

Economic schools of thought on the environment: investigating unity and division

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How do ecological and heterodox economists differ, if at all, from each other and from neoclassical economists addressing environmental problems? In 2009 we probed this question by conducting an international survey across these communities, namely at conferences of the European Society for Ecological Economics, the Association for Heterodox Economics, and the European Association of Environmental and Resource Economists. The research was designed to gain insight into the extent to which ecological economics can be described as heterodox and a distinct field from orthodox environmental and resource economics. Conflicting visions of ecological economics have led to a prevalence of neoclassical articles and thought mixed in amongst more heterodox work. We introduce a novel classification of work in the field of environmental policy in order to test for the existence of differences in terms of methodological and ideological approaches. How heterodox economists understand environmental issues is also an important question to answer if there is to be more collaboration between them and ecological economists. The findings have implications for cooperation and the future direction of both ecological and heterodox economics.

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1. Introduction

The form and conduct of human interaction with the natural environment has become a major political and economic issue in recent times. Over some 50 years, the subfields of resource and environmental economics have developed within a neoclassical frame to address the continuing and growing problems. The increasingly recognised inadequacies of these orthodox approaches led to the emergence of ecological economics, in the late 1980s, as a new research field that seemed to be headed in the direction

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of an environmental political economy (Spash, 1995). Simply noting the drive for a significant change from mainstream thinking, recognised as necessary to get environmental action, might lead to the conclusion that ecological economics must be heterodox. However, the ecological economics movement has also involved the combination of natural sciences with economics and as a result a less clear rejection of mainstream methodology and ideology. Indeed, within ecological economics the socio-economists have often been in conflict with those, non-economists (e.g. some key ecologists), who decided to ally themselves with neoclassical environmental and resource economists (Røpke, 2005; Spash, 2011).

So, the extent to which ecological economics is actually substantively different from the mainstream remains unclear for many, especially those outside the movement. Certainly, the journal *Ecological Economics* has published numerous neoclassical environmental and resource economics articles and often neglected a more radical political economy approach. Entire issues have appeared that fit comfortably within the orthodox frame (e.g. adopting mathematical models of optimising behaviour, assuming microeconomic axioms, regarding humans as self-interested utility maximisers, pricing externalities and conducting trade-offs). Also common has been the uncritical use of cost-benefit analysis, along with benefit transfer and more simplistic calculations for claiming a money value can be attached to ecosystems characterised as goods and services. Nature has been described as capital that can be traded-off for other types of capital (e.g. human, social, man-made). Mainstream regulatory tools, such as tradable permits, also seem to be uncritically accepted by some ecological economists (e.g. Daly and Farley, 2004) as if no fundamental change in economic systems was necessary. Yet, the whole idea of establishing ecological economics in the first place was due to substantive discontent with the mainstream and the failure of environmental economics to achieve its promise of a revolution in economic thought, at one time expected to be equivalent to that of Keynesian macroeconomics (see the Introduction to Bohm and Kneese, 1971). That forgotten promise was a challenge to and change in, not accord with, dominant neoliberal market structures. At a time when supposed ecological economists can be found putting their names to pricing and trading biodiversity, ecosystems and greenhouse gases, whether ecological economics has anything interesting to say, outside the orthodoxy of another version of a pseudo Green capitalism, is then a reasonable question.

In this paper we probe the extent of differences between ecological and neoclassical economists, and whether the former contains a serious heterodox core group. The approach employed attempts to characterise methodological and ideological positions within ecological economics, and hypothesises that clear divisions should arise if there are distinctions to be drawn. We then empirically test for such divisions using a survey instrument specifically designed for the purpose.

Mearman (2011) has claimed that there is little structure to heterodox economics beyond that provided by pre-existing (or constituent) schools of thought and little agreement on core concepts or principles. He has attempted to support this conjecture with a survey of heterodox economists, but his samples are too small for strong inferences and several of his statistics lack significance. In addition, the category he refers to as ecological economics actually appears to be little more than mathematical modelling of natural systems. As will be explained in the next section, there are distinct differences in approaches to the environment and economics even within ecological economics. These differences need to be understood in order to identify the heterodox from the orthodox.

We start Section 2 with a brief historical overview that sketches the rise of ecological economics for those unfamiliar with the movement (for more on the history of and divisions within ecological economics see Martinez-Alier, 1990; Spash, 1999, 2011; Røpke, 2004, 2005). This leads into a description of some key expected differences between ecological economists, and orthodox and heterodox approaches. The section brings these ideas together with a novel characterisation of ecological economics as a movement in three potential camps. In Section 3 the survey method is described and in Section 4 the results reported from three European conferences organised by ecological, heterodox, and resource and environmental economists, respectively. The sample is narrowed down to contrast heterodox with neoclassical (orthodox) groupings via respondent self-classification, thus avoiding the taxonomic problems encountered by Mearman (2011). In Section 5, the discussion and conclusions suggest some implications for knowledge integration to improve cooperation in developing an interdisciplinary political economy approach to the environment.

2. Economic thought on the environment

Unlike other areas of economic thought, ecological economics has a strong natural science element. This has impacted on how the movement has engaged with economic ideas and adds an additional dimension beyond the purely socio-economic. We start by explaining the role and influence of this aspect before turning to the relationship with orthodox and heterodox schools. We then critically discuss the engagement of different schools with environmental topics and issues. This background on the mix of approaches to the environment and economics is brought together in Section 2.3 under a new classification framework.

2.1 Historical overview

Economics has generally been a slow and reluctant field in seriously addressing environmental problems within the core of its disciplinary teachings. Despite basic concerns relating to human interactions with the environment having been reflected in the classical and neoclassical thought of the 1800s, the general approach and development of economics in the 1900s sidelined resource constraints, environmental degradation and, what might be termed, general limits to ever increasing material and energy throughput. An economics literature from the early 1900s can be identified as developing concerns about conservation issues related to agriculture (e.g. soil erosion) and a theoretical approach to non-renewable resource use (i.e. optimal depletion), which is still fundamental to neoclassical resource economics (Spash, 1999). However, such topics had already moved from being the concern of central figures in economic thought to specialists in agriculture and resource economics.

The resource economists of the 1950s regarded the environment as a source of materials that required some specialised management and conservation due to characteristics that differentiated them from manufactured goods (e.g. Ciriacy-Wantrup, 1952). In the 1960s and 1970s, environmental economics appeared in the USA as a distinct subdiscipline concerned with the growing pollution problems that were becoming evident to the general public, even if previously ignored by the academic community (Kneese and Bower, 1968; Bohm and Kneese, 1971). The recommended economic approach employed cost-benefit analysis to calculate optimal pollution control and so

led to the development of a range of methods in monetary valuation (e.g. travel cost, hedonic pricing, contingent valuation; see Hanley and Spash, 1993).

The problem with traditional environmental economics was how it became nothing more than an extension of mainstream thought without having any impact on mainstream thinking. Within a decade, the promise of 'revolution' receded into preoccupation with method (i.e. mathematical formalism) over substance, and conformity to mainstream doctrines. The rise of popular political and environmental discontent in the 1960s and 1970s had failed to impact on the core conduct of economics. At the same time, non-economists were openly associating environmental problems with capital-accumulating socio-economic systems.

Natural scientists played a key part in the growing recognition of problems relating to interactions between the natural environment and human economy. The idea that pollutants became inert if diluted or spread widely was fundamentally revised by the realisation that ecological systems connected diverse elements of the environment through material, chemical and energy flows. Dispersal of sulphur and nitrous oxides via large chimneys, in an attempt to avoid local health impacts, created acidic deposition, an international environmental and political problem with widespread damages (Yanarella and Ihara, 1985). Bioaccumulation of chemicals in the food chain brought home the fragile pinnacle upon which humanity stands (Carson, 1987 [1962]). The susceptibility to human intervention of supposedly stable self-equilibrating systems led to alternative ecological approaches. Change and uncertainty became part of ecological understanding and its models, rather than being treated as exogenous shocks to be externalised or neutralised (Holling, 1986).

Ecological economics then appeared as an emergent property of disparate and chaotic elements in a socio-economic and politic stew, seasoned by learning from the growing scientific awareness of human–environment interactions and given a good stir by academic reflection. Yet, any pretence of a consensus on action or direction would be highly misleading. Ecological economics combined some disparate elements of discord and gave them voice. Two strong but conflicting positions then soon appeared dominant (Spash, 1999).

Ecologists of a practical or 'pragmatic' political philosophy sought to link ecology with economics. For them the type of economics was irrelevant and indeed many seemed blissfully unaware of any distinction between economic schools of thought. From this perspective, environmental problems can be understood by studying natural sciences alone, but the information gained needs socio-economics as a means for communicating the findings to politicians. As explained by Spash (1999), this 'ecology and economics' approach sought political advancement of core messages via key natural science journals and collaboration with establishment figures. This led to a linking of models rather than a fundamental challenge to them. The methodology was inherently multidisciplinary, despite the rhetoric of interdisciplinary or transdisciplinary thinking. Under this approach, ecologists were no more expected to question the economics than economists were expected to question the ecology.

In contrast, ecological economics also attracted a combination of older academics disenchanted with the failure of environmental economics, younger socio-economists seeking new ideas and more radical social scientists. In general, this group appears to have been looking for interdisciplinary interactions with open-minded natural scientists and others. This socially oriented ecological economics grouping wanted new theory within economics, not just some political realisation that the environment was

as important as other economic topic areas. The point was that understanding economic systems requires understanding the natural environment within which it is embedded, and that this fundamentally changes the way in which economics should be conducted both in theory and practice. This group formed a practical desire for policy to change the institutional arrangements whereby daily life is conducted; the aim being to address power relationships and social inequity because they are integrally related to environmental degradation. The group might be thought of as a revolutionary and radical branch, while the aforementioned advocates of an ecology and economics approach represent an appeasing and conservative branch.

These two positions appear distinct and important for understanding ecological economics as a social and scientific movement (Spash, 1999). However, there is always the danger of oversimplification where dichotomies are concerned, because they can conceal as much as they reveal. The complex interactions of natural scientists (e.g. ecologists, conservation biologists, physicists), social scientists (e.g. economists, political scientists, sociologists) and others (e.g. engineers, foresters) seems likely to have produced much variety. An important part of that variety is the mix of different types of economists and their worldviews. The contention of this paper is that the importance of such key groupings can be explained in terms of ideology and methodology as well as explored empirically. Clearly, the socially oriented ecological economists, as described, would appear aligned with heterodox economists in a fundamental critique of mainstream economics and its view of economic systems, as has been argued elsewhere (Spash, 2011). Yet, keeping in mind Mearman's (2011) critique, there is then some question on what grounds this correspondence might be drawn.

2.2 Heterodox versus orthodox economics and the environment

Heterodox economics serves as an umbrella term to cover the coming together of sometimes long-standing, separate projects or traditions. This includes the post-Keynesians, critical institutionalists, feminists, Marxists, Austrians and social economists (Lawson, 2006). Lee (2009, p. 6) has defined heterodoxy as blasphemous economists whose ideas are a rejection of and challenge to the orthodoxy. They are non-brethren and their persecution is a legitimate act in defence of the orthodoxy. They are distinguished from heretical economists, who are tolerated because they use many of the same tools and models as the orthodox, and as a result their ideas have led to theoretical advances in the orthodoxy. Such heretical economists may be lauded as part of the establishment (e.g. Nobel Prize winners). They are not blasphemers because they still believe in the fundamental core ideas of the orthodoxy, they protect and defend that core, and hold back from pursuing the logic of their ideas to revolutionary ends.

The rise of modern ecological economics from a discontent with mainstream economics, and in particular microeconomics, should separate it from neoclassical environmental and resource economics. This would make ecological economics equivalent to Lee's blasphemers. At the same time there are influential figures writing about ecological economics who understand little and care less about such (orthodox versus heterodox) divisions, and basically regard any economics that highlights environmental problems as a good thing (e.g. Ehrlich, 2008). In so far as such individuals are non-economists, they might be regarded as falling outside the heterodox/orthodox classification and so creating a novel aspect in ecological economics. Then there are those who, like Lee's heretics, question the neoclassical resource and environmental

economics approach, but are reluctant to leave the comfort of the theoretical structure, social identity and secure career path that it provides them. They may also be fundamentally committed to market capitalism. These three different groupings can be further distinguished by ideological and methodological positions with respect to the environment.

Neoclassical theorists have given resource and environmental economics a technocentric optimism and ideological faith in market pricing that avoids requirements for fundamental changes in human behaviour. The approach can be summarised as follows. If the economy is constrained by a lack of resources, then technology must provide the solution via exploiting new substitutes and accessing new deposits. Scarcity will appear in higher prices, which are expected to stimulate resource conservation and new technologies. Resource use includes the assimilative capacity of the environment to absorb human wastes and pollutants. If the environment is excessively polluted, then the belief is that technology can be developed that will clean it up. However, this is only really called for once society is rich enough to afford such a luxury as a clean and unpolluted environment. Development, then, requires exploitation of resources and environmental degradation in order to achieve technological advancement and capital accumulation to get back the environmental quality lost in the process of development. Humans themselves struggle with one another to meet their needs, wants and desires. This justifies the emphasis on growth of resource and energy throughput as a necessity to meet human demands. Environmental concerns are then portrayed as a modern phenomenon and/or rich country preoccupation; the environment seen as a luxury good. Environmental problems are at best secondary issues relative to growth, wealth creation, capital accumulation and employment.

Despite being a pure fallacy—ignoring history and human dependence on nature (Martinez-Alier, 2002)—this characterisation, or establishment discourse, enables some common elements to be maintained across those schools of economic thought that relegate environmental issues to the sidelines. Such elements include believing that growth is an unquestioned end, economics should be preoccupied with how to achieve growth, consumption is good and increasing it raises well-being. A series of implicit environmental assumptions underlying this approach go unquestioned. Instead, economic discourse concentrates upon how to achieve and maintain growth and full employment, avoid destabilising business cycles, encourage productivity and innovation, and generally conduct human affairs as divorced from physical reality and context. Ownership of the means of production, wealth and income distribution, property rights and, more generally, institutional arrangements can all be debated without basically questioning the interaction of the economy with the environment.

Both orthodox and heterodox economists are then observed to have ignored the fundamental role of the environment in economic affairs. The orthodox position is clear. Resource and environmental economics became the subdisciplinary field to assuage those economic heretics with a concern for the environment. Meanwhile, mainstream micro- and macroeconomics developed theories assumed to operate independently of either the natural resource base or the assimilative capacity of the environment, and so completely marginalised environmental concerns. The heterodox position is more complicated by the different schools of which it is constituted, but generally addressing the environment has been at best a minority pursuit or totally ignored until quite recent times. However, that there is some variety in the extent to which attention has

been paid to the environment is worth outlining. This is illustrated next with respect to neo-Marxists, critical institutionalists and post-Keynesians.¹

Perhaps the most serious attention amongst these three schools has been within the ecosocialist literature, although this appears to be based more in sociology and political science than in economics. A range of contributors have been active in discussing the relationship between Marxism/socialism and the political economy of nature, such as political scientist Ulrich Brand in Austria, sociologist Ted Benton in the UK, and in the USA sociologists James O'Connor and John Bellamy Foster and economist Paul Burkett.² The journal *Capitalism, Nature, Socialism* is dedicated to covering research in the area of Red–Green thought and radical social ecology. On the left anarchist end of the spectrum there is the work of Murray Bookchin (1921–2006), who published a book (under the pseudonym Lewis Herber) on pollution and toxic chemicals (Herber, 1962), the same year as Rachel Carson.

Indeed, there is a body of work across Marxist, socialist and anarchist writers addressing environmental issues that might feed into an ecological economic understanding. The incorporation of entropy via the concept of social metabolism has links back to social idealism amongst the ecological utopians of the early 1900s (Martinez-Alier, 1990). Some attempts have also been made to combine more of an ecosocialist perspective with ecological economics. For example, the edited book by Martin O'Connor (1994), later secretary of the European Society for Ecological Economics (ESEE), brought together a variety of researchers in a political ecology approach.

While this shows a range of left-wing writers have paid attention to economy–environment interactions, the core of Marxism and socialism still appears distant from, if not hostile to, environmental concerns and their socio-economic importance. Red–Green political alliances have declined in popularity since the late 1980s, perhaps due to the rise of ecological modernisation, Green capitalist and neoliberal environmental policies. In addition, a fundamental tension between socialists and Greens concerns the relative importance given to value in humans as opposed to value in Nature and so the priority of social versus ecological objectives. Benton (1989, p. 52) notes the oppositional positions taken by some left-wing responses to environmentalism and also the characterisation given to socialism by some environmentalists. Typical of the latter is the claim by Georgescu-Roegen (1975) that mainstream and Marxist economists alike have held to a thesis that the power of technology is without limits, and Daly's (1992, p. 196) criticism of Marx for being committed to economic growth without limit. Burkett (2005), for one, has challenged such criticisms and made the case for a more informed ecosocialist debate. Synthesising neo-Marxism and ecological economics can be seen as following up with theory the call for a Red–Green alliance (Burkett, 2006; Altvater, 2007). This suggests the need for attention to the underlying ecosocialist value theory and Douai (2009) provides a contribution in that direction.

¹ The feminist economics literature also seems important and in particular its ecofeminist branch. This literature is not explicitly discussed, but we note this is deserving of attention. Several writers from this perspective have also been feeding into the ecosocialist debate, e.g. British social scientist Mary Mellor, American philosopher Carolyn Merchant, Australian sociologist Ariel Salleh and German sociologist Maria Mies.

² Altvater (2007) mentions David Harvey, Enrique Leff, Michael Perelman, Richard England and Sergei Podolinsky, but also notes an active debate on Marxism and ecology in Latin America and Europe. Other ecosocialist writers are American psychologist Joel Kovel, British geographer David Pepper, Australian political economist Stuart Rosewarne, French engineer and political activist Alain Lipietz, British philosopher John O'Neill, and French economist Bertrand Zuindeau.

There certainly seems more to unite than divide those concerned about the impacts—both societal and environmental—from the current economic system.

Institutional economics in its critical form (as opposed to neoclassical new institutionalism) has also paid some attention to environmental concerns (e.g. Galbraith, 1969 [1958]). There is a line of reasoning in institutional economics going back to Veblen (1898), which links economics to an evolutionary biological approach, and there is Veblen's (1991 [1899]) work on conspicuous consumption, which links well with ecological concerns over the consumer society. Kapp (e.g. 1950, 1970, 1978) is foremost amongst those in the last century working with a critical institutional economic approach who developed a serious concern for the environment. Following in this line, and referencing the work of Myrdal, has been Söderbaum (e.g. 1992, 2000), who has also been actively engaged with ecological economics. Then, more recently, there has been Vatn, a past President of the ESEE, who has amongst his publications a substantive volume on institutional economics and the environment (Vatn, 2005).

In contrast to these two heterodox schools, the post-Keynesians have almost totally ignored environmental problems, as well as resource and energy constraints, in the tradition of maintaining capital accumulation and full employment. A search of the *Journal of Post Keynesian Economics* on the Web of Knowledge database reveals 1420 articles (as of July 2011), of which there is just one on an environmental or natural resource topic—published in 2003 relating to oligopoly in the oil industry. In recent years there has been an overdue appeal for this to change, which has pointed to the potential for post-Keynesians to contribute through their emphasis on systems, uncertainty, realism and pluralism (Mearman, 2007). Ecological economics is particularly weak on macroeconomic issues and, if anything, has tended to use economic equilibrium theories and concepts of capital, which are inconsistent with some of its basic premises about systems functioning derived from ecology (e.g. Holling, 1986). A more heterodox macroeconomic approach, sharing basic methodological concerns, would therefore be a significant step forward, and there has been some attempt to start a dialogue between post-Keynesians and ecological economists (Holt *et al.*, 2009). However, the role and meaning of macroeconomic growth is a core area where disagreement seems most likely (Spash and Schandl, 2009). Although emphasising distributional concerns, post-Keynesian, like mainstream, economics assumes growth is good and more is better. Indeed, as noted, the general thrust of post-Keynesian literature remains untouched by collaborative developments and appeals for addressing the environment.

Despite the environmentally informed works and authors cited above, economists of all schools appear able, if they choose, to ignore the evidence of environmental problems and limits to growth as having anything to do with the core of their economic approaches, theories and models. This has been described as due to the treatment of environmental issues as special cases of more general theoretical constructs in mainstream economics (Spash, 2011). The establishment discourse (e.g. price theory, resource allocation, efficiency) then dominates the economic debate. Indeed, heterodox economists have been noted to cite orthodox work more than heterodox (Dolfsma and Leydesdorff, 2008). In the USA, heterodox economics has been identified with a concentration of research activity in five areas: microeconomic theory, macroeconomic theory, labour, history of thought and industrial organisation; while nine of the top 10 heterodox departments publish nothing related to the environment (Lee *et al.*, 2010, 1366–7). As within the economic mainstream, the environment seems to be treated as an optional extra, or specialism, rather than of fundamental importance to understanding economic systems and their operation.

Why then should ecological economists have any particular allegiance with heterodox as opposed to orthodox economics? One answer to this lies in identifying common ontological presuppositions (Lawson, 2006). For example, in a comparison with post-Keynesian economics the state of the world is seen in common as involving strong uncertainty, social indeterminacy, emergent properties and historical dynamic process (Spash and Schandl, 2009). In contrast, the mainstream can be seen as treating individuals as passive agents in a static closed system with an ontology of isolated atomism. This justifies the formulation of social reality as one typified by regularities, so allowing the methodology of deductive reasoning and mathematical formalism. In contrast, ecological economics, like other heterodox traditions, accepts the transformative power of human agency with emergent properties arising from a dynamic interconnected process of multilayered social interactions.

Mainstream economics is, then, identified as having watered down or changed interdisciplinary research and heterodox concepts in order to make the results fit within and conform to its own approach (Lee, 2009). This can be viewed as a form of mainstream economic imperialism—as exemplified for economic psychology by Earl (2005). Modern heterodoxy is then distinguished from the mainstream by allowing theory and method to be informed by insights into social reality. As Lawson states:

The fact that heterodox economists resist the mainstream reformulation of their concepts of uncertainty, evolutionary developments, care, institutions and history, etc., reveals that heterodoxy is not so much committed to the latter categories per se, as that it insists on their possessing the ontological properties of openness, processuality and internal-relationality, etc. (Lawson, 2006, p. 497)

In order to distinguish the heterodox from mainstream, we might therefore look to the understanding and importance given to key concepts. This point is picked up in the design of the empirical work reported in Sections 3 and 4.

2.3 Ecological economics as a movement in three camps

Bringing the elements of the discussion so far into a more coherent frame, then, requires conceptualising the role of the orthodox and heterodox along with the mix of natural and social sciences that constitute ecological economics. Building on Spash (2011), we identify three potential approaches within the ecological economics movement.

First, there is a historical root within ecological economics going back to neoclassical theory (Spash, 1999). There are agricultural, environmental and resource economists all trained in the neoclassical tradition who have chosen to associate themselves with various forms of ecological economics (at least in name) while maintaining a strictly orthodox outlook. For example, Carl Göran Mäler, an environmental economist, and Partha Dasgupta, a resource economist, were both part of the rebranding of the Beijer Institute as a research centre in ecological economics. Along with other neoclassically minded economists, such as Charles Perrings, they pursue a mainstream mathematical formalism, optimisation and modelling approach. Their focus is on merging old resource economics and optimal exploitation with discussions of sustainability, resilience and environmental policy, while mostly avoiding direct valuation work and critiques of the current political economy. This branch forms what we term ‘the new resource economists’ (NRE).

Second, ecological economics has an identifiable grouping of natural scientists whose primary motivation appears as aiming to achieve policy ends via their interaction with the social sciences and, principally, economics. At the same time social scientists may

aim to do likewise via their association with natural scientists. This group may range from activists to academics. As political goal-orientated individuals, they are pragmatists in that they are primarily concerned with judging the success of methods by their outcome. In order to avoid confusion with the American school of philosophy called pragmatism, they are termed ‘the new environmental pragmatists’ (NEP).

Third, there are those seeking a heterodox approach to economics who reject the fundamental theory of neoclassical economics. They see the explanations offered by externalities and optimisation of behaviour as part of the problem, not the solution. Unlike the pragmatists, they are concerned about rigour of explanation and not merely achieving policy-oriented goals regardless of by which means. For example, rejection of monism leads to value pluralism and so means concepts such as ‘total economic value’ are rejected regardless of their political acceptability. This group aims to revolutionise economics in order to both correct the way in which the environment is addressed and also address a range of other associated societal problems (e.g. poverty, inequity, discrimination, sexism, myopia, hedonism, materialism). Taking a political economy approach, the economic system is regarded as totally infused with power relationships and embedded within social structures. Social and environmental problems are, then, regarded as inseparable policy issues. This group is referred to as ‘the social ecological economists’ (SEE).

There is some potential for these positions to be held in a variety of combinations. Thus, some SEE might adopt aspects of pragmatism or vice versa. Indeed, Richard Howarth, Editor of *Ecological Economics*, has argued in favour of a position he calls the ‘big tent’, where we could imagine all three positions would combine (Howarth, 2008). Although there seem likely to be problematic aspects to combining such diverse ideological and methodological positions, some might regard this as a form of methodological pluralism (e.g. Norgaard, 1989). A series of questions then arise: whether anyone actually populates these hypothesised positions, if so how significant they are, whether the groups conform to specific characteristics, whether they differ as outlined, whether they are combined at all? These are issues probed in the empirical study.

3. Method

A key aspect of the preceding discussion concerns the differences and similarities between orthodox and heterodox economists in the way they perceive and address environmental problems, and the influence of these positions within ecological economics. The hypothesis we put forward is that, despite differences in other areas, the underlying approach to the environment of the mainstream—a naive conception based on the independence of the economy from the environment, never-ending growth and technological fixes—is also one found amongst many heterodox economists. Ecological economics is, then, potentially a distinct breakaway from this tradition, which might link with other more radical heterodox approaches.

In order to address the existence of such differences, we administered a structured survey at three conferences chosen to obtain samples of ecological economists, heterodox economists, and orthodox resource and environmental economists:

- (i) ESEE, ‘Transformation, Innovation and Adaptation for Sustainability: Integrating Natural and Social Sciences’, Eighth International Conference, Ljubljana, Slovenia, 29 June–2 July 2009.

- (ii) Association for Heterodox Economics (AHE), 'Heterodox Economics and Sustainable Development, 20 Years On', 11th Conference, London, UK, 9–12 July 2009.
- (iii) European Association of Environmental and Resource Economists (EAERE), 17th Annual Conference, Amsterdam, the Netherlands, 24–27 June 2009.

The survey was designed for self-completion by the respondents and involved five main parts. The first was designed to classify respondents by their heterodoxy and ecological economics research grouping based on the three categories introduced in Section 2, namely NRE, NPE and SEE. The second probed for knowledge of and agreement with 10 key concepts in ecological economics in order to assess core theoretical understandings and approaches. As suggested at the end of Section 2.2, this approach should aid distinguishing orthodox from heterodox positions. Part three, which is not reported in this paper, involved respondent reaction to a set of summarised journal articles in the field. Part four administered three environmental belief scales and part five concluded the survey by requesting socio-demographic data.

Indication of heterodoxy was asked by a direct question but also via a request for the three journals most often read by the respondents. A key design feature in part one of the survey was the classification of the three ecological economics camps or groupings using expected ideological and methodological differences. Respondents were asked their closest affiliation with three summary statements of the main positions characterising each group. They were informed that 'Environmental research and policy is a broad field of inquiry that encompasses a number of different theoretical approaches'. They were then presented with the three statements that were described as characterising 'three broad schools of thought on how environmental issues should be addressed'. The three camps were summarised as follows:

- (A) *New Resource Economics*: We should base our efforts upon the basic tenets of accepted economic theory, such as the axioms of consumer choice and model of the individual as a rational agent. The *most important* role for research is to inform policy makers as to the efficient use of scarce resources.
- (B) *New Environmental Pragmatism*: The natural sciences provide objective information that should be the primary basis for informing policy, but we face a communication problem. The *most important* role for research is to be pragmatic and employ whatever approaches are effective to inform the policy community about environmental problems and their solution.
- (C) *Social Ecological Economics*: Environmental problems are complex, can be viewed from multiple perspectives and involve values that are often incompatible. The *most important* role for research is to understand different disciplinary perspectives and develop institutional approaches and social processes to address the interface between economics, science and policy.

These positions were presented without the titles. In addition, respondents were informed that 'some or all of these approaches can overlap'. A Venn diagram was presented that showed the three distinct approaches as well as the potential overlap. The participants were instructed to 'use the Venn Diagram to indicate which BEST describes the approach or mix corresponding to YOUR research approach'. They could then indicate that they assessed their research approach to be reflected by any one of

the three statements or they could indicate that their research approach reflected any combination of the statements. Thus, a respondent could choose any pairing, all three positions or any one position. This allowed them to describe their research philosophy in seven distinct ways (i.e. NRE, NEP, SEE or a combination of these approaches).

In part two of the survey respondents were asked to rate the importance of 10 key concepts for addressing environmental problems on a seven-point scale. The ideas selected were: (1) steady-state economy; (2) cost-benefit analysis; (3) ecological footprint; (4) incommensurability; (5) post-normal science; (6) green accounting (e.g. the index of sustainable economic welfare); (7) ecosystems as goods and services; (8) social multicriteria analysis; (9) small group deliberation; and (10) non-utilitarian ethics. The concepts were drawn from Spash (2009). The participants were asked to rate each concept on a seven-point Likert scale, where 1 = 'not at all important', 4 = 'moderately important' and 7 = 'extremely important'. As not all the participants were expected to have heard of all the concepts, they were also provided with the option of a 'don't know' response.

Part four of the survey was set up to explore environmental beliefs. Three scales were based upon the findings of Milfont and Duckitt (2004), who used an exploratory analysis to simultaneously assess several previously published environmental belief scales. An additional item was added to the ecocentrism scale, which otherwise contained only a single item. The three environmental belief scales were:

- (1) *Technological optimism scale (5 items)*: A high score on this scale indicates that the respondent believes science and technology can solve environmental issues.
- (2) *Ecocentrism scale (2 items)*: A high score on this scale indicates that the respondent believes humans should stop developing the natural environment and wilderness locations.
- (3) *Anthropocentric scale (5 items)*: A high score on this scale indicated that the respondent believes that nature should be actively used to increase the welfare of human communities.

Respondents used a five-point Likert scale to rate the items, where 1 = 'strongly disagree', 3 = 'undecided' and 5 = 'strongly agree'. For a full list of the items used for each of the three scales see Appendix 1.

4. Results

Attendance figures are approximations given by the conference organisers at the time. The ESEE and EAERE conferences were much larger than the AHE conference. Over half the full participants attending the AHE conference completed the survey ($N = 44$); the organisers estimated that 80 delegates attended all three days while others attended only part-time (approximately 20).³ Attendance at the ESEE conference was estimated

³ Mearman (2011, p. 489) estimates the AHE membership at 250 in 2008, but notes considerable variability, giving figures of 168 in 2006 and 258 in 2007.

⁴ Personal communication (28 July 2011) from the International Society for Ecological Economics (ISEE) secretariat gave the membership for the ESEE as 548 people in 2009 and a year later 496. David Stern, an Associate Editor of the journal *Ecological Economics*, states on his personal website (9 July 2011) that current membership is 3049 ISEE members with ESEE the largest block at over 700, but he gives no source for his data (<http://stochastictrend.blogspot.com/2011/07/membership-of-international-society-for.html>).

Table 1. *Orthodox versus heterodox economists*

	Conference		
	ESEE (%)	AHE (%)	EAERE (%)
Heterodox economists	42	80	24
Neoclassical economists	2	0	53
Other economists	23	18	20
Non-economists	33	2	2
Total %	100	100	99
<i>N</i>	95	44	45

Note: May not add to 100% due to rounding errors.

at about 200 delegates, which means about half ($N = 95$) completed the survey.⁴ Only about 10% of attendees at the EAERE conference, which was the most well attended of the three, completed the survey ($N = 45$).⁵ The reason for this low participation rate was that, unlike the other two conferences, the organisers refused to allow the survey to be advertised, handed out or distributed, and refused to announce or let researchers announce the survey at any conference sessions or plenary talks. This was despite prior permission having been sought and given to allow the survey to be administered at the conference. The low response rate for the EAERE conference and the restriction on administration of the survey clearly mean being cautious over extrapolating the results to the general population of environmental and resource economists. They do not mitigate investigation of the between-group differences of primary concern here.

The first survey question asked respondents to nominate their main research discipline. The self-definition of heterodox versus neoclassical was undertaken by respondents who reported their main field as economics. As some economists may disagree with being classified as either heterodox or neoclassical, a category of 'other' was also an option. This allows a division of the sample into non-economists and three categories of economists (heterodox, neoclassical and other). Results broken down by conference show no neoclassical economists attending the AHE conference and only a few at the ESEE. The EAERE conference sample shows that half consider themselves neoclassical but, perhaps surprisingly, a quarter define themselves as heterodox (Table 1). The ESEE sample is distinct from the other two in having a large proportion of non-economists, consistent with the history of the movement.

4.1 *The role of formal education*

Further insight into these divisions is gained from information gathered on the training of participants. All had university education and 95%–96% postgraduate degrees. Classification of degree training by heterodoxy and conference attended is shown in Table 2. The impact of combining economics with another subject is indicated by the total absence of any neoclassical economists with such training. This implies that

⁵ The EAERE gives its membership as over 1000. <http://www.eaere.org/overview.html> (date last accessed 26 July 2011).

Table 2. *Training and heterodoxy*

University training	Heterodox economist				Neoclassical economist				Other economists				Non-economists				Total				
	ESEE	AHE	EAERE		ESEE	AHE	EAERE		ESEE	AHE	EAERE		ESEE	AHE	EAERE		ESEE	AHE	EAERE		
Economics (straight)	N 11	17	2	-	-	-	17	9	1	2	2	2	2	-	-	22	18	21	-	-	
	% 28	50	18	-	-	-	74	41	12	22	22	22	6	-	-	23	42	48	-	-	
Economics (combined)	N 6	14	2	-	-	-	-	6	4	1	1	1	1	-	-	13	18	3	-	-	
	% 15	41	18	-	-	-	-	27	50	11	11	11	3	-	-	14	42	7	-	-	
Ecological economics	N 5	-	1	-	-	-	-	5	-	-	-	2	2	-	-	12	-	1	-	-	
	% 13	-	9	-	-	-	-	23	-	-	-	6	6	-	-	13	-	2	-	-	
Environmental economics	N 2	-	-	1	-	-	4	-	-	1	1	-	-	-	-	3	-	5	-	-	
	% 5	-	-	50	-	-	17	-	-	11	11	-	-	-	3	-	-	11	-	-	
Agricultural/resource economics	N 4	1	4	-	-	-	-	-	-	1	1	-	-	-	4	1	5	-	-	-	
	% 10	3	36	-	-	-	-	-	-	11	11	-	-	-	4	2	11	-	-	-	
Agricultural/forestry	N -	-	-	-	-	-	1	1	-	2	2	2	2	-	-	3	-	3	-	-	
	% -	-	-	-	-	-	4	4	-	22	22	6	6	-	-	3	-	7	-	-	
Environmental management/human geography	N 5	1	-	-	-	-	-	1	-	-	-	7	7	-	-	13	1	-	-	-	
	% 13	3	-	-	-	-	-	4	-	-	-	23	23	-	-	14	2	-	-	-	
Natural sciences	N 2	-	1	1	-	-	-	-	2	-	-	8	8	-	-	11	2	2	-	-	
	% 5	-	9	50	-	-	-	-	25	-	-	26	26	-	-	12	5	4	-	-	
Engineering	N 2	-	1	-	-	-	1	-	-	2	2	4	4	-	-	6	-	4	-	-	
	% 5	-	9	-	-	-	4	-	-	22	22	13	13	-	-	6	-	9	-	-	
Other	N 2	1	-	-	-	-	-	-	1	-	-	5	5	1	-	7	3	-	-	-	
	% 5	3	-	-	-	-	-	-	12	-	-	16	16	100	-	7	7	-	-	-	
Total N	39	34	11	2	23	8	9	22	8	9	9	31	31	1	1	94	43	44	-	-	
Total %	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Notes: Data missing for three respondents. At each conference, 95%–96% of respondents had postgraduate degrees. Total % may not add to 100 due to rounding errors. ‘Other’ includes: at ESEE, two sociologists, two planners, two mathematicians/statisticians, one business; at AHE, two political scientists, one business. ‘Natural sciences’ includes four ecologists at ESEE.

broadening an individual's perspective can play an important role in their breaking away from the narrow confines of neoclassical thought. At the same time, being exclusively educated in economics does not seem to prevent being heterodox. Surprisingly, specialised environmental economics training is a minority background for participants amongst the EAERE sample, while some of those with such education, attending the ESEE conference, regard themselves as heterodox. Contrary to expectations, none of those educated as resource or agricultural economists classify themselves as neoclassical, but rather prefer the designation of heterodox.

The data show that those without formal university degrees in economics may still regard themselves as economists. Ecological economics appears to attract a diverse range of such people, including those educated in environmental management, human geography, natural sciences and engineering. Others, trained as economists, classify themselves as non-economists and so appear to think of themselves as disassociated from the profession. Those with a straight ecological training form only a fraction of the non-economics group attending the ecological economics conference, even amongst the natural scientists (only four out of 11). However, responses to stating a primary research discipline revealed 17 ecologists amongst the 31 ESEE respondents in the non-economics group. So again there is divergence between training and personal disciplinary classification. In ecological economics, there is certainly the potential for skill transfer and self-redefinition over time. For example, the presence of those with engineering training may indicate adoption of the industrial ecology approach in ecological economics and/or the transference of mathematical skills to an NRE approach.

4.2 *Heterodox versus neoclassical*

Next we narrow down the comparison to focus upon contrasts and similarities between the heterodox groups of economists at the ESEE and AHE and the neoclassical group at the EAERE. The expectation was that the ESEE and AHE heterodox economists should be close in terms of methodological and ideological positions, and distinct from the EAERE neoclassicals. However, such differences were not expected across the full range of tests, due to the hypothesised divergence of both heterodox and orthodox economists from ecological economists on issues of growth and the environment.

Table 3 displays the demographics for the three subsamples and reveals several demographic similarities across the groups. All subsamples consist of a majority of males aged over 35 with a postgraduate education and coming from Western Europe. The AHE sample has a significant non-European minority, including Americans. The ESEE subsample has a quarter Eastern Europeans, with the conference being held in Slovenia, and an almost total absence of non-Europeans.

4.3 *Unifying journals and reading patterns*

One way in which academic research communities can be identified is through literature held in common. Respondents were asked to list the three journals they read most often. This allows a network analysis showing the connections between journals. Network diagrams take each participant and depict their choices as a triad of connected nodes. For example, if a participant indicated that they read *Environmental Values*, *Ecological Economics* and the *Cambridge Journal of Economics*, their triad diagram would be as represented in Figure 1A. If another participant is then added to the diagram who indicated they read *Science*, *Nature* and the *Cambridge Journal of Economics*,

Table 3. *Subsample demographics*

	ESEE heterodox (%)	AHE heterodox (%)	EAERE neoclassical (%)
Gender			
Male	73	79	61
Female	27	21	39
Postgraduate education	93	97	100
Age >35 years	63	77	61
Residence			
Western Europe	73	58	87
Eastern Europe	25	7	0
North America	0	16	9
South America	2	3	0
Asia	0	7	4
Australia/New Zealand	0	9	0
<i>N</i>	40	35	24

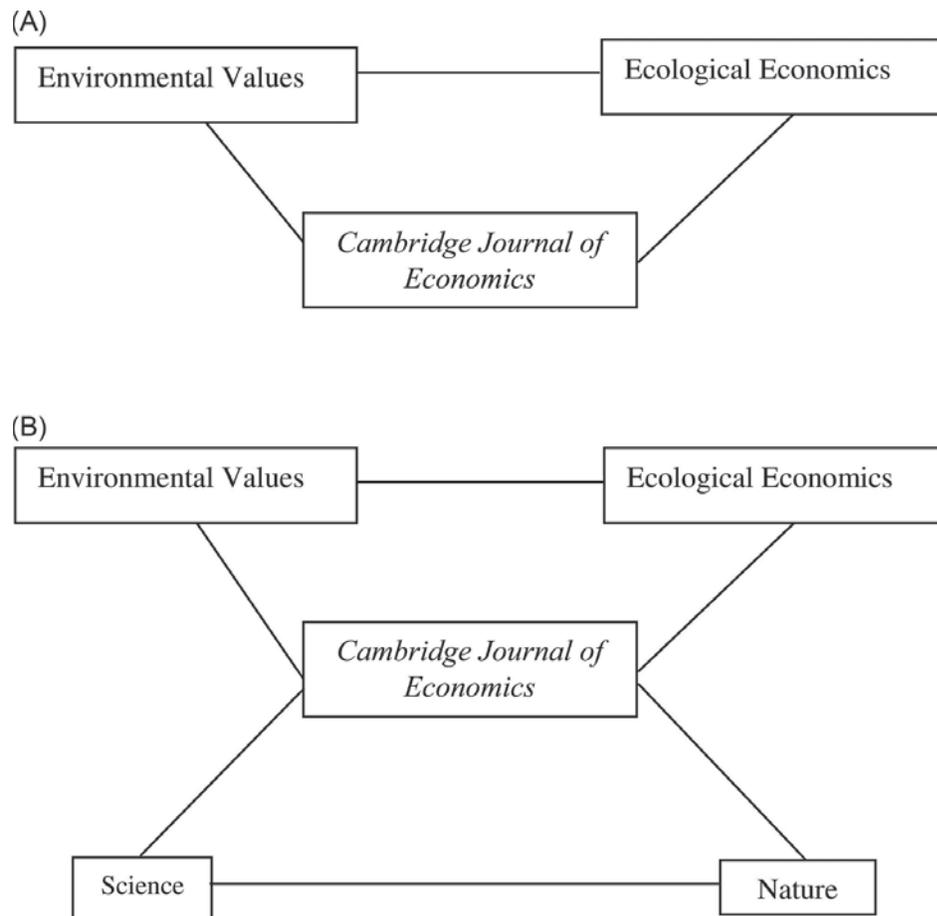


Fig. 1. (A) A journal network diagram for a single individual. (B) A journal network diagram for two individuals.

the new network diagram would be as represented in Figure 1B. The more people who read the same two journals, the thicker will be the font of the line shown in the following figures. The data relate to the samples and subsamples being referenced, and so caution is required in drawing conclusions about the community of which they are a part, but some strong associations appear representative.

An interesting aspect is, then, where there are key primary journals acting as hubs or nodes for communication. We define nodes as follows. If the journal was only mentioned once it was not classified as a node. A tertiary node was defined as a journal read by two or three respondents and a secondary node by four to seven respondents. A primary node was a journal read by eight or more participants (a minimum of approximately 20%–30% of the sample in each case). A total of 111 journals were named across the three samples; they are specified and number coded in Appendix 2.

Figure 2 gives the results for the ESEE heterodox subsample. Comparison with the data for the overall ESEE sample shows the dominant main journal connecting all others remains *Ecological Economics* (1), which was read by 85% of respondents. In comparison with the AHE and EAERE communities, the role of this one journal is far more dominant in bringing together otherwise separate interests and clearly forms a unifying hub journal for the ESEE heterodox group. In that group, the 40 respondents made reference to 59 different journals, including non-economic journals. Most respondents selected *Ecological Economics* (1) and then a unique pattern for the other two journals. This reveals both great diversity and distinct individual differentiation as to important source information. The secondary nodes, such as *Environmental Values* (18), *Energy Policy* (38) and *Ecology and Society* (10), are themselves interdisciplinary and so indicate a group interest in the integration of different disciplinary bodies of knowledge. In comparison with the total ESEE sample, these heterodox ecological economists give a reduced importance to the journals *Science* (9) and *Nature* (7), with the former moving from being a secondary node to no significance. Similarly, the *Journal of Industrial Ecology* (26), which is a secondary node for the total ESEE sample, is no longer significant in Figure 2. This implies neither the natural science nor industrial

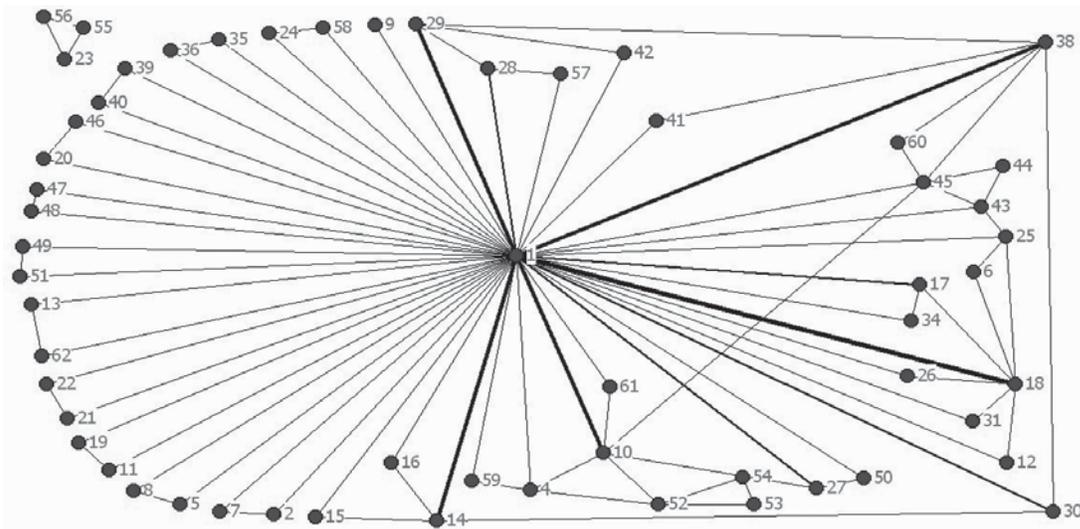


Fig. 2. ESEE heterodox journal network.

Note: Primary node: (1) *Ecological Economics*. See Appendix 2 for other journal codes.

ecology perspectives are strongly related to the umbrella of heterodoxy for ecological economists, at least as far as the ESEE attendees sampled here are concerned.

Heterodox AHE respondents are also a diverse group, with 33 respondents referencing 47 journals. However, there is also distinct identifiable clustering and an economic and political focus. As Figure 3 shows, the unifying factor is the *Cambridge Journal of Economics* (52), and without this journal the community would appear to fall back into some identifiable and separate areas of research interest. Lesser nodes occur around journals associated with post-Keynesian economics, Marxism and institutional economics. These heterodox schools have distinct journals of interest to them. The journal *Ecological Economics* (1) appears, but as a low-ranking tertiary node for this community.

Other researchers have reported similar results. Cronin (2010) found that the *Cambridge Journal of Economics* (52) is the most cited of 20 top heterodox journals and a key intermediary between heterodox journals. It was also shown to cluster with the *Journal of Post Keynesian Economics* (88). The results here are consistent with these findings. The journal *Ecological Economics* appeared in Cronin (2010) as one of the top 24 journals classified as ‘non-heterodox/other’, citing highly the top 20 heterodox journals.

Dolfsma and Leydesdorff (2008) note that if a node with a high level of ‘betweenness centrality’ were to be deleted from a network, the network would fall apart into otherwise coherent clusters. They find the *Cambridge Journal of Economics* has an exceptionally high betweenness centrality. This is again consistent with the findings here, but also with Mearman’s (2011) contention that the heterodoxy is merely a combination of separate and distinct schools.

EAERE neoclassical economists tend to choose the same journals as the overall EAERE group, with the *Journal of Environmental Economics and Management* (*JEEM*) and *Environmental & Resource Economics* (*ERE*) coming top (Figure 4). The 24 respondents in this subsample made reference to 30 journals; 54% selected *ERE* and 58% *JEEM*, with 38% of the sample indicating that they read both. However, for the total EAERE sample, *ERE* is a secondary node, behind *JEEM*, and appears equal with *Ecological Economics*. This shows that the latter has established itself as an outlet for the

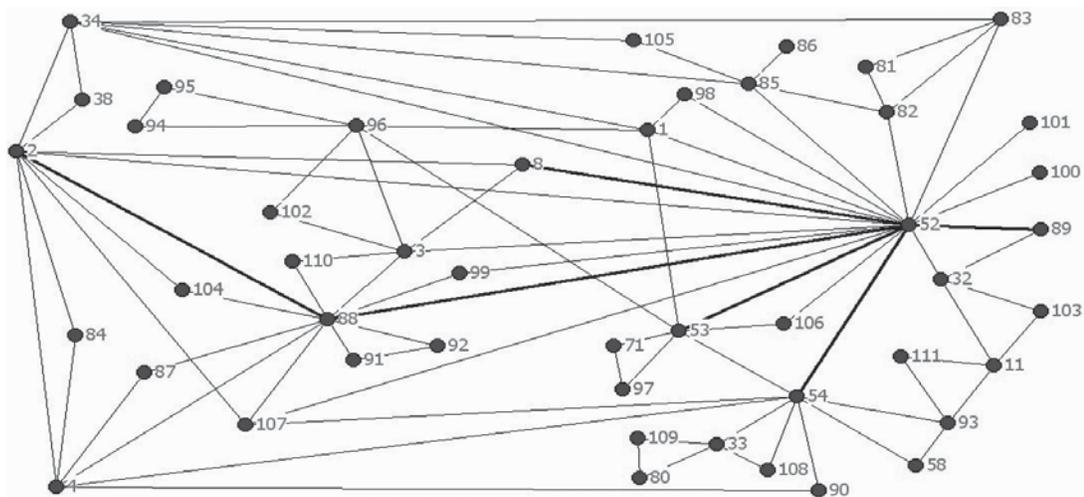


Fig. 3. AHE journal network.

Note: Primary nodes: (52) *Cambridge Journal of Economics*; (88) *Journal of Post Keynesian Economics*. See Appendix 2 for other journal codes.

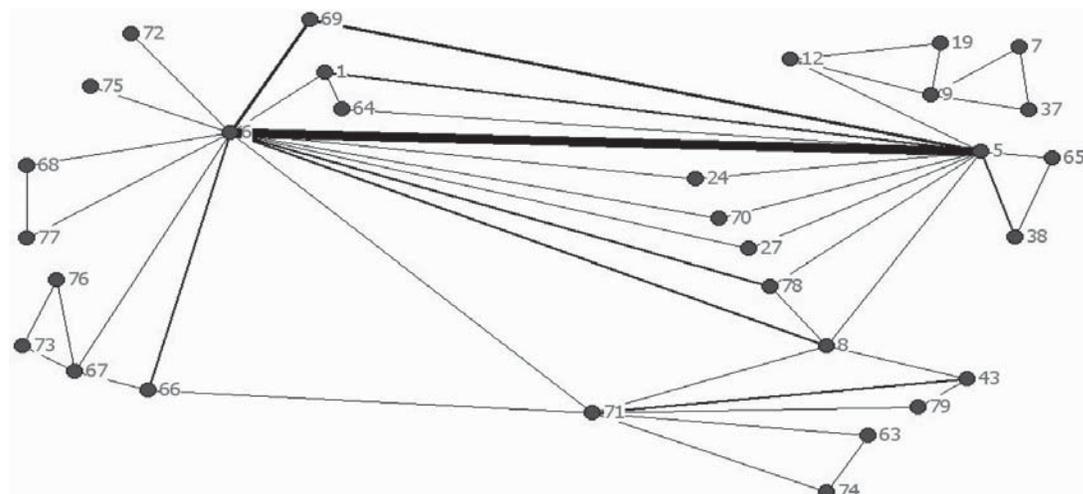


Fig. 4. EAERE neoclassical journal network.

Note: Primary nodes: (5) *Environmental & Resource Economics*; (6) *Journal of Environmental Economics and Management*. See Appendix 2 for other journal codes.

EAERE community but is seen as far less important by the neoclassical economists. Another difference for this group, over the total EAERE sample, is the relative favour given to the *American Economic Review* (8).

Table 4 summarises the journal node results for the three communities. Despite the large number of journals (111 in total, see Appendix 2), there is relatively little crossover in readings and that which does occur is often at a minimal level (i.e. amongst relatively few respondents). Only three journals appeared in all three subsamples: *Ecological Economics* (1), *Energy Policy* (38) and the *American Economic Review* (8), but the latter two are not nodes in all three. The two heterodox groups shared 10 journals, while the two environmental oriented subsamples shared 12 journals. The lowest crossover was between AHE heterodox and EAERE neoclassical, with just four journals mentioned in common and no nodes held in common besides *Ecological Economics*. The ESEE heterodox group holds three journal nodes in common with each of the other two groups. As shown in Table 4, only *Ecological Economics* is a node across all three subsamples.

4.4 Knowledge of key concepts

Key concept knowledge shows further distinct divisions between the communities and especially with respect to their perspectives on environmental issues. A striking result is the lack of knowledge and knowledge differences concerning some of the ideas. Overall, the ESEE heterodox sample has the greatest understanding across all concepts and the AHE heterodox sample the least. For both the neoclassical and ecological economics samples, 90% understand six concepts, but of the remaining ones the ESEE heterodox group has much better knowledge. The least understood concept is post-normal science, with no knowledge amongst 18% of the ESEE heterodox sample, 62% of EAERE neoclassical economists and 71% of AHE heterodox. About a quarter to a third of the AHE heterodox sample lack knowledge of incommensurability, small group deliberation, ecosystems as goods and services, and social multicriteria analysis, and one in five lack knowledge of non-utilitarian ethics. The EAERE

Table 4. *Journal nodes*

		ESEE heterodox	AHE heterodox	EAERE neoclassical
Code	Journal			
1	<i>Ecological Economics</i>	1*	3	3
2	<i>Journal of Economic Issues</i>		2	
3	<i>Journal of Economic Perspectives</i>		3	
4	<i>Journal of Economic Literature</i>	3	3	
5	<i>Environmental & Resource Economics</i>			1*
6	<i>Journal of Environmental Economics and Management</i>			1*
8	<i>American Economic Review</i>			3
9	<i>Science</i>			3
10	<i>Ecology and Society</i>	2		
11	<i>World Development</i>		3	
12	<i>Land Economics</i>			3
14	<i>International Journal of Sustainable Development</i>	3		
17	<i>Organization & Environment</i>	3		
18	<i>Environmental Values</i>	2		
27	<i>Environment and Planning C: Government and Policy</i>	3		
28	<i>Environmental Management</i>	3		
29	<i>Land Use Policy</i>	3		
30	<i>Journal of Environmental Planning and Management</i>	3		
32	<i>Development and Change</i>		3	
33	<i>Journal of Development Studies</i>		3	
34	<i>Review of Radical Political Economics</i>		2	
38	<i>Energy Policy</i>	2		3
43	<i>Quarterly Journal of Economics</i>	3		3
45	<i>Journal of Evolutionary Economics</i>	3		
52	<i>Cambridge Journal of Economics</i>	3	1*	
53	<i>Journal of Economic Methodology</i>		2	
54	<i>Review of Social Economy</i>		2	
63	<i>Journal of Economic Theory</i>			3
66	<i>Journal of Economic Dynamics & Control</i>			3
67	<i>European Review of Agricultural Economics</i>			3
69	<i>American Journal of Agricultural Economics</i>			3
71	<i>The Economic Journal</i>			2
78	<i>Journal of Public Economics</i>			3
80	<i>Economic & Political Weekly</i>		3	
82	<i>New Left Review</i>		3	
85	<i>Capital & Class</i>		3	
88	<i>Journal of Post Keynesian Economics</i>		1*	
93	<i>Journal of Institutional Economics</i>		3	
96	<i>Journal of Economic History</i>		3	
107	<i>Review of Political Economy</i>		3	

Note: Node importance: 1*, primary node; 2, secondary node; 3, tertiary node.

neoclassical economists also have deficiencies in some of these areas: even more (42%) lack knowledge of incommensurability, while a third and a fifth lack knowledge of small group deliberation and social multicriteria analysis, respectively. The full results are shown in Table 5. To the extent that post-normal science, incommensurability, small group deliberation, social multicriteria analysis and non-utilitarian ethics are

Table 5. Response statistics for the ratings of the key concepts

	No knowledge %	Mean rating	SD	Comparison of means (ANOVA)
Cost–benefit analysis				
ESEE	3	3.00 (<i>N</i> = 38)	1.56	<i>F</i> (2, 92) = 20.18**
EAERE	0	5.54 (<i>N</i> = 24)	1.78	
AHE	6	3.33 (<i>N</i> = 33)	1.90	
Steady-state economy				
ESEE	10	5.20 (<i>N</i> = 35)	1.51	<i>F</i> (2, 87) = 5.34**
EAERE	0	4.08 (<i>N</i> = 24)	1.69	
AHE	11	3.77 (<i>N</i> = 31)	2.29	
Ecosystems as goods and services				
ESEE	8	4.78 (<i>N</i> = 36)	1.69	<i>F</i> (2, 83) = 4.47*
EAERE	8	5.27 (<i>N</i> = 22)	1.32	
AHE	20	3.82 (<i>N</i> = 28)	2.14	
Green accounting				
ESEE	10	4.46 (<i>N</i> = 35)	1.48	<i>F</i> (2, 84) = 1.68
EAERE	8	4.95 (<i>N</i> = 22)	1.43	
AHE	14	5.13 (<i>N</i> = 30)	1.68	
Ecological footprint				
ESEE	5	4.35 (<i>N</i> = 37)	1.67	<i>F</i> (2, 89) = 10.60**
EAERE	4	3.52 (<i>N</i> = 23)	0.99	
AHE	9	5.34 (<i>N</i> = 32)	1.49	
Non-utilitarian ethics				
ESEE	13	5.91 (<i>N</i> = 34)	1.29	<i>F</i> (2, 82) = 26.91**
EAERE	8	3.32 (<i>N</i> = 24)	1.59	
AHE	17	5.90 (<i>N</i> = 29)	1.45	
Small group deliberation				
ESEE	13	5.29 (<i>N</i> = 34)	1.29	<i>F</i> (2, 71) = 9.40**
EAERE	29	3.35 (<i>N</i> = 17)	1.73	
AHE	34	3.96 (<i>N</i> = 23)	1.99	
Social multicriteria analysis				
ESEE	8	5.69 (<i>N</i> = 36)	1.03	<i>F</i> (2, 79) = 6.30**
EAERE	21	4.53 (<i>N</i> = 19)	1.61	
AHE	23	5.67 (<i>N</i> = 27)	1.21	
Incommensurability				
ESEE	15	5.97 (<i>N</i> = 33)	1.16	<i>F</i> (2, 67) = 0.30**
EAERE	42	5.93 (<i>N</i> = 14)	1.07	
AHE	34	4.96 (<i>N</i> = 23)	1.89	
Post-normal science				
ESEE	18	5.84 (<i>N</i> = 32)	1.27	<i>F</i> (2, 48) = 7.77**
EAERE	62	3.11 (<i>N</i> = 9)	3.14	
AHE	71	4.50 (<i>N</i> = 10)	2.27	

Note: **p* < 0.05; ***p* < 0.01.

central for understanding the message of ecological economics, there appear problems with communicating across the heterodox communities. At the same time the AHE sample are not a specifically environmental group of researchers, so the fact that the majority (two-thirds or more) have some understanding of all concepts, except post-normal science, can be seen as an encouraging finding.

Further insight is gained by analysis of the means and standard deviations using a one-way analysis of variance (ANOVA) for the rating of the concepts, as shown in Table 5. No significant difference in the rating of the importance of the concepts was found for green accounting and incommensurability. *Post hoc* tests were conducted on the concept ratings where the ANOVA results revealed significant differences, with the exception of the concept of post-normal science because the sample size was so small. Levene statistics revealed heterogeneous variance between the conference samples for the steady-state economy and cost–benefit analysis concept ratings. Therefore, the Games–Howell *post hoc* test was used for these two concepts. The other concepts were assessed with the least significant difference (LSD) *post hoc* test. Table 6 summarises the results for these *post hoc* tests.

The ESEE sample gave a significantly higher rating for the importance of steady-state economy and small group deliberation than both the EAERE and AHE samples. There is agreement between ESEE and AHE heterodox economists on rating non-utilitarian ethics and social multicriteria analysis as more important than EAERE neoclassical economists consider these concepts. The AHE sample rate ecological footprints higher than the other communities and ecosystems as goods and services lower. The neoclassical EAERE sample gave a higher rating for the importance of cost–benefit analysis and a lower rating for non-utilitarian ethics and social multicriteria analysis. As we move from left to right in Table 6, there is a change from non-mainstream ideas towards those acceptable within a neoclassical frame. Thus, valuing externalities can be applied to ecosystems using cost–benefit analysis and these approaches are most favoured by the EAERE neoclassical economists. On the left-hand side are constraints and more political approaches involving plural values and multiple perspectives. Note that treating ecosystems as goods and services is seen as important by the ESEE heterodox sample, but apparently not using cost–benefit analysis.

4.5 Environmental beliefs

Three environmental belief scales were administered to measure commitment to technological optimism, ecocentrism and anthropocentrism. A principal components

Table 6. Rating of concept importance

ESEE > AHE = EAERE	ESEE = AHE > EAERE	AHE > ESEE > EAERE	ESEE = EAERE > AHE	EAERE > AHE = ESEE
Steady-state economy ^a	Non-utilitarian ethics ^b	Ecological footprint ^b	Ecosystems as goods and services ^b	Cost–benefit analysis ^a
Small group deliberation ^b	Social multi-criteria analysis ^b			

Notes: >, significantly greater than; =, no significant difference.

^aGames–Howell *post hoc* test.

^bLSD *post hoc* test.

analysis with varimax rotation was able to clearly differentiate between the technological optimism scale (Cronbach’s $\alpha = 0.73$), the ecocentrism scale (Cronbach’s $\alpha = 0.69$) and the anthropocentric scale (Cronbach’s $\alpha = 0.61$). Each scale was divided by the number of items in the scale, so that the scores for each scale range from 1 (strongly disagree) to 5 (strongly agree). Table 7 displays the means and standard deviations. A one-way ANOVA revealed significant differences for responses to the technological optimism and ecocentrism scales. Levene statistics revealed no significant differences in the homogeneity of variance of the scales, so the LSD *post hoc* test was employed to further probe for differences in the technological optimism scale scores and the ecocentrism scale scores. The anthropocentrism scale showed no differences and is therefore not analysed further.

If we take technological optimism first, an LSD *post hoc* test revealed that the ESEE heterodox group had a significantly lower technological optimism scale score than both the EAERE neoclassical and AHE heterodox samples. No significant difference was found in the technological optimism score for the AHE and EAERE samples. This suggests that the ESEE heterodox economists would be less optimistic about technology solving environmental problems than the EAERE and AHE samples.

In terms of ecocentrism, an LSD *post hoc* test revealed that the ESEE group has significantly higher ecocentric beliefs than both the EAERE group and the AHE group. Once again, there were no significant differences found between the EAERE group and the AHE group. This suggests that the samples from the EAERE and AHE conferences are more pro-development of natural environments than the ESEE sample.

4.6 Research approach

The last aspect of the survey on which we report here is the self-reported research approach. That is, the ideological and methodological positions characterised under the three categories of NRE, NEP and SEE. The two heterodox samples from ESEE and AHE have very similar patterns of response, as shown in Figure 5. The main difference being the total rejection of the pure NRE position by the AHE sample, and their weaker representation in the central position (i.e. the ‘big tent’) in which all three

Table 7. Three environmental belief scales

		N	Mean	SD	Comparison of means (ANOVA)
Technological optimism scale	EAERE neoclassical	24	2.82	0.76	$F(2, 92) = 6.22^{**}$
	AHE heterodox	33	2.57	0.79	
	ESEE heterodox	38	2.19	0.59	
Ecocentrism scale	ESEE heterodox	39	3.62	0.99	$F(2, 93) = 6.97^{**}$
	AHE heterodox	34	3.16	0.90	
	EAERE neoclassical	23	2.70	0.94	
Anthropocentric scale	EAERE neoclassical	23	2.70	0.72	$F(2,92) = 1.07$
	AHE heterodox	34	2.59	0.66	
	ESEE heterodox	38	2.46	0.56	

Notes: * $p < 0.05$; ** $p < 0.01$.

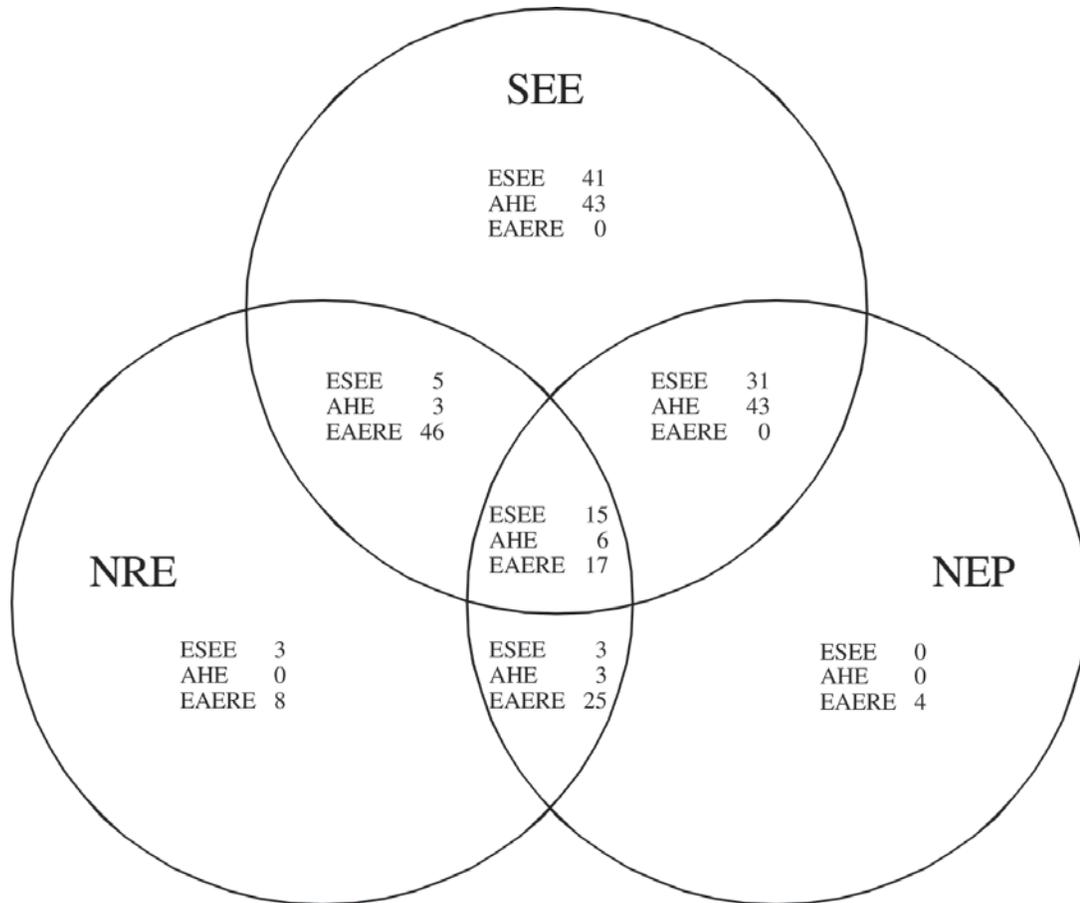


Fig. 5. *Self-categorised research approach: heterodox versus neoclassical.*
 Notes: Numbers are percentages for each sample: ESEE heterodox, AHE heterodox and EAERE neoclassical.
 Two percent non-response for ESEE and AHE.

approaches combine. Instead, they favour SEE and SEE combined with NEP. Perhaps surprisingly, the pure NEP position has no takers from amongst the ESEE or AHE samples and is only favoured by a small percentage of the EAERE neoclassical sample. At the same time, all three samples show that approximately half of the respondents include NEP as an aspect of their research approach.

The major division is then between the EAERE neoclassical sample and the two heterodox samples. The former reject a pure SEE position completely, along with SEE combined with NEP. This is a total contrast with the heterodox economists, where these two classifications were majority positions held by 72% and 86% of the ESEE and AHE samples, respectively. The EAERE neoclassical economists favour combining the more neoclassically consistent NRE approach with either SEE, NEP or both. Thus, 63% are found agreeing with the SEE approach as part of their research position.

5. Discussion and conclusions

Many heterodox approaches are directed towards particular theoretical and/or empirical/applied issues. That they fail to address environmental issues may be seen as an

issue of ‘incompleteness’. In this context, a solution would be to bring together the various heterodox approaches so that they complement and integrate with the aim of making the whole better than the parts. This requires the ability of different schools to understand each other and for individuals within those schools to be able to communicate their ideas. Where there are methodological and ideological divergences, differences in world views and lack of knowledge of key concepts this will mitigate bringing together heterodox approaches. There have, then, been questions raised as to the coherence of heterodox economics.

Our overall conclusion is that there are distinct differences between the ecological, heterodox and neoclassical economists sampled, which imply divergent preoccupations. The conference samples are reading different journals. There were only four journals that were read in common amongst the top 40 journal nodes across the three conferences. This helps explain why there may be metaphors and analogies that are not understood across the different groups. For example, the diverse reading patterns of the ESEE group would seem likely to encourage familiarity with such concepts as incommensurability and post-normal science, and greater general readiness to learn about non-economic subjects. In contrast, the narrow reading patterns of the EAERE neoclassical economists, as a community, seem likely to reinforce a narrow perception of reality.

A substantive difference between the heterodox AHE and ESEE groups was the closer contact of the latter with non-economists, such as (but not only) ecologists. This is likely to produce greater awareness of physical constraints and biophysical limits to socio-economic systems. An interdisciplinary understanding of the interaction between the natural and the socio-economic sciences helps explain why the ESEE respondents have: (i) more pessimism about the possibility of scientific solutions; (ii) a higher ecocentrism score; and (iii) a higher rating for the importance of a steady-state economy.

The network diagrams suggest divergent patterns of unification around nodes. The EAERE sample was quite distinct, being unified in the reading of two core environmental economics journals, while most other journals read by this group were neoclassical. The ESEE group members were unified in the reading of *Ecological Economics*, while it was also common place for these economists to read other journals that were not widely read by others within this community. This means the movement is somewhat eclectic and very diverse, rather than built upon pre-existing schools of thought or groupings. The AHE group was most importantly linked via the *Cambridge Journal of Economics*. They also listed a diverse range of individual journal reading patterns, but, in addition, a set of commonly read journals that were held in common by smaller subgroups. The common subgroup reading patterns for AHE suggest the presence of economists from specific economic schools of thought, namely post-Keynesian, neo-Marxist and critical institutional/evolutionary. The importance of this key node and smaller subgroupings pattern could be taken as support for Mearman’s (2011) contention that there is little to heterodox economics as a unified field beyond the constituent parts. However, this would be to ignore the evidence on methodological and ideological positions.

As noted in Section 2, there are divergent approaches to the environment between heterodox schools. The relative presence of post-Keynesian versus ecosocialist and environmentally aware critical institutionalists would be expected to determine how far the group as a whole might adopt a SEE perspective. Yet this position comes through

very strongly for the AHE sample, even with the clear presence of post-Keynesians. The survey results show 92% of the ESEE sample and 95% of the AHE sample selecting a research philosophy that includes SEE. In contrast, 96% of the EAERE sample selected a research philosophy that includes NRE and seems clearly interested in applying the basic tenets of mainstream theory. That heterodox research involves a focus on multiple perspectives and values is consistent with why SEE appears so strongly. That the majority of participants in both the heterodox samples classified themselves as SEE or NEP and SEE suggests that these economists are concerned about social research without using the axioms of mainstream economics or holding efficiency as a primary goal. A neoclassical approach to the environment is more concerned with applying the basic tenets of consumer choice and the rational agent model, and so consistent with NRE.

The majority of the sample of neoclassical respondents from the EAERE conference classified themselves as NRE and SEE or NRE and NEP, suggesting that these researchers are focused on using the axioms of mainstream economics in order to inform and filter their understanding of other disciplines while applying methods they regard as pragmatic. This difference is further highlighted by the EAERE group rating the importance of the concept of cost–benefit analysis as being higher than the heterodox groups, while also rating the concepts of non-utilitarian ethics and social multicriteria analysis as being lower than the heterodox groups. However, there was also a minority in the EAERE sample holding a heterodox self-definition and those amongst the neoclassical group wishing to combine all three perspectives in the ‘big tent’. There are also some ‘big tent’ advocates amongst the ecological economics sample, which seems likely to reflect holding to some form of methodological pluralism.

An interesting question is, then, how NRE ideological and methodological commitments can be maintained while holding that SEE positions are simultaneously valid? On the basis of the past interactions between mainstream and heterodox approaches, a distinct possibility is the domination of the field of ecological economics with key concepts being watered down or changed beyond recognition in order to conform to an implicit orthodox ontology and methodology. Yet there is still the possibility that ideas may flow in the opposite direction and result in a broadening of the horizons of neoclassical economists that breaks down their restricted world view. However, converting into fully committed alternative environmental thinkers would seem to require multidisciplinary, if not interdisciplinary, training. In this regard the finding that no neoclassical economists in the sample held combined degrees suggests neoclassical economic imperialism is a more likely outcome.

In terms of addressing economy–environment interactions from a heterodox perspective, there are clear challenges. Many heterodox economists appear to lack knowledge of key concepts seen as important by ecological economists. At the same time, the more positive attitude towards traditional economic positions—technological optimism, pro-growth, pro-development—conflicts with the beliefs of ecological economists about the need for behavioural and structural change, respecting biophysical constraints and recognising limits to material consumption as a means for increasing well-being. That ecological economists are mixing natural science and other non-economic subjects seems likely to be an important contribution to their different world view, but also a further potential barrier to communication with other heterodox economists.

Incorporating nature and our dependency upon the non-human into a theory of political economy is seen as essential by the socio-economists within ecological economics, in order to create a better understanding of social and economic systems and motivate the necessary actions required to address our ongoing crises. That the changes required are revolutionary in terms of the current economic systems makes alliance with radical economists from other schools seem logical. One unifying factor is clear in this study, the majority of heterodox economists sampled, including those within ecological economics, share common perspectives in terms of their world view and this already involves a far more radical research approach than that found amongst neoclassical environmental and resource economists. There, then, appear to be good grounds for unification through ideological and methodological commonalities in order to raise the profile of environmental and resource issues amongst heterodox economic schools of thought.

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Appendix 1: Environmental belief scales

A1.1 Technological optimism scale

Item 1: Most environmental problems can be solved by applying better technologies.

Item 2: Science and technology will eventually solve our problems with pollution, overpopulation and diminishing resources.

Item 3: Humans will eventually learn enough about how nature works to be able to control it.

Item 4: We cannot count on science and technology to solve our problems (reverse item).

A1.2 Ecocentrism scale

Item 1: Turning new unused land over to development should be stopped.

Item 2: I oppose any removal of wilderness areas, no matter how economically beneficial their development may be.

A1.3 Anthropocentric scale

Item 1: Nature is important because of what it can contribute to the pleasure and welfare of humans.

Item 2: One of the better things about recycling is that it saves money.

Item 3: One of the most important reasons to keep lakes and rivers clean is so that people can have a place to enjoy water sports.

Item 4: One of the most important reasons to conserve is to ensure a continued high standard of living.

Appendix 2: Journal coding for network diagrams

1	<i>Ecological Economics</i>
2	<i>Journal of Economic Issues</i>
3	<i>Journal of Economic Perspectives</i>
4	<i>Journal of Economic Literature</i>
5	<i>Environmental & Resource Economics</i>
6	<i>Journal of Environmental Economics and Management</i>
7	<i>Nature</i>
8	<i>American Economic Review</i>
9	<i>Science</i>
10	<i>Ecology and Society</i>
11	<i>World Development</i>
12	<i>Land Economics</i>
13	<i>Futures</i>
14	<i>International Journal of Sustainable Development</i>
15	<i>Estudos Sociedade e Agricultura (Brazil)</i>
16	<i>European Environment</i>
17	<i>Organization & Environment</i>
18	<i>Environmental Values</i>
19	<i>Proceedings of the National Academy of Sciences USA</i>
20	<i>Antipode</i>
21	<i>Real World Economics Review</i>
22	<i>Journal of Interdisciplinary Economics</i>
23	<i>Science, Technology, & Human Values</i>
24	<i>Journal of Economic Behavior & Organization</i>
25	<i>Journal of Behavioural Economics</i>
26	<i>Journal of Industrial Ecology</i>
27	<i>Environment and Planning C: Government and Policy</i>
28	<i>Environmental Management</i>
29	<i>Land Use Policy</i>
30	<i>Journal of Environmental Planning and Management</i>
31	<i>Business Strategy and the Environment</i>
32	<i>Development and Change</i>
33	<i>Journal of Development Studies</i>
34	<i>Review of Radical Political Economics</i>
35	<i>GAIA</i>
36	<i>Journal of Sustainable Tourism</i>
37	<i>Climate Change</i>
38	<i>Energy Policy</i>
39	<i>Ecological Economy (China)</i>
40	<i>Rethinking Money</i>
41	<i>Energy and Environment</i>
42	<i>Human Ecology</i>
43	<i>Quarterly Journal of Economics</i>
44	<i>Journal of Economic Growth</i>
45	<i>Journal of Evolutionary Economics</i>
46	<i>Waste Management</i>
47	<i>Water Management</i>
48	<i>International Journal of the Commons</i>
49	<i>Journal of Rural Studies</i>
50	<i>Journal of Environmental Policy & Planning</i>
51	<i>Sociologia Ruralis</i>
52	<i>Cambridge Journal of Economics</i>
53	<i>Journal of Economic Methodology</i>
54	<i>Review of Social Economy</i>
55	<i>Storytelling, Self, Society</i>
56	<i>Science as Culture</i>

57	<i>Tourism Management</i>
58	<i>Socio-economics</i>
59	<i>German Economic Review</i>
60	<i>Technology and Culture</i>
61	<i>Biological Invasions</i>
62	<i>Biodiversity Conservation</i>
63	<i>Journal of Economic Theory</i>
64	<i>Environment and Development Economics</i>
65	<i>Energy Economics</i>
66	<i>Journal of Economic Dynamics & Control</i>
67	<i>European Review of Agricultural Economics</i>
68	<i>Journal of International Economics</i>
69	<i>American Journal of Agricultural Economics</i>
70	<i>Energy</i>
71	<i>The Economic Journal</i>
72	<i>Natural Resource Modeling</i>
73	<i>Economist</i>
74	<i>Games and Economic Behavior</i>
75	<i>Marine Resource Economics</i>
76	<i>Economisch Statistische Berichten (Netherlands)</i>
77	<i>Canadian Journal of Economics</i>
78	<i>Journal of Public Economics</i>
79	<i>Journal of Macroeconomics</i>
80	<i>Economic & Political Weekly</i>
81	<i>Monthly Review</i>
82	<i>New Left Review</i>
83	<i>Rethinking Marxism</i>
84	<i>The Economic and Labour Relations Review</i>
85	<i>Capital & Class</i>
86	<i>Radical Statistics</i>
87	<i>Journal of Political Economy</i>
88	<i>Journal of Post Keynesian Economics</i>
89	<i>Population and Development Review</i>
90	<i>Forum of Social Economics</i>
91	<i>Intervention</i>
92	<i>Intereconomics</i>
93	<i>Journal of Institutional Economics</i>
94	<i>Desarrollo Económico Argentina</i>
95	<i>Realidad Económica Argentina</i>
96	<i>Journal of Economic History</i>
97	<i>History of Economic Ideas</i>
98	<i>Capitalism Nature Socialism</i>
99	<i>Meteroeconomica</i>
100	<i>American Journal of Economics and Sociology</i>
101	<i>Sociological Theory</i>
102	<i>Review of International Political Economy</i>
103	<i>International Labour Review</i>
104	<i>International Journal of Public Policy</i>
105	<i>Science & Society</i>
106	<i>Feminist Economics</i>
107	<i>Review of Political Economy</i>
108	<i>Economy and Society</i>
109	<i>Journal of Agrarian Change</i>
110	<i>History of Political Economy</i>
111	<i>IMF Staff Papers</i>