechanisms outside the system may not always operate to affect the system. In the diagram, M/M' represents the on-(M)-and-off (M') nature of mechanisms. Thus, there is a focus on potentialities and not just actualities. In addition, the ways in which causal mechanisms combine also change over time.

Another important concept is ontological depth. Causal mechanisms lying beneath the level of events operate to change the system. Conceptualizing the nature of reality in this way has specific implications. First, the ecological dimension of the economy is clearly acknowledged. Given that the open system contains depth, it must automatically include

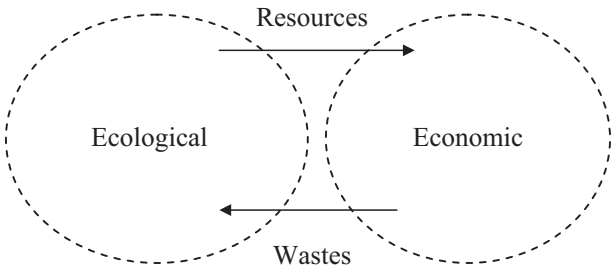
the ecological. It is therefore incorrect to envisage the economic and the ecological as separate spheres (see Figure 2.2a), as is common in environmental economics. The concept of depth also enriches all the approaches seeking to embed the economic within the ecological (see Figure 2.2b). In formulations such as Figure 2.2b, reality could be flat: the economy draws from the ecology which surrounds it. Depth requires us to think of the economic as embedded in and (at a higher level) emergent from the ecological. That still allows one to envisage the economic reacting back on the ecological. For this reason we draw the two-way arrows in Figure 2.2c.

Moreover, beneath the mechanisms shown in the diagram, there are further levels. Economic events are determined by combinations of economic mechanisms, but also political, social and psychological mechanisms, which are in turn all affected by the biological, chemical and physical mechanisms. Therefore, any ecological feature or event is complexly determined by a range of causal mechanisms located at various layers of reality. Take the pollution of a river. One can construct a causal sequence as a story of how the pollution occurred and what its effects were. A physical process of production has created a toxic effluent. This is partly a product of the physical and chemical mechanisms (and hence engineering). The economic mechanisms are those causing (in the sense of a temporal causal sequence) a particular productive technology to be chosen. Class relations may also affect the choice of technology. The physical and chemical output also affects the biological nature of the river and humans. The chemical in the river harms organic elements in the river, such as fish, and anything else that consumes the water or the fish. The pollution may cause ill health and the loss of enjoyment from activities related to the river, such as swimming or fishing. The fact that the pollution is noticed is the result of social mechanisms that value rivers and create institutional structures for monitoring them. The impulse to act against pollution is, in turn, partly psychological and partly cultural (it may emanate from religious or other cultural norms).

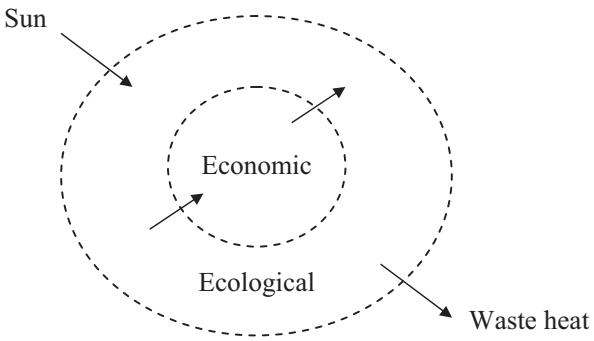
This story is familiar to economists. What does the concept of ontological depth add? Principally, it impels comprehending the pollution as not merely a causal sequence of events, in which an event occurs and leads directly to another event (like one billiard ball striking another), but in terms of layers of reality with different causal mechanisms. Further, the higher layers in the overall structure, such as the economic, are dependent on lower levels such as physical structure; but they also have their own properties which are emergent from the lower.

This conceptual framework provides a broader and deeper apparatus for understanding reality than those approaches that focus on the economic as a separate entity. It is impossible to ignore the bigger picture in

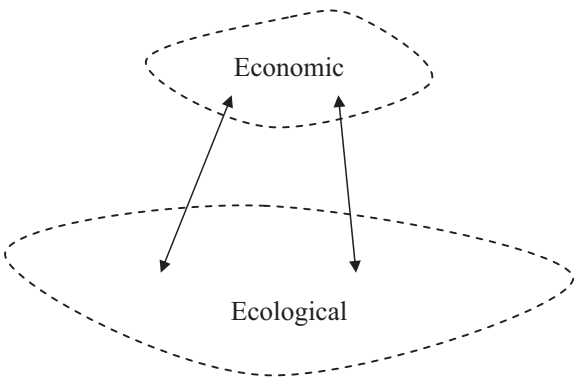
(a) Economy and ecology as separate, interacting spheres



(b) Economy as lying within the ecological



(c) Economic emergent from ecological



Sources: (a) See, for example, Common (1988, p. 13, Fig 1.4); (b) adapted from Harris (2002, p. 8, Fig. 1.2).

Figure 2.2 The economic and the ecological: contrasting conceptions

explaining an apparently economic effect. Such a wider view is crucial in dealing with highly complex ecological issues. That does not mean that an economist must understand every detail of every aspect at every layer of reality, but neither can all these layers be ignored. An economist informed by this view must pay more attention to the interaction between the economy and ecology.

Methodologically this has important implications. Most of the time, economists ignore the underlying physical to focus on the economic, and claim that this is a necessary abstraction. However, taking ecological considerations into account, this abstraction is clearly not justified. Every production decision has irreducible ecological dimensions and implications. It could even be argued that classical economists recognized this (Christensen, 2005). As an aside, methodologically this could mean that an economic analysis of the environment is necessarily interdisciplinary; it must take information from other disciplines to inform its own judgements. Further, the lessons from methodological developments such as those found in Kuhn (1962) and Babylonianism, as well as arguments for pluralism, suggest that strategies of economic imperialism are unlikely to be successful.

However, analysis in terms of depth and causal mechanisms means that it is important to focus on mechanisms, and their potential activity and effects (and their interaction with other mechanisms). This changes the policy focus. The key ontological questions are: (1) Which mechanisms exist? (2) How are mechanisms triggered? and (3) Can structures be created with mechanisms that produce better outcomes?

That is not to say that the framework described here is without flaws. The concept of depth does not let us determine the mechanisms that are most important. Clearly, when applied to the environment, this is crucial. Some mechanisms may be crucial to life, or death, and thus there is a hierarchy of mechanisms to consider. There is an analogy here with lexicographic preferences, which imply that substitutability between goods is not complete (van den Bergh et al., 2000; Gelso and Peterson, 2005). Lexicographic preferences are a staple of Post Keynesian consumer theory (see Lavoie, 1992, *passim*).

The ontology outlined may have other implications for economics generally, and for an economics of the environment specifically. For example, the concept of equilibrium appears problematic. Equilibrium has been a concern of Post Keynesians since at least Kregel (1976) and Robinson (1974). Equilibrium encompasses multiple, very different senses, including expectations being met, a balance of forces, an equality of two quantities and no tendency to change. While some meanings of the term (for example, 'stability') are easier to support in an open system (if only because people

act to create stability), others are weak. It might be possible for individual expectations to be met, but only by luck because the current actions of agents make the construction of probability distributions very difficult (see below). Similarly, given emergence, it is difficult to conceive of equilibrium as the end of an economic process. Questioning the concept of equilibrium also raises questions about economics. In the context of the environment, many concepts are thrown into doubt. For example, all notions of optimization must be questioned. This has a considerable impact on environmental economics, and even on ecological economics (where optimum is a less popular concept, but still used).

UNCERTAINTY

The second implication of recent methodological work for the study of the environment concerns uncertainty. It is clear that environmental analysis and decision-making are dogged by uncertainty. All economists would accept that. However, Post Keynesians have long taken a particular view on uncertainty – that it is non-probabilistic. This point is well established in Paul Davidson's work (1994), which stresses the non-ergodic nature of the world. Davidson claims that through crucial decisions (those that are irreversible or difficult to reverse) future possibilities are changed, and thus probability distributions for future events are impossible to formulate. That has implications for economic modelling and for the economy. It explains the existence of money as something people seek to hold as a store of wealth during uncertain times (Keynes, 1936, Chapter 17); and it means that individual agents make decisions based not on rational calculation, but often on a whim. Davidson's view is itself rooted in Keynes's work on probability. Recent developments in Post Keynesian methodology have refocused attention on Keynes and provide ontological support for his views.

Keynes's theory of probability is based on the formation of a logical relation between an a priori reasonable hypothesis and evidence related to that hypothesis. Consider a prediction about the rate of economic growth in the UK 20 years from now. This cannot be derived from a past frequency distribution because the conditions under which the past frequencies occurred no longer hold. Long-term prediction in particular is therefore difficult. Hence, Keynes's (1937, pp. 213–4) comment that: 'the prospect of a European war is uncertain, or the price of copper and the rate of interest twenty years hence . . . About these matters there is no scientific basis on which to form any calculable probability whatever. We simply do not know.' Keynes's probability is concerned 'with what it is

rational to believe given the evidence' (Lawson, 1985, p. 118), rather than with what is 'out there'. Agents are held to form, on the basis of induction, a degree of rational belief in a hypothesis, which itself is formed by analogy. Although Keynes (1921) did not define uncertainty, for him, and *contra* mainstream economics, uncertainty is not a probabilistic concept. Probability helps define uncertainty, since there is a correspondence between certainty and knowledge of a probability relation, and therefore uncertainty can be defined as the absence of such knowledge.

Agents form probability estimates about outcomes but also a weight, similar to a degree of confidence (not to be confused with the statistical concept of confidence interval – see Franklin, 2001), that they have in those estimates. If a probability carries a low weight, that probability is likely to be unstable. Keynes (1936, p. 148) notes that:

> The state of long-term expectation, upon which our decisions are based, does not solely depend, therefore, on the most probable forecast we can make. It also depends on the *confidence* with which we make this forecast – on how highly we rate the likelihood of our best forecast turning out quite wrong.

Keynes's theory of probability, and its subsequent interpretation and expansion, provide a theory of action – agents consider likelihood plus confidence, or probability plus weight. When weight is low, Keynes argues, investors will be driven by factors such as convention, whims, 'animal spirits', imagination (Carvalho, 1988, p. 76) and ethics (Runde, 1990). As Dow (2004) argues, Keynes places an emphasis on judgement in decision-making in uncertain environments. She offers monetary policy through committees of decision-makers, such as those in central banks, as an example.

The distinction between probabilistic risk and non-probabilistic uncertainty has influenced ecological economists (Spash and Clayton, 1997; Spash, 2007). It supports the view that environmental futures cannot have probabilities attached to them based on past relative frequencies, given that in open systems ecological entities are evolving in non-random ways. For example, the notion of a feedback loop suggests that rising levels of carbon dioxide lead to irreversible changes in the ecosystem (such as the oceans producing their own net carbon dioxide). This changes the basis of life. Under such circumstances, simply extrapolating from past instances (even with some stochastic adjustment) is flawed. Such arguments have parallels in complexity theory. In complex adaptive systems, agents adapt to new circumstances, often creating new rules and routines and mechanisms that govern future behaviour, thereby creating emergent phenomena. Thus, although the present and future are rooted in each other and

in the past, in the past it would have been difficult to predict the future. In the language of non-ergodicity, past frequency distributions would have different averages than current or future ones.

Furthermore, it could be argued that even with a logical theory of probability, there is no basis for constructing a probability for some ecological outcome. Or, to be more precise, one could not construct a probability distribution in which one has much confidence because the available evidence is likely to be small relative to our ignorance about the problem. Events far in the future are difficult to predict; attempting to make forecasts about the economy 20 years from now is fruitless (Keynes, 1937). For example, it would seem impossible to construct a probability distribution of the effects of peak world oil production (Campbell, 2003), which include economic reorganization and social dislocation. But what is the probability of any one of these outcomes, or even of counteracting events or mechanisms, such as the ability of individuals to sustain themselves without access to oil? Such variables appear beyond estimation; certainly past data provide little support for any estimate, however precise.[6]

In economics, uncertainty affects theory. The Arrow and Debreu (1954) model of general equilibrium requires the existence of a complete set of futures markets. These would simply not exist in the world pictured here. The problems are specifically acute for environmental problems. The conventional analysis of pollution suggests that there may be an optimal amount of pollution. A typical analysis of pollution calculates marginal private and social costs and benefits of units of pollution and production. The contrast between social and private involves the recognition of externalities. Moreover, the calculation of costs and benefits requires, for accuracy, that future costs and benefits are taken into account. However, those future effects are unknown. They would need to be estimated probabilistically, but the arguments above suggest that the relevant probability distributions may not even exist.

These problems plague all cost–benefit analyses, the most popular tool employed by environmental economists. The pervasiveness of uncertainty leads to methodological objections to cost–benefit analysis (Harris, 2002, pp. 111–14; Keat, 1997; Gowdy, 2007; Hansson, 2007; Spash, 2007) – agents are not equipped with the information to calculate future benefits and weigh them against future costs. Such an approach assumes methods of projecting the future, which uncertainty would suggest have dubious reliability. Further, cost–benefit analysis usually rests on there being a discount factor so that future costs and benefits can be viewed in current terms. Such discount factors are subjective and psychological and reflect one's attitude to the future. However, they also reflect a prediction of how our current actions might affect the future and therefore what rate of

discount would be safe and reasonable for us to assume; thus, our ability to predict becomes relevant. For policy analysis, from a realist perspective, one would prefer that discount factors had some objective anchor. It may be possible to employ random discount factors, simulations, sensitivity analysis and the like to the problem, but without much confidence that this will improve the prediction and valuation of future outcomes. Of course, the same analysis applies to cost-effectiveness analysis, which avoids the problems of comparing costs and benefits, but still must engage in calculation of the future and its translation into present values.

UNCERTAINTY ABOUT METHODS

For Dow, no one method can be relied upon a priori. Babylonianism is organic in its practice. Investigations evolve, often in unpredictable ways, and perhaps halt, to start again from a different point. Science is trial and error, not in the sense of moving incrementally to a perfect theory, but in trying out theories and taking elements from one and parts from another to tell a story. Thus, Babylonianism holds that there is unlikely to be a single set of axioms, or a single theory, which can explain a set of phenomena. Theories beginning from different assumptions and different paradigms, therefore, must be respected and explored (Feynman, 1965).

Babylonianism also advocates theories whose assumptions form and content bear some relation to reality. It holds that atomistic theories are less likely to be successful than organic theories. However, atomistic theories should not be thrown out because they might throw some light on reality, particularly if there are parts of it which are more atomistic. However, simple theories that are deduced from simple axioms are problematic.[7] Reflecting the concerns of Marshall and Keynes about long chains of deductions from axioms, Babylonianism regards such logical leaps to be somewhat fanciful (Dow, 2005, p. 387). This is partly because, due to uncertainty about the world, there is no set of axioms that we can be (reasonably) certain about, and also because deductions assume that no other interfering factors will change the conclusion.[8]

The analysis of an ecosystem is a case in which the identification of a single set of driving axioms is problematic. As illustrated above, pollution is complex, and so we need several different strands of reasoning and evidence to understand its causes. On the issue of climate change, although models generally predict a dire future, there are a range of models and therefore different predictions. Different models contain different assumptions and different causal mechanisms. Fallible theories and the incomplete nature of modelling make it unlikely that any single theory could be

'the' model of climate change. Support for this view is given implicitly by studying the behaviour of major decision-makers, such as central banks, who may use one main structural model and support this by using a set of auxiliary models. The problems associated with modelling and forecasting those economic systems in the fairly short term are likely to be much greater in models attempting to capture climate change and its effects (for an illustration, see Spash, 2007).

There are grounds for further pessimism. Keynes's methodological objections to Tinbergen suggest that modern econometric techniques have severe limitations (but see Brady, 1988). For Keynes, the assumptions of the uniformity of nature and fixed coefficients undermine the usefulness of econometrics in an organic reality. Econometrics assumes an independence of observations, and this in turn assumes an atomic rather than organic reality. This critique has been embraced by Davidson, by Critical Realism and by Dow. All argue against traditional methods of economic analysis, driven by econometrics, because they rely on closed systems.

Such arguments can appear rather sceptical and even nihilistic. What can we as agents do? Facing uncertainty about the world and about which methods to use, researchers and policy-makers require a basis for action. One possible route is to adopt the 'precautionary principle', a view commonly held in ecological economics. The precautionary principle holds that humanity should 'strive for minimum interference with the operation of natural systems, especially where we cannot predict long-term effects' (Harris, 2002, p. 131). Advocating the precautionary principle can be understood in the context of uncertainty, open systems and the limited prospects of developing knowledge in such environments. However, critics of the precautionary principle might argue that it is merely a way of avoiding or suspending judgement and analysis. This is not strictly fair, because precaution, judgement and analysis are connected; indeed, precaution often follows the others.

A Post Keynesian approach would be to apply judgement directly and base action on that. One way that confidence in a course of action may be increased (and the weight of argument increased) is to gather more evidence. However, this cannot be a simple inductive exercise of generalizing from a number of cases, or counting similar instances. Rather, Keynes saw benefit in negative analogy; that is, gathering evidence in unlike situations. If a finding occurred in a range of contexts, it was more likely to be true. According to Dow (2005, p. 387), Keynes employed an ordinary or human logic, in which we use 'judgement to combine direct knowledge, indirect (theoretical) knowledge, conventional knowledge, and animal spirits or intuition' to make decisions. None of this guarantees greater accuracy; neither does it claim faux precision.

PLURALISM

Babylonianism and Critical Realism argue that methods should be tailored to the reality they are studying; however, given the complexity of the environment, it is difficult to be confident that the correct method has been chosen. For this and other reasons, there have been many recent calls for pluralism. Inevitably, there are many definitions of pluralism (Salanti and Screpanti, 1997). Pluralism can be defined as the advocacy of plurality. This can operate on various levels. One can envisage a plurality of realities, or a fragmented, complex reality in which there is a plurality of heterogeneous types of entity. Given that, and given the difficulties in establishing knowledge in those environments, one can advocate a plurality of methodological approaches (including some that make prediction their standard for theoretical success and others that eschew this standard) and of methods. Significantly, ecological economists have also argued for pluralism (Martinez-Allier et al., 1998).

Given the difficulty of choosing the correct method, some authors have argued that several methods be combined. Downward and Mearman (2007) argue for mixed-methods research. Mixed methods combine, in a single investigation, multiple data types, theoretical accounts, methods and methodologies. Downward and Mearman (2008) contend that economic agents, such as the Bank of England, use mixed methods as a response to the uncertainty they face. Using mixed methods has implications for environmental economics. As with all economics, environmental economics has a quantitative and formal bias. Mixed methods see this bias as misplaced. Rather, consistent with Keynes's concept of weight, different methods and data illuminate different parts of reality and add to the weight of the argument.

There is a parallel here with multi-criteria analysis, which is sometimes referred to as 'multi-criteria evaluation' or 'multi-attribute utility analysis' (Stirling, 1997). Multi-criteria analysis attempts to gather together pieces of evidence from different perspectives to aid decision-making in complex environments. As its name suggests, it tries to avoid the problems with attempting to make optimization decisions based on a single criterion. However, multi-criteria analysis has a quantitative bias, since it attempts to generate an algorithm that quantifies all the evidence (Martinez-Allier et al., 1998; Stirling, 1997; Stirling and Mayer, 2001). A mixed-methods approach would see this final step as unnecessary. Rather, following Keynes, evidence would be presented in its raw quantitative and qualitative form, and decision-makers would then use their judgement in drawing conclusions.[9] How this would be operationalized requires further investigation. However, it is unlikely that any kind of formulaic response would be suitable. Rather,

each investigation requires its own context-specific response. This is not eclecticism; some methods will be better than others in different contexts, and some methods will be better per se (modelling versus reading tea leaves). But this approach recognizes that complex environments require complex investigation. This takes us back to Keynes's human logic.

CONCLUSION

This chapter has discussed some recent developments in Post Keynesian methodology and their implications for an economic analysis of the environment. Sceptics and other critics might ask: 'So what?' Many of the arguments made here have been foreshadowed, often within Post Keynesian economics. That is true; however, the recent work has codified the earlier work. Further, a critic may say that the recommendations above are light and weak. Again, that is true; methodological arguments are necessarily vague. Yet vagueness may be a virtue in uncertain environments. To paraphrase Keynes, it is better to be vaguely right than precisely wrong. Furthermore, recent methodological work has highlighted the problem of prescriptive methodology. Thus, the developments in a Post Keynesian methodology should act only as suggestions for practice, not rules. Any useful developments in a Post Keynesian economics of the environment will emerge from theoretical and empirical work, albeit with the assistance of methodology. Much of the theoretical apparatus already exists; the new methodology will assist future work.

This chapter also has identified some key features of a Post Keynesian economics of the environment, which is rooted in the methodology of the approach. A Post Keynesian environmental economics would embrace realism; ontological reflection; an ontology of depth, layers and emergence; an ontology of uncertain openness, history and change; a scepticism about current methods, including long chains of deduction, mathematical modelling, econometrics and concepts such as equilibrium and optimization; and a recognition that ordinary logical thought might require weighing different types of evidence drawn from a variety of locations and methods.

Finally, there are many overlaps between the Post Keynesian approach to economics, especially its methodological positions and recommendations, and ecological economics. This commonality is much more than a shared opposition to neoclassical environmental economics. To be sure, that opposition is shared; but the dialogue beginning between Post Keynesian economics and ecological economics will likely lead to an array of positive developments (Holt, 2005). Furthermore, the ground is shared without making either approach redundant. Ecological economists

have already drawn on Post Keynesian influences, for instance on natural capital and on uncertainty; conversely, Post Keynesians can learn much from the practical and theoretical developments in ecological economics, for instance on multi-criteria analysis.

NOTES

1. Dow (2005) prefers the term 'structured pluralism' to Babylonianism. The former conveys the pluralism she advocates, but eschews eclecticism. Dow feels that Babylonianism has become associated with eclecticism (despite her many statements to the contrary). Since Babylonianism is better known, it shall be retained here.
2. This distinction is rather blunt but common (Harris, 2002). It is beyond the scope of the chapter to explore either environmental or ecological economics in detail, or the distinction between them. Generally, environmental economics tends to be neoclassical, while ecological economics does not.
3. Many realists argue for a moral realism; that is, a morality existing independent of us, in the same way that objects might (Mearman, 2009).
4. Spash and Clayton (1997) note that there are many definitions of natural capital and that none of the available definitions is particularly effective.
5. Martinez-Allier et al. (1998) argue that there is only weak comparability between objects considered in ecological analysis. This case applies also to natural and non-natural capital. Holland (1997) argues that the distinction between natural and man-made capitals is complicated, even unsustainable. For example, cultivated nature is partly natural, partly man-made. Holland argues further that the distinction between weak and strong sustainability is flawed.
6. It could be said that such scenarios are characterized by ignorance; that is, not knowing the possible outcomes of processes. Under uncertainty, the possible outcomes could be known, even if no probability could be attached to them. See Stirling (1997) and Faber et al. (1996, Chapter 11) for further discussion.
7. There are limits to this argument. Some effects may be easy to identify and predict (such as pouring excess chemicals into a river); however, Babylonianism urges caution about making strong causal claims.
8. It should be noted that the decision to reject axiomatic thought has been controversial among Post Keynesians. Davidson (2003–04) has argued that Post Keynesians must adopt an axiomatic framework to compete with mainstream approaches. However, Dow (2005) argues against this, and suggests that Davidson's use of the word 'axiom' should not be taken in the same way as is it used in mainstream approaches. Specifically, Post Keynesian axioms should be empirically grounded and not lead to long chains of logic reasoning.
9. A similar procedure occurs under multi-criteria mapping (Stirling, 1997; Stirling and Mayer, 2001). Multi-criteria mapping is seen as eschewing any analytical fix, such as those allegedly attempted by cost–benefit analysis. This claim deserves further investigation, since multi-criteria mapping retains concepts such as utility maximization (across criteria) (Stirling, 1997, p. 200) and 'linear additive weighting' (Stirling and Mayer, 2001, p. 535), which retain a quantitative bias.

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