

1. Paper for the Association for Heterodox Economics Conference

2. The Triple Crisis Finance, Development and Environment

3. London, 2-4 July 2014

4.

5. Are paradigms the answer?

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Abstract

Kuhn highlighted the importance of paradigms and paradigm shifts. For heterodox and pluralist economists this frames the issue in terms of a “mainstream paradigm” and other alternatives. Consequently the debate is largely constrained to lie within the “set of alternative paradigms”. This paper questions this framing, illustrating additional dimensions which are frequently overlooked.

A structure is presented focusing on three transitions, those between: theory and the real world; theory and empirical formulations; and empirical results and policy decisions. These provide numerous questions which should be considered if findings are to be viewed in a real world context.

An underlying theme of the paper is that the development of ideas, the provision of information, the choice of conclusions and the significance of those conclusions are developed in a political environment. The politics in relation to academia, the political sphere, and the news media is very important in terms of its implications for public perceptions of issues.

The paper draws on multi-disciplinary sources and addresses issues of rhetoric, ontology and epistemology. The results are useful for economic debate, including debate between competing schools of thought and the application of economics in cross-disciplinary contexts.

[The paper is the core of a manuscript currently in preparation for Springer publishers and due for publication shortly.]

6. Introduction

An international student call for pluralism in economics was released on 5th May 2014 ([International Student Initiative for Pluralism in Economics, 2014](#)). It referred to three forms of pluralism, theoretical, methodological¹ and interdisciplinary. The call was highly critical of both the narrow range of theory being covered and the overriding emphasis on quantitative methods in mainstream economics. It argued for inclusion of more theoretical perspectives and for qualitative analysis. This highlights the two main areas for deliberation in the academic analysis of social issues, namely the theoretical, both within and across disciplines, and the empirical.

Kuhn's (1970) influential book, *The Structure of Scientific Revolutions*, highlighted the importance of paradigms² as determinants of our understanding, and of paradigm shifts as descriptors of significant changes in understanding. His interpretation suggests that one paradigm will be adopted until circumstances are such that it is replaced. For heterodox and pluralist economists, the concept of paradigms frames the issue in terms of a 'mainstream paradigm' and the need for some alternative(s). Pluralism emphasises the co-existence of alternatives, and the debate is largely constrained to lie within the 'set of alternative paradigms'. Pluralist economics courses commonly cover a number of these options, suggesting a choice from Neoclassical, Post Keynesian, Marxist, Institutional, Austrian, Behavioural and other alternatives ([Chang, 2014, in his Chapter 4, outlines nine different schools](#)).

While acknowledging the existence of controversies and debate on theory and empirical methods, this paper takes a step back from these to give a somewhat different framing of the problem. Keynes (2007, p. 297) talked of additional reserves, qualifications and adjustments needed when applying formal analysis to the real world. These extra requirements are important, but are frequently overlooked or understated. Just as Minsky (2008, p. 109) referred to theories as both a lens and a blinder, so do paradigms, by their nature, constrain our understanding.

To highlight these issues, a structure is presented here that focuses on three transitions or 'paths', namely those between theory and the real world, theory and empirical formulations, and empirical results and policy decisions. This focus provides a basis for critical assessment of economic analysis. By attempting to explicitly recognise the constraints of conventional analyses (application of paradigms), it provides numerous questions which should be considered if findings are to be viewed in a real world context. In the following sections I will present the general structure, then illustrate points that could be considered for each of the three paths, before drawing general conclusions. The material draws from a longer and more wide-ranging manuscript currently being finalised for publication as a SpringerBrief.³

1 There are alternative interpretations of the term, 'methodology'. Dow (2012) takes a broad view, seeing it as setting environments with which theories can develop. This results in an important insight. Drawing also on Caldwell (1986), she argued that competing schools may fail to understand each other due to their use of different methodologies and evaluative criteria. Criteria used by one school may be inappropriate for critical assessment of another,

2 To paraphrase, Kuhn (1970, p. 10) saw a paradigm as 'a coherent tradition of scientific practice, including law, theory, application and instrumentation, that has an enduring group of adherents'.

3 Details forthcoming at: <http://www.springer.com/series/8876?detailsPage=titles>.

7. A General Structure – three paths

In a discussion on the structure of argumentation in economics, Klammer refers to gaps in the reasoning:

Gaps between the theoretical and empirical arguments have not been bridged, policy implications do not necessarily follow and methodological arguments are, for the most part, seriously flawed. ([Klammer, 2007, p. 106](#))

I have constructed Figure 1 to make broadly similar points, focusing on the application of points to real world decisions. It highlights three areas which, I suggest, have received too little attention.⁴ In particular, they highlight potential difficulties in the translation of results from one area of analysis to another as described by paths A, B and C, and in these moves across areas unrecognised errors are likely to arise. The diagram could be modified to include feedback from the real world impacting on theory and empirical analysis, or from empirical analysis to theory where findings appear to be inconsistent with a theory. This raises further issues about the political and institutional environment in which theories and techniques evolve. They are important, and feedbacks will occur. However, as discussed in section 3, there may be barriers to change when this involves challenges to established positions.⁵

Figure 1 Logical errors, Types A, B and C

The arrows in the diagram are intended to focus attention on problems that can be identified with paths A, B and C. Theoretical findings, being based on specific assumptions, may not translate directly to the real world (path A). The relationships or theoretical findings may also

⁴ The diagram highlights another possible concern, as suggested by one commentator. The separation of theory and empirical analysis, combined with the nature of journal publication, may have led to a heavy emphasis on empirical analyses and a corresponding lack of attention to theoretical issues.

⁵ Peer review and research assessment exercises tend to constrain research to lie within the bounds of Kuhn's 'normal science', where the fundamentals are not challenged. A few key institutions, organisations and journals can be very influential in defining what is 'acceptable' ([Gillies, 2006](#)). Chang ([2014](#)) describes some of these constraints when he writes of mainstream economics being defined by its theoretical approach rather than its subject matter.

not be accurately or uniquely described in empirical formulations (path B). The results of empirical analyses may not support the claims made about their real world implications (path C). In each of these cases, the paths may not be based on logic, in which case they rely on rhetoric. People, often unaware, are prepared to accept flawed reasoning. Consequently, these three types of error are highlighted through this structure.

My awareness of these three dimensions arose from work in multidisciplinary and policy environments. I saw what appeared to be flawed or unduly rigid reasoning by those of other disciplines. Once observed, I realised that the same points could be made about economists. It is often easier to see things when somewhat detached from the situation than when immersed in it. Examples drawn from areas outside economics can assist with this. My discussion here relates specifically to economics, however.

Much economic analysis focuses on either the development of theory and internal consistency within theory, or on the application of quantitative methods, primarily econometrics. It is to be hoped that any theory is internally logically consistent. Similarly, empirical analysis should be based on sound methodology. However, these two requirements, as contained within the ovals in the diagram, are not sufficient for the use of these approaches to be meaningful for real world issues. Nevertheless, conclusions are commonly drawn on the basis of accepted conventions for the application of standard techniques and interpretation of results. Focusing on the arrows in the diagram, this paper gives a few examples to illustrate the way this framing shapes what we see. More issues are covered in the forthcoming book from which this paper is drawn. The points are not unique to the practice of mainstream economics. Similar points could be raised with alternative theoretical perspectives and empirical analyses that attempt to explain the real world. It is the extra aspects, the pieces that are omitted, that must later be added in or refined to get a clearer understanding.

An underlying theme of the paper is that the development of ideas, the provision of information, the choice of conclusions and the significance of those conclusions are developed in a political environment. The politics in relation to academia, the political sphere, and the news media is very important in terms of its implications for public perceptions of issues. It shapes what is considered acceptable and what is considered correct. There is a heavy subjective dimension to people's willingness to agree or disagree with findings presented to them, and also to the conclusions that researchers are prepared to draw from their analyses. These aspects also need to be understood if we are to judge the value of findings and understand the environment in which findings are used.

Central to an understanding of the significance of the diagram and the associated potential errors is the concept of **framing**. This is generally not expressly considered by economists, but it is heavily used elsewhere ([Scheufele & Tewksbury, 2007](#); [Severin & Tankard, 1997](#); [Tversky & Kahneman, 1981](#); [Weaver, 2007](#)). It has been described as a process of "selection, emphasis, exclusion, and elaboration" ([Severin & Tankard, 1997, p. 320](#)). Choices are made (sometimes by default through the adoption of an approach) as to what will be included and excluded, and the stories which will be told about the included aspects.

Minsky is well aware of the problems that framing can cause, although he does not use the term. He draws on an address by Tobin ([1966](#)) to describe its significance in an economics context, writing:

"James Tobin, who was a member of the Council of Economic Advisers during President Kennedy's first two years in office and who received the Nobel Prize in 1982, noted that "The terms in which a problem is stated and in which the relevant information is organized can have a great influence on the solution." But the way "a problem" is stated and the identification of "relevant information" reflect the economic theory of the policy adviser. That is, the game of policymaking is rigged; the theory used determines the questions that are asked and the options that are presented." ([Minsky, 2008, p. 110](#))

The representation is one of people looking at something. Minsky states this explicitly:

"In all disciplines theory plays a double role: it is **both a lens and a blinder**. As a lens, it focuses the mind upon specified problems, enabling conditional statements be made about causal relations for a well-defined but limited set of phenomena. But as a blinder, theory narrows the field of vision." ([Minsky, 2008, p. 109 \[emphasis added\]](#))

How we look at something shapes what we see. Kuhn ([1970](#)) popularised the term '**paradigm**', which also suggests a perspective taken and has been influential in shaping our understanding of the nature of scientific enquiry ([Dow, 2012](#)). However, it could be argued that these representations of the processes followed are themselves misleading.

Any description, including Kuhn's (and mine) involves framing. Economic models are not representations of the real world. They are simplistic structures which could be more accurately described as **analogies** for aspects of the real world. Hence, "a 'theory' is not a collection of assertions about the behavior of the actual economy but rather an explicit set of instructions for building a parallel or analogue system" ([Lucas, 1980, p. 697](#)). Theories are alternative representations which, it is hoped, under some circumstances provide information which can be useful in aiding us to understand real world events. Their applicability in any specific situation is open to question, and they will not be complete depictions on the phenomena of interest.

Further interpretation of the context in which economics research is undertaken can be drawn from literature on groups and group cultures. This is indicated by Kuhn with his reference to 'normal science', and by Galbraith ([1999](#)) when he talks of 'conventional wisdom'. This aspect is covered in more detail in Birks ([2012](#)), as is the additional dimension of rhetoric and its significance in economics.

8. Path A: Theory to the real world

In his Preface to *The general theory of employment, interest, and money* Keynes wrote:

"For if orthodox economics is at fault, the error is to be found not in the superstructure, which has been erected with great care for logical consistency, but in a lack of clearness and of generality in the premisses." ([Keynes, 2007, p. xv](#))

Path A emphasises the point that theory does not describe the real world. Nor is it a simplified representation of the real world. Theory presents a simplified structure that we hope is a suitable analogy for certain aspects of the real world. Extra thought is required for the application of theory.

Given that there may be several possible explanations of observed phenomena, care should be taken about any conclusions that rely on evidence being 'consistent with' theory. This does

not mean that the theoretical explanation is correct. There may be numerous alternative explanations of the observed phenomena that can be presented.

Theory may also be misapplied. The economics approach of market failure is based on a comparison with the 'ideal' of perfect competition. The latter is used as a counterfactual against which to compare the 'failure'. In epidemiology, four alternatives have been suggested as counterfactuals in relation to risk of disease. These are *theoretical minimum risk*, *plausible minimum risk*, *feasible minimum risk*, and *cost-effective minimum risk* ([Murray & Lopez, 1999](#)). These represent, in turn, the lowest risk imaginable, even if highly unrealistic; the lowest risk that might be considered possible, even if not currently realistic; the lowest risk that has been achieved somewhere, and thus is known to be attainable; and the lowest risk that could be achieved using all cost-effective means available. The economic 'ideal' as a counterfactual would roughly parallel the theoretical minimum risk, containing no distortions, while the others reflect the best we might ever expect to achieve, or the best that has been observed elsewhere, or the best that could be currently achieved using approaches that are known to be cost-effective. When the choice of counterfactual is framed in this way, perfect competition stands out as an extreme option.

Theories serve as tools that may aid us in our attempts to understand our environment and to make decisions. As with any tools, care must be taken in their use. There are alternative views on how those who favour a theory can or should react to criticisms of that theory. Three arguments that are sometimes used in response to such criticisms are described below. They all have flaws and can lead to problems. A fourth option is then discussed. The four options are:

- 1) Accept current theory as a matter of faith;
- 2) Do not look outside current theory as long as it can give SOME explanation of an observed phenomenon;
- 3) Do not reject a theory, even if flawed, unless the challenger can present a superior alternative;
- 4) Take a more pragmatic approach.

We can consider these four views in turn.

9. Accept current theory as a matter of faith

Several writers have voiced concern at a perceived debasement of academic standards. Mishan talked of "the stringent requirements of scholarship" being set aside where, "the doctrines of... ideologically inspired 'studies' are not regarded by their proponents as provisional and refutable hypotheses" ([Mishan, 1993, p. 202](#)). This suggests the possibility of a higher level of academic discourse. Mishan was referring to studies based on gender and ethnicity. However, similar criticisms could also be made against other academics, even without clear political motivation, or rather, through acknowledging the politics of academia. Economics may also fit this description.

A possible explanation lies in the effect of the framing of economic theory. The suggestion in this context would be that, while economic theory may be based on 'provisional and refutable hypotheses', this basis may seldom be questioned, and it may even be considered that the issues have been fully debated and resolved, or, at least, are so well entrenched as to be

accepted as a starting point for any analysis. This would match the concepts of a ‘dominant IDF’ ([Fairclough, 1995](#)), ‘normal science’ ([Kuhn, 1970](#)), and ‘conventional wisdom’ ([Galbraith, 1999](#)) and has been described specifically for economics ([Robinson, 1970](#); [Rosen, 1972](#)).

It could be said of the dominant mainstream theory that economic theory provides frames that have come to be widely accepted among economists, and these shape perceptions of economic phenomena. Being accepted, they both enlighten and restrict the aspects that are observed. Taking a step back, one could consider whether this economic theory has tended to set the agenda itself. In other words, economics has specified not only the approaches to issues, but also the selection of issues and questions to be considered (and those to be overlooked) by economists.

10. Do not look outside current theory as long as it can give SOME explanation of an observed phenomenon

Normal science has been described as, “a strenuous and devoted attempt to force nature into the conceptual boxes supplied by a professional education” ([Kuhn, 1970, p. 5](#)). Similarly, “conservative conventionalists attempt to preserve existent theories by building onto them ever more elaborate (critics would label them ad hoc) peripheral systems” ([Caldwell, 1980, p. 367](#)). Even if successful, it should not be considered as an end to discussion. Not only is the presence of alternative consistent hypotheses possible, but, according to Milton Friedman, it is inevitable:

“Observed facts are necessarily finite in number; possible hypotheses, infinite. If there is one hypothesis that is consistent with the available evidence, there are always an infinite number that are.” ([Friedman, 1953, p. 9](#))

This criterion for acceptability of an established theory, simply being consistent with the evidence, sets the bar at such a low level that many theories would be virtually impossible to reject. This could lead us to hold an inflated view of our level of understanding, and may be one reason why economists are sometimes thought of as arrogant.

11. Do not reject a theory, even if flawed, unless the challenger can present a superior alternative

Writing on econometrics in *The Economic Journal*, Peter Phillips quotes Hoover, who makes a claim about scientists: “even accumulated falsifications or anomalies do not cause scientists to abandon an approach unless there is the prospect of a better approach on offer” ([Phillips, 2003, p. C27](#)). The point is made for economics, “...you can’t beat something with nothing, and so it is not enough to show that some given rational choice model does not fit the data, it is necessary to show that some other perspective leads to a model with better fit and predictive power” ([Grofman, 1993, p. 240](#)). This approach would support the use of something that is known to be misleading in preference to admitting ignorance. While criticisms of a theory or the presentation of contrary evidence have been dismissed on the basis that a superior alternative has not been presented, this is not a valid reason for ignoring flaws in a theory. Socrates, 2,400 years ago, made the point that it is important to recognize the limits of one’s understanding ([Plato, Approx 380 B.C.E.](#)). Disciplinary boundaries, where adhered to, can serve to perpetuate misconceptions and to limit fruitful imagination.

12. Take a more pragmatic approach.

The three views above could be considered as being logically flawed. Alternatively, they could be described as rhetorical arguments that are persuasive for their target audiences. They are widely used by people who want to maintain a particular position. However, there is another option available. The information for the public on the 2008 award of the Nobel Prize to Krugman includes the statement, “The truth, as in so many other instances, is that reality encompasses features of both theories” ([The Royal Swedish Academy of Sciences, 2008, p. 2](#)). Similarly, Tullock writes, “I have given you a number of theories on how regulatory agencies act and I regret to say that instead of telling you now which one of them is true, I think all of them are partly true” ([Tullock et al., 1983, p. 10](#)). There is a danger that a focus on simple explanations, automatically assuming they are valid, not looking beyond a narrow, accepted perspective, or rejecting valid criticisms unless alternative superior solutions are presented, results in an inflated sense of the extent to which issues are understood.

A pragmatic approach would result in a qualified use of theory-based understanding. Alternative evidence can result in two key qualifications that should be recognised:

13. Valid criticisms should be recognised as limitations of current understanding (and hence on our ability to intervene to bring about desired changes);
14. All theories should be recognised as being partial, and they are analogies for, rather than representations of, the real world. They result in the framing of issues, so it is prudent to use a mix of theories and to acknowledge the aspects that are assumed away in a particular theoretical approach. There are additional reserves, qualifications and adjustments to be considered in any application of theory ([Keynes, 2007, p. 297](#)).

These points can be expressed in another way. Rather than considering that there are ‘theories’ that may ‘explain’ the evidence of the real world, it should be recognised that there are ‘analogies’ that may be ‘consistent with’ the evidence of the real world (and may then in addition possess some explanatory power). To take the latter to be the former is to overstate the level and value of our understanding.

15. Path B: Theory to empirical formulations

There are many aspects to consider in relation to Path B, the empirical analysis of theoretical relationships. These include, among others: issues of data availability; aggregation of data over time, space and other categories; estimation methods and the range of functional forms that can be estimated; and criteria for choosing ‘best fit’. Here I will discuss just one common component in the quantitative estimation of relationships, that of ‘control variables’.

A Google Scholar search for ‘vector of control variables’ conducted on 27 February 2009 produced ‘about 4,140’ results. Repeated on 24 October 2012 the number had grown to ‘about 8,780’, and ‘about 10,800’ on 11 March 2014. It has become common practice to convert basic models with a few variables into ostensibly more complex and realistic models simply by adding ‘control variables’. It is then claimed that the effects of those variables have been taken into account, with the results for the variables under investigation being those observed having made full allowance for the other effects.

Without further explanation of the functional form, this is pure rhetoric. Consider standard approaches to the use of data in different currencies (adjusting for exchange rate differences by converting to a common currency) or different price levels (adjusting for inflation by converting from nominal to real values). Instead of these adjustments, would it be considered

acceptable to add an exchange rate or a price index as an additional variable in a linear regression? The implication would be that the effect of say a price level change is independent of the magnitudes of all other variables. If such an approach is unacceptable, why should it be assumed sufficient when controlling for any other influences?

As an alternative perspective, note that in linear regression a unit change in a control variable is assumed to have a fixed effect on the dependent variable. This fixed effect is assumed always to be correct, although it depends also on the specific form of the dependent variable. How can it always be correct? Consider when the dependent variable is:

- A number - the control variable has a fixed numerical effect;
- A log - the control variable has a fixed proportionate effect;
- A total value (such as GDP) - the control variable has a fixed total effect;
- A per capita value - the control variable has a fixed per capita effect;
- A nominal value - the control variable has a fixed nominal effect;
- A real value - the control variable has a fixed real effect;
- A first difference - the control variable has a fixed effect on the first difference.

Should it be simply assumed that, whichever of these is used, it results in the relationship being correctly specified? As alternative specifications are chosen for the dependent variable, can it be expected that the functional form for the control variable will always be correct? This would appear to be highly implausible.

Similar issues have been identified in psychology, especially building on the work of Brofenbrenner, who recognized the impact of wider social factors on individual behaviour. As one illustration, Brofenbrenner challenged the idea that the effects of certain factors can be taken out so as to analyse interactions between others:

“[Brofenbrenner] went on to explain that it made no sense at all to control for ethnicity, social class, or household composition in an attempt to isolate "pure" process. No processes occur outside of a context. And if we want to understand context, we need to take it into account, not pretend to control it away.” ([Steinberg, Darling, & Fletcher, 1995, p. 424](#))

This suggests a major problem with much of the quantitative work in economics. Unstated and untested assumptions are being made right at the specification stage. This will generally have an impact on the results, but not in any predictable or meaningful way. Specification error is a concern raised in econometrics textbooks, but not commonly in relation to control variables.

16. Path C: Empirical results to the real world

Once deliberation on policy begins, additional issues arise ([Desai, 1981](#)). Political aspects such as the information made available, how it is presented, and how support is achieved, become very important. Aspects of this were recognised long ago by Adam Smith ([1963](#)), when he described rhetoric used in politics, terming it ‘deliberative eloquence’. Others have argued strongly that the ‘fallacy of the transposed conditional’ has resulted in widespread misapplication of tests of statistical significance ([Ziliak & McCloskey, 2008](#)).

In addition to such issues, there are also a number of specific policy questions to ask when drawing policy conclusions from quantitative analyses such as multiple regression. An ‘ideal’ economic approach to policy decisions (assuming perfect information and zero costs of analysis) involves identifying all the available policy options, determining their effects,

valuing them to calculate costs and benefits, and then applying a decision rule to select the best option.⁶ A statistically significant relationship in a regression equation tells nothing about alternative options. Nor does it address the question of costs and benefits. All it demonstrates is that it **may** be possible to alter the value of Y by changing the value of X_1 . Outstanding questions⁷ include:

1. Can you change X?
2. How can X be changed?
3. At what cost?
4. How much control is there over this change (how precise are the changes in X)?
5. How variable are the effects on Y?
6. What lags are there?
7. What is the **value** of the resulting change in Y (what is the benefit, does it outweigh the cost)?⁸
8. Are there any distributional effects (gainers, losers)?
9. Are there any side-effects?
10. Are there other policy options available (including changing the relationship between X_1 and Y)?

In summary, it is important to consider the ability to change the target variable, and the costs and benefits of such a change, along with those of alternative policy options to address the same problem. This information is not provided through a t-test.

17. Closing remarks

A standard economics education consists of a collection of courses based on a selection from a limited number of established textbooks and associated study, instruction and assessment material, combined with some exposure to econometric methods. The focus is on learning the theories and methods so that the student can then understand or engage in research that follows the conventions of these bodies of literature.

There is a heavy emphasis on ‘mainstream’, essentially neoclassical, economics. Pluralists will argue, and can make a strong case, for a broader coverage of perspectives, inclusion of

⁶ Even then, decision rules can be flawed. For example, the criterion in cost-benefit analysis of positive or highest net present value ignores the distribution of costs and benefits. In other words, it implicitly requires the compensation criterion, although, if expressly stated, the criterion might be considered unacceptable.

⁷ While these questions are raised in relation to econometric studies, they apply to all policy options where one (policy) variable is altered so as to bring about a change in another (target) variable.

⁸ This is one of the key concerns raised in Ziliak and McCloskey (2008). Note that effects on Y, and the policy significance of the resulting Y, may not always be continuous. This can cause particular problems, especially where variability of outcome assumes particular significance. Consider the difference, for a non-swimmer standing in a tank of water, between a situation where the water level is exactly at shoulder height and one where the water level is, on average, at shoulder height. Econometric estimation gives average impacts only.

economic history and the history of economic thought and perhaps perspectives from other disciplines such as politics and sociology.

The focus in this paper has been at one step removed from debate on competing theories. The concern has been for the rhetoric and framing that underpins the prevailing conventions. This suggests a framing that highlights three additional areas where economic analysis could benefit from critical assessment. In doing so, it raises questions which are relevant for many applications of theory and applied research where the aim is to provide relevant policy advice.

The three areas refer to the relationship between theory and the real world, theory and empirical analysis, and the results of empirical analysis and identification of real world effects. It is argued that there are important aspects of each of these which can benefit from more explicit consideration than they generally receive. The points included here, along with additional points in the forthcoming book, provide a basis for telling critiques of much of the accepted thinking in economics.

An understanding of framing and rhetoric is an important component of this critique. It is useful for identifying possible explanations for the existence and ongoing prevalence of the problems highlighted by these questions. Given that all exposition involves both rhetoric and framing, it also suggests ways in which the situation can be improved, not least by recognition of the nature of the problem.

it is not enough that some people are aware of the need for change. There has to be a group of sufficient size to ensure that the issue is heard and change occurs. The challenge is therefore not simply for individuals to broaden their approach to economics. It is for economists generally to be open to a wider range of approaches and to be more critical of the approaches that they use. This is harder, but the end result could be an exciting, vibrant, relevant discipline.

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