Towards New Thinking in Economics

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1. Introduction

Traditional equilibrium economics underlies most textbooks of economics and journals of economic theory. It is the thinking that has led to the ideology that justifies self-serving behaviour, shown as partly responsible for the banking crisis, and that has ignored systemic risks associated with externalities such as the banking failures and global warming. It is theory largely unsupported by formal scientific observation and empirical data. Over the past 50 years, it has been increasingly recognised as dependent on false assumptions about human behaviour and physical systems, and as based on a rigid and ill-informed interpretation of utilitarian ethics. The continued use of the assumptions, most pertinently in the use of cost-benefit analysis and computable general equilibrium models (e.g. for climate policy), strongly suggests that their only justification is that they are required for the mathematics and computation to be tractable. Any empirical support for the theory has been generally incoherent, *ad hoc* and rhetorical, with the most outstanding example the fact that the multi-sectoral equilibrium modelling of climate mitigation policy, which dominates the literature on the topic, is based typically on one year's data (and this is simply to calibrate the model to yield results of the right magnitude, rather than to provide empirical validation of the results).

New thinking in economics is an interdisciplinary approach to economic problems that acknowledges and respects the insights and analysis from other disciplines, especially those from ethics, history and engineering as well as complexity and evolutionary theory. Four issues can be highlighted, each of which has been either ignored by traditional economic modelling of the problem or treated in a misleading way that discounts the insights from heterodox economics and other disciplines.

1) The economy is a complex, non-linear dynamic system with technological change inherent in economic growth. Many economic policy issues are potentially non-marginal changes to the system in the context of strong uncertainty.
2) Many issues of economic policy (traditionally called "welfare economics") are primarily ethical-economics in nature, and should be informed by moral philosophy rather than economics in isolation. Traditional economic models adopt an extreme form of utilitarianism, with a questionable choice and use of discount rates, ignoring the philosophical literature and the concept of justice.
3) Engineering and history inform economics through studies of the production processes involving the supply and demand of materials, energy, skills and entrepreneurship. Economic history is critical in understanding the relationship between economics and technological change because the technologies evolve in response to economic conditions, e.g. carbon-price signals. Traditional models assume continuity and path independence.
4) The politics of mitigation implies unstable alliances and trade-offs between governments and political parties. By the use of the social welfare function (required for the calculus), traditional economists simplify social choices and pre-empt political negotiation, claiming an optimality for their subjective assumptions and market interpretations.

2. "Traditional" and "new" economics approaches

It is important to distinguish between a general definition of economics[1] and the particular approach used in most of the literature, which following Beinhocker (2006) and Maréchal (2007) I shall call "traditional" economics defined as "the set of concepts and theories articulated in ... textbooks. It also includes concepts and theories that peer-reviewed surveys claim, or assume, that the field generally agrees on." (p. 24)[2]. This traditional economics is epitomized by Samuelson's *Economics*, now co-authored by Nordhaus[3], and based on the neoclassical mathematical synthesis promoted by Samuelson that came to dominate mainstream economics thinking in the late 20thC. I shall contrast the traditional economics with a "new" economics, as in the title of Boulding's 1992 book, including complexity, evolutionary and Post Keynesian theory and emphasising institutions, non-linear dynamics, and deep uncertainty.

Neoclassical economics is defined as being characterized by an emphasis on rationality, via the use of utility maximization, an emphasis on equilibrium, and by neglect of strong kinds of uncertainty, particularly of fundamental uncertainty (Dequech 2008, p. 290). The traditional economic approach is almost exclusively neoclassical, adopting a version of expected utility theory with human welfare usually translating into private market consumption per head in the applied models. The theory is applied to utility across countries with huge differences in consumption and many years into the future, when consumption can rise perhaps many times over. This method rests on the idea that individual preferences are fixed and utilities can be aggregated and converted into well-behaved mathematical equations in a "social welfare function", and differentiated to give stable marginal properties, as the basis for policy. It also crucially assumes that all natural services can be converted to money and back again at any time, i.e. that there are no irreversible effects (Ackerman and Heinzerling, 2004).

However, the literature of traditional economics does not exist in isolation. Other disciplines address the same problems as economics. Climate scientists address the likelihood and risks of extreme events, and draw conclusions about what "one can safely say, for all practical purposes". Ethics considers issues of justice and equity. Engineering and architecture give insights into how the capital stock can be designed to save energy and reduce greenhouse gas emissions. Economic geography and history provides understanding as to how economies grow and how technologies diffuse and evolve. Political science considers how societies make decisions regarding public policy. Furthermore, economics is not confined to the study of equilibrium in various guises, assuming groups of identical representative agents, with entirely self-interested consumers and known, quantifiable social welfare functions. The weakening of the neoclassical paradigm has been accompanied by a more general undermining of the ideology and prescriptions of traditional economics by deconstruction of the origins of the theory in physics and cybernetics (Mirowski, 1989, 2002). Behavioural economics going back to Kahneman and Tversky (1989) has revealed key relevant empirical findings for risk aversion

[1] Economics is the study of social activity undertaken with its primary purpose the expectation of reward, which usually involves money, the motivations of such activity and its consequences, both good and bad. In contrast the neoclassical economist Robbins (1932) defined economics as "the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses" (p. 16), asserting that economics is a value-free science.

[2] It has become debatable whether neoclassical equilibrium economics is mainstream anymore (Dequech, 2008; Colander et al. 2004), as this paper argues for climate-change economics and as argued more generally by Hodgson (2007). Prominent economists are acknowledging that for macroeconomic growth "The right way to think about this complex set of issues is not clear, but it is clear that the competitive paradigm cannot be fully appropriate." (DeLong and Summers, 2001).

[3] Samuelson and Nordhaus (2001) is the 17th edition of a textbook originally published by Samuelson in 1948.

and utility maximisation that are inconsistent with traditional treatments. Complexity theory and agent-based modelling has developed a theory of economic evolution (Arthur, 1994; Beinhocker, 2006).

Traditional economics has developed an approach, which has persistently ignored the conclusions and insights of other disciplines. The new economics is more pluralistic and respectful of other disciplines. Cost-benefit analysis is formally replaced by a Multi-Criteria Analysis developed in management science and applied to sustainable development (Munda, 2005) in which socio-economic, ecological, and ethical perspectives are taken into account.

3. Uncertainty in economic systems: equilibrium versus complexity

A critical issue in economics is the treatment of uncertainty. The treatment of uncertainty is one criterion that distinguishes the traditional and the new economic analysis.

The classic text (Knight, 1921) defines risk as the property of outcomes with quantifiable probabilities and uncertainty as that with unknown probabilities. Keynes made a similar distinction: 'By uncertain knowledge I do not mean merely to distinguish what is known for certain from what is only probable. About these matters there is no scientific basis to form any calculable probability whatever. We simply do not know.' (1973 pp. 113-14 quoted by Holt (2007)). In the traditional cost-benefit analysis, the form of the expected probability function is simply assumed, converting any and all uncertainty into "certainty equivalence" and subjecting the final model to a sensitivity analysis. The estimates prevalent in the literature can be highly misleading because the studies set aside or ignore deep uncertainty in costs and benefits. A critical example is that the global long-run growth rates are almost entirely exogenous in the models (coming from labour supply and technology), so that the uncertainties of the effects of policy on labour and technologies and then on growth are ignored.

A more flexible "new economics" modelling approach is based on the economic history of institutional structures. It emphasizes the importance of accounting and economies of specialization and allows for increasing returns to scale in the factor demand equations. In critical sectors, technology is modelled to allow for reductions in unit costs as the scale of production increases and the markets develop. Scenarios incorporating system-wide changes in technology can be developed consistently. This approach does not impose costs of policy by assumption, unlike general equilibrium, so that an alternative scenario may be less costly than business as usual, depending on the availability of unemployed resources or induced technological change.

4. Economic ethics, intergenerational equity and the discount rate

Neoclassical economists claim that their work is value-free (Robbins, 1932), scientific (Nordhaus, 2007) or purely descriptive (Pearce *et al*, 1995; Nordhaus, 2007). It has been plausibly argued that they are drawing on 19th Century science to promote a secular, rationalist religion (Nelson, 2001, p. 133). Their faith is in the path-independence of consumer preferences and producer technologies, a faith shown to be empirically false in psychology, physics and history. Their thinking, apparently logical, is based on the fallacy that "the pursuit of self interest is guided by objective laws to a socially beneficent outcome" when instead this pursuit involves moral choices, at both personal and social levels (Foley, 2006, p. xiii).

Nordhaus (2007, p. 140-1) characterises economics as scientific in being peer-reviewed and reproducible; he derives the discount rate from a pure description of the market rather

than from moral philosophy. He contrasts his approach with that of the Stern Review (2007), which he finds unscientific[4].

Moral philosophers have long debated the relative weighting to be given in utility theory between social groups. The Stern Review commissioned a paper on the ethics of climate change from Broome (2006). He makes uncomfortable reading for economists, partly because he insists, rightly, that economics is not ethics-free, that basing economics on the ethics of individuals assumed to be entirely self interested can go badly wrong, and that "willingness to pay" is invalid as a means of valuation (Broome, 2005). This is in direct contradiction to the analyses of Pearce *et al.* (1995, p. 196-7) and Nordhaus[5], when they contrast prescriptive with descriptive valuations of human life. In considering the ethics of climate change, Broome positions *justice* centre stage, arguing that those who cause climate change should cease to do so because it is unjust, and if they cannot cease, then they should compensate those who suffer.
In economic analysis, justice as a theory of ethics (Rawls, 1971) deserves serious attention as an alternative to utilitarianism. Rawlsian ethics would focus social policy on preventing the climate damages and on caring for the subsistence minority, unlike the traditional policies, which have almost the opposite effect in this scenario.

Broome (2006) also considers expected-utility theory alongside justice as a guide to social policy. Importantly he distinguishes "value" from "utility" and allows for intrinsic value in human life and nature. He considers the utilitarian view, arguing that (1) lives should not be valued by the method of willingness-to-pay, which makes the value of people's lives depend on how much they can afford to spend on prolonging them and (2) future lives should not be discounted in value relative to present lives of similar quality[6]. The argument that because people in the future are expected to be better off in real money terms, so that we can then discount a monetary value of their lives or their health runs into serious logical and moral problems, which are not solved by recourse to the term "statistical lives".

Nordhaus and others, who rely on the market to provide an estimate of the social discount rate, are assuming that these preferences are fixed, but their procedure is not empirically valid and short-circuits the political process, in which for example democratically elected politicians aim to lead and change preferences. They are also assuming that the preferences take a particular form, in which no *ethical* preferences are allowed, although in fact people might prefer that natural resources be preserved as a matter of principle, even though they have no utility for them. Finally they are assuming fungibility of natural and man-made assets, i.e. that they all have monetary values and can be exchanged.

It is the implicit assumption on the part of traditional economists of the 'moral' superiority of the market that is at the heart of this debate. Moral philosophers will have none of it. Traditional economists evade this implication of their analysis, claiming that they are being descriptive rather than prescriptive, but their logic does not stand up to scrutiny. This is economics as a religion (Nelson, 2001), in which society is composed of self-interested individuals, whose behaviour is to be assumed rational, then interpreted and described by economics as a mathematical science, e.g. in finding and using the pure rate of time preference,

[4] There is a literature devoted to the issue of whether economics is a science or not. See (Mirowski 1989, 2002; Weintraub, 2002; Katzner, 2003). It is a science in that theory and observation are considered together when and where possible or in that mathematics is a science (Samuelson's position). However, neoclassical path-independent economics as a mathematical science (see Nelson, 2006 and Weintraub, 2002) is strictly a branch of mathematics rather than economics, since it violates a basic law of physics, the Second Law of Thermodynamics.

[5] Nordhaus (2007) claims that his 1.5%pa pure rate of time preference is "designed to provide the most accurate projections rather than to be normative in nature." (p. 40).

[6] Broome's view on discounting is even supported by the utilitarian philosopher R M Hare, who likewise argued that a discount above zero cannot be justified ethically (Hare, 1981, p.100-101)

or the value of human life. The underlying fallacy is that market forces lead by themselves to intrinsically good outcomes (Foley, 2006). A "new economics" approach is to acknowledge that there are ethical, aesthetic and other values, and that all life should not be converted into money, with the exchangeability that money permits (Ackerman and Heinzerling, 2004). The use of the discount rate to account for time preference and risk should be re-thought to allow for subjective time preference and a risk analysis independent of the return (Price, 2005). The distribution of rights consistent with sustainable development should be considered (Padilla, 2004). The anti-utilitarian moral philosopher Bernard Williams has criticised the reductionism of "utilitarian thought" and "the device of regarding all interests, ideas, aspirations and desires as on the same level, and all representable as preferences of different degrees of intensity, perhaps, but otherwise to be treated alike… The assimilation does not give our convictions enough weight in our own calculations. At the same time, it can give other people's convictions too much weight" (Williams, 1985, p86).

5. Engineering and history: induced technological change

Traditional economics relies heavily on the production function, a concept basic to the determination of the allocation and growth of economic output, conventionally measured as marketed output, i.e. GDP in national accounts. In macroeconomic structural models this function takes special forms, typically Cobb-Douglas or Constant Elasticity of Substitution (CES) with tractable properties: they are continuous, typically with constant returns to scale, and reversible in that outputs can be expressed in terms of their inputs of labour, capital, materials, and vice versa, a feature that contradicts path dependence, i.e. the second law of thermodynamics. This economics has been derived by analogy with physical process of the first law of thermodynamics by Walras drawing on 19thC textbooks of physics (Mirowski, 1989; Beinhocker, 2006) without an adequate treatment of time or the later second law with the underlying physical requirement that all processes involve increasing entropy.

More striking still, technological change is assumed to be independent of production change, implying no learning by doing or by researching in the traditional treatment. If the models are to include such endogenous technological change it must be grafted on to the neoclassical production function by linking it with an engineering model, typically for the energy supply and demand sectors. The outcome is inconsistent in that endogenous technological change is allowed for energy but not other sectors (many other relative prices change as well as carbon prices in climate policies) or for other economic variables, such as exports, employment or even consumption.

The aggregate production functions, used in the equilibrium economic models, have been subject to detailed and severe criticism over many years, both of the underlying theory (Mirowski, 1989; Felipe and Fisher, 2003; DeCanio, 2003) and of the validity of the empirical estimates (Felipe and McCombie, 2005). Theoretically, the use of an aggregate production function requires two (heroic) assumptions: 1) that it is a meaningful exercise to combine the processes of e.g. furniture-making, oil-refining, and food-retailing, and 2) that ALL markets are perfectly competitive. Empirically, the use of National Accounts data on flows in current prices to estimate production functions is methodologically wrong, because the dataset used imposes an accounting identity on the monetary value of production and the combined values of the inputs to production, namely materials, labour and capital. The estimation procedure therefore estimates an accounting identity, not a causal relationship, and hence the very good fits obtained are entirely an artefact of the data[7].

[7] The empirical basis of the functions actually included in the models is even more compromised, being no more than a collection of guess-estimates from an inconsistent literature (DeCanio, 2003).

The implication of the production function in the traditional models, both the one-sector models of Nordhaus and others and the multi-industry CGE models, is that because the functional form assumes that the economy is at full employment and maximal efficiency, *any* policy leads to costs in the form of loss of potential output. It is this feature that leads to the contrast between the energy-engineering, bottom-up models, providing estimates of some 6 $GtCO_2$-eq by 2030 at net negative costs, i.e. "no regret options", compared with no such unrealized mitigation potential estimated by the top-down equilibrium models (IPCC, 2007, p. 14-16). The potential for energy saving assessed by countless engineering studies is simply ignored in the equilibrium models by assuming full information, maximum efficiency and full employment, now and forever, in violation of the facts. New evolutionary economics can provide insights into the non-economic barriers to energy efficiency and how they may be overcome (Maréchal, 2007, p.5183-5184).

The traditional treatment of production also normally rules out of court any modelling outcome that increases the growth rate of the economy as an outcome of policy. There are many conditions under which GDP may increase, e.g. use of carbon tax revenues to reduce distortionary taxes, the effect of policy in reducing the widespread under-employment in developing countries, and the possibilities of more productive technological pathways.

Complexity economists (Arthur, 1994) strongly argue for path dependency and increasing returns and economic historians have long argued that technological change and economic growth are intimately related (Maddison, 2001) and path dependent (David, 2001).

6. Social choices

Traditional economics approaches the problem of social choice by the use of the social welfare function, which is a mathematical equation, or a set of equations, in an economic model, intended to represent the social good. However, the concept is fundamentally flawed. When national governments act, it is much more likely to be 'in the national interest' than in any formal manner capable of being represented as a 'criterion function', an 'objective function' or a 'social welfare function' as some key concepts are known in general equilibrium modelling of the economy and the environment. As Arrow (1967, p. 736) remarks about Samuelson's neoclassical treatment, 'Whose behaviour or whose judgement is referred to in the social welfare function is never clarified.'

In theory, the concept depends on the validity of adding up the welfare of households or people such that the aggregate social welfare function is stable and predictable over time. Arrow (1950) showed that for a set of reasonable assumptions (inter alia: a heterogeneous population, universality, "independence of irrelevant alternatives") such aggregation is impossible except under extremely restrictive conditions. Traditional economics has resorted to assuming that members of the population, or social groups such as households or firms, are in fact identical "representative agents", whose welfare and behaviour can be aggregated. This assumption, required for the macroeconomic equilibrium models to be theoretically valid in relation to microeconomic behaviour, is 'both unjustified, and leads to conclusions that are usually misleading and often wrong.' (Kirman, 1992, p.117).

In addition, the social welfare function is not politically viable. The idea that there is a stable relationship between different policy objectives such as reduction of greenhouse gases, economic growth and development, growth in consumption, reduction in unemployment or in the rate of inflation, does not make sense when the actual political process of policy formation is considered, whatever the political complexion of the government or the prevailing consensus about sound policy promoted by international organizations such as the OECD, the IMF or the

World Bank. Institutional decision-making (e.g. that by national governments) is normally characterised by the achievement of consensus between people and groups with potential conflicts of interest. If this is so, it is quite easy to envisage the simultaneous pursuit of conflicting goals, and the sudden alteration of policies as different interest groups gain precedence. There is no escaping the fact that the goals of national, economic and social policy are different for different interest groups, and that the national interest cannot be restricted to a fixed formula. In the face of these difficulties, traditional economists have adopted the assumption of a benevolent dictatorship, i.e. a policy dictatorship for good or bad.

Social choice involves social groups, "stakeholders", such as government, industry, NGOs, and political parties, in a process of consensus (Ostrom 1990). But it also involves information. A real choice requires the equal and simultaneous presentation of feasible alternatives. When a policy is the subject of political debate and possible implementation by government, policy advisors consider the benefit that such implementation would produce in each of various mutually exclusive 'states of nature' that might follow it, the good being considered for each group affected over space and time.

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REFERENCES

Ackerman, F Heinzerling L (2004) *Priceless: On Knowing the Price of Everything and the Value of Nothing*. New York, The New Press.

Arrow KJ (1950) A difficulty in the concept of social welfare, Journal of Political Economy 58(4): 328–346.

Arrow KJ (1967) Samuelson Collected, Journal of Political Economy 75(5): 730-737.

Arthur WB (1994) *Increasing Returns and Path Dependence in the Economy* Ann Arbor: University of Michigan Press.

Beinhocker, E. (2006) *The Origin of Wealth: Evolution, Complexity and the Radical Remaking of Economics*, Random House Business Books.

Boulding K (1992) *Towards A New Economics*, Edward Elgar Publishing Ltd.

Broome J (2005) Why economics needs ethical theory, *Pelican Record*, 42: 80–8; reprinted in Broome J (forthcoming) Why economics needs ethical theory. In: Welfare, Development, Philosophy and Social Science: Essays for Amartya Sen's 75th Birthday, 3, Basu K, Kanbur R (eds), Oxford University Press

Broome J (2006) Valuing policies in response to climate change: some ethical issues, contribution to the work of the Stern Review of the Economics of Climate Change.

Colander D Holt R Rosser Jr JB (2004) The Changing Face of Mainstream Economics. *Review of Political Economy*, 6(4), 485-499

David P (2001) Path dependence, its critics, and the quest for 'historical economics' in Garrouste P Ioannides S (Eds) *Evolution and Path Dependence in Economic Ideas: Past and Present*, Edward Elgar, London, .

DeCanio S (2003) *Economic Models of Climate Change A Critique*, Palgrave-Macmillan, New York.

DeLong JB, Summers LH (2001) The new economy: background, historical perspective, questions, and speculations. Proceedings, Federal Reserve Bank of Kansas City. 11-43.

Dequech D (2008) Neoclassical, mainstream, orthodox, and heterodox economics, *Journal of Post Keynesian Economics*, 30(2): 279-302.

Felipe J, Fisher FM (2003) Aggregation in Production Functions: What Applied Economists Should Know, *Metroeconomica, 54*: 208-262

Felipe J, McCombie JSL (2005) How sound are the Foundations of the Aggregate Production Function (in Symposium on the Aggregate Production Function), *Eastern Economic Journal*. 31(3) 467-488

Foley D (2006) Adam's Fallacy A Guide to Economic Theology. Harvard University Press.

Hare, R M (1981), *Moral Thinking*, Oxford University Press

Hodgson GM (2007) Evolutionary and institutional economics as the new mainstream? *Evolutionary and Institutional Economics Review* 4 (1) 7-25

Holt R (2007) What is Post Keynesian economics? In Forstater M, Mongiovi G, Pressman S (eds) Post Keynesian Macroeconomics, Routledge Press.
Kahneman D and Tversky A (1989) Prospect Theory: An Analysis of Decisions Under Risk *Econometrica, 47* (2): 263–291.
Katzner D (2003) Why Mathematics in Economics? *Journal of Post Keynesian Economics*, *25*(4), 561–573.
Keynes JM (1973) The General Theory and After, Collected Writings, vol. XIV, London: Macmillan
Kirman AP (1992) Whom or what does the representative individual represent?, *Journal of Economic Perspectives*, 6(2):117-136.
Knight FH (1921) *Risk, Uncertainty, and Profit* Boston, MA: Hart, Schaffner & Marx; Houghton Mifflin Company.
Maddison A (2001) *The World Economy A Millennial Perspective.* Paris: OECD.
Maréchal, K (2007) The economics of climate change and the change of climate in economics. Energy Policy 35: 5181-5194
Mirowski P (1989) *More Heat Than Light Economics as Social Physics: Physics as Nature's Economics*, Cambridge University Press, UK.
Mirowski P (2002) *Machine Dreams Economics becomes a cyborg science Light Economics as Social Physics: Physics as Nature's Economics*, Cambridge University Press, UK.
Munda G (2005) Multiple criteria decision analysis and sustainable development. In: Figueira J, Greco S, Ehrogott M (eds) Multiple Criteria Decision Analysis: State of the Art Surveys. International Series in Operations Research & Management Science 78. Springer, Berlin Heidelberg New York, 953-986
Nelson JA (2006) *Economics for Humans*, University of Chicago Press.
Nelson RH (2001) Economics as Religion from Samuelson to Chicago and Beyond. Pennsylbania State University Press.
Nordhaus WD (2007) The Challenge of Global Warming: Economic Models and Environmental Policy, July 24, 2007, Yale.
Ostrom E (1990), *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press.
Padilla E (2004) Climate change, economic analysis and sustainable development. Environmental Values 13: 523-544
Pearce DW, Cline WR, Achanta AN, Fankhauser S, Pachauri RK, Tol RSJ, Vellinga P (1996) The social costs of climate change: greenhouse damages and the benefits of control. In: Bruce J, Lee H, Haites E (eds) Climate Change 1995—economic and social dimensions of climate change. Cambridge University Press, Cambridge, pp. 125–44
Price C (2005) An intergenerational perspective on effects of environmental changes: discounting the future's viewpoint. In Innes JL, Hickey GM, Hoen HF (eds) Forestry and environmental change: socioeconomic and political dimensions. Report 5 IUFRO Task Force on environmental change
Rawls J (1971) *A Theory of Justice*, Harvard University Press
Robbins L (1932) *An Essay on the Nature and Significance of Economic Science*, Macmillan, London, 1932.
Samuelson PA and Nordhaus WD (2001) Economics, 17 edition. New York: McGraw-Hill
Stern N (2007) *The Economics of Climate Change: The Stern Review.* Cambridge, UK: Cambridge University Press
Weintraub, ER (2002) How economics became a mathematical science. Duke University Press.
Williams BAO (1985) *Ethics and the Limits of Philosophy*, Routledge