

Sheila Dow, 'Cambridge's contribution to methodology in economics', in Robert A Cord, ed., *The Palgrave Companion to Cambridge Economics*, 2017, Palgrave Macmillan reproduced with permission of Palgrave Macmillan'.

This extract is taken from the author's original manuscript and has not been edited. The definitive, published, version of record is available here:

<http://www.palgrave.com/gb/book/9781137412324>.

Cambridge's contribution to methodology in economics¹

Sheila C Dow

A contribution to R Cord (ed.), *The Palgrave Companion to Cambridge Economics*.
London: Palgrave Macmillan.

Introduction

Over its history, Cambridge has had a notable impact on the methodology of economics, and it is the purpose of this chapter to chart and discuss this contribution. We focus on some central methodological themes: the aims and scope of economics, how to deal with the limitations of both pure induction and pure deduction as a basis for an economic methodology; the appropriate nature and role of assumptions, of mathematical deduction and of real experience; the place of moral considerations in economic theory. Methodology is understood as arising from epistemology and ontology, so we will include philosophy in our coverage. Indeed it is in providing philosophical foundations that a significant part of the Cambridge contribution lies. Since ontology entails an understanding of the subject matter of economics, methodology is seen as encompassing also a view on the scope of economics.

By contribution we will mean explicit methodological (or philosophical) analysis by Cambridge economists and its effect on the methodological analysis of others, whether or not the effect involved a misinterpretation of the original analysis. While Cambridge has seen a wide range of methodological practice and of theoretical contributions which embodied distinctive *implicit* methodological positions, we only consider explicit references to methodology. Even then the coverage is inevitably limited, not least because of the number of major figures who have been based at Cambridge and the wide reach of Cambridge's influence through the international spread of its former students.

Further, the development of philosophical and methodological thought alongside theoretical developments has been a complex process; the interpretations offered here inevitably gloss over much of that complexity. Particular emphasis is placed on interpretations emanating from Cambridge. The focus will be on some common threads which could be said to constitute a Cambridge tradition in economic methodology.² Martins's (2013) remarkable study makes the case (with reference to philosophical foundations) that there has been a revival in Cambridge of the political economy tradition of Smith and Ricardo. Here rather we start with the older political economy tradition in Cambridge, starting with Newton's experimental method, and consider contributions to methodology which could be seen as deviations from this Cambridge tradition, as

¹ This chapter has benefitted from helpful comments and suggestions from Geoff Harcourt.

² See Dow, Dow, Hutton and Keane (1998) for a discussion of what constitutes a 'tradition' in economic thought.

well as more recent revival of the older methodological tradition. In the process we trace the evolution of Cambridge's contribution of a 'third way' approach to methodology.

We consider first the Cambridge philosophical tradition as it existed at the emergence of classical political economy at the end of the eighteenth century, focusing in particular on mathematics, since it provides the background to Malthus's methodological contribution in his debates with Ricardo. The *Methodenstreit* then provides the context for the publication of J N Keynes's *Scope and Method of Political Economy* at the time of Marshall's launching of political economy at Cambridge as a discipline separated from economic history. The older Newtonian Cambridge tradition resumed its influence with J M Keynes's *Treatise on Probability*, which is discussed in relation to contemporary Cambridge philosophy and in terms of the subsequent methodology of his economics. Keynes's followers in the 'Circus' were more explicit on the subject of methodology, in a tradition continued and developed by Cambridge scholars up to the present day working outside the mainstream methodology tradition which now dominates the Faculty of Economics and Politics. It will be argued that keeping alive discussion of the philosophy of economics has been as important a contribution as particular philosophies of economics.

The Cambridge Philosophical Tradition and classical political economy

The Cambridge figure who arguably had the most profound influence on the methodology of political economy as it emerged in the eighteenth century was Newton, whom Keynes (1946: 363) called 'Cambridge's greatest son'.³ The scientific methodology he developed, as understood in Cambridge, had a distinctive character which carried over to subsequent developments in economic methodology in Cambridge. His experimental method for natural science involved *analysis* of experimental results leading to *synthesis* in the form of general principles in a process of abduction. These principles were provisional, allowing for the possibility that subsequent experiments might confound them, requiring reformulation. This methodology had several key features: it was realist in requiring a grounding in real experience with a purpose of uncovering real causal mechanisms, it was cautious as to the truth-value of general principles, and these principles were open to revision in the light of new experience and took the form of tendencies rather than laws (Montes 2006).

For Descartes, in contrast, reason was primary, generating propositions by means of deductive logic with certainty (assuming the premises to be self-evidently true). These propositions could then take the form of natural laws, with empirical evidence only being sought for purposes of confirmation. The other counterpoint to Newton's influence was the empiricist position that the only source of knowledge was induction from enumeration of repeated instances. Newton's abductive methodology thus followed a path between the two extremes of pure deductivism and pure inductivism, involving a logic of induction through the mental process of identifying patterns.⁴ Keynes's (1946) essay on Newton was explicit that he was neither a rationalist nor an empiricist.⁵ Keynes (1946: 365) drew attention to the role of Newton's mind in forming

³ Newton's thought of course had its own antecedents, but we begin the account with him.

⁴ See Loasby (2003) for a discussion of theorising along these lines, with particular reference to Smith's theory of mind.

⁵ There may be an autobiographical overlay to Keynes's interpretation, but if so this would reinforce the view that Keynes saw himself reinvigorating a Cambridge methodological tradition.

hypotheses, maintaining that he conducted experiments to provide evidence for what he already knew intuitively.⁶ As Comim (2006: 129) puts it, ‘the Newtonian system is neither an imagined construct nor a collection of haphazard empirical laws but something that transcends both’. This Newtonian middle way methodology, or *via media*, was to prove characteristic of a distinctive strand of methodological thinking in Cambridge which continues to evolve to the present day.

Martins (2013: ch. 5) discusses the difference between Newton and Descartes’s methodologies as lying in their approaches to mathematics. While Newton relied on classical geometry as separate from arithmetic, Descartes combined the two in analytical geometry. While for Newton geometrical argument related directly to real experience, arithmetic (algebraic) operations did not necessarily do so, as in the irrational numbers. Similarly the calculus generated infinitesimally small numbers as well as infinity and points, which again have no real counterpart; yet they could be identified with respect to Cartesian coordinates. For Newton it was important that mathematical argument correspond to real experience, building on common sense understandings. To the extent that this mathematical tradition continued in Cambridge in the education of economists, it influenced the methodology of the emerging Classical tradition there.

For the development of political economy at Cambridge we need first to look to the methodological approach underpinning the emergence of political economy in Scotland, where Newton’s influence was profound. As Montes (2006) and Comim (2006) show, Scottish Enlightenment thinkers shared the Cambridge understanding of Newton, rather than the rationalist continental understanding of him. Hume and Smith in particular were great admirers of Newton and sought to apply his methodology to the emerging field of political economy, while being explicitly critical of Descartes’ methodology. Further Hume’s resolution to the problems both with deductivism and inductivism provided a philosophical justification for Newton’s methodology. Newton’s approach to mathematics fed through to Scottish political economy mediated through the Scottish philosophy of common sense – a *via media* which required mathematical concepts to have their origin in sense data, while allowing abstraction in the form of simplification (Olson 1971), as well as paying due regard to ordinary experience (Comim 2002). This common sense philosophy was to re-emerge in Cambridge with G E Moore (1925) and his influence on Keynes (Coates 1996).

For political economy, experiments consisted of extensive historical study of different real contexts, from which patterns emerged with the assistance of the imagination and use of metaphor and analogy, from which provisional generalisations might be formed. The aim was to employ the imagination in order to formulate provisional generalisations about underlying causal tendencies, knowing that the scope for knowledge was limited by the complexity of social systems (Hume’s problem of induction). The form of history used for providing experimental evidence was thus analytical, or conjectural, history (supporting for example a stages approach to socio-economic history) rather than the recounting of instances. Finally, like Newton, the aim for Hume was to develop theoretical reasoning which could be reconciled with ‘vulgar’ (non-specialist⁷) understanding (Comim 2006: 126). For Smith (1762-63) this reconciliation was a necessary

⁶ Hartley wrote to Keynes in response to his paper on Newton, noting the similarities with Faraday’s methodology which he had earlier described as follows: ‘In the period of his great achievements, his experiments were rarely continuous, the intervals between them suggesting the subconscious working of his mind. He waited until the impulse came and his “prescient wisdom” had planned the experiment and foreseen the result’ (as quoted in Kuehn 2012).

⁷ This meaning differs from the Marxist use of the term to refer to non-Marxist economics.

element of the scientist's rhetoric of persuasion (in the absence of demonstrative proof) and reflects a concern for science to be problem-oriented and to have practical application. It also reflected the common sense philosophy which supports the continued reliance on common sense beliefs unless there is good reason to abandon them.

Scottish political economy in turn influenced the development of political economy at Cambridge. If we take Keynes's (1933: 79) suggestion that Paley might be considered the first of the Cambridge economists, Waterman (1996) makes the case that, as Paley's thinking progressed, he was increasingly influenced by Scottish political economy. Keynes (1933: 71) otherwise gave priority to Malthus as 'the first Cambridge economist'. Malthus is of particular interest, given his explicit contributions to methodology. It was under the influence of Scottish political economy as well as what was still a Newtonian mathematics education at Cambridge that Malthus developed his theory of population.⁸ His methodological position was most clear in the context of his debates with Ricardo (Cremaschi and Dascal 1996). The focal point of these disagreements lay in Malthus's belief 'in the impossibility of reducing human needs and tastes to mathematical figures', leading Ricardo to criticise Malthus as being 'unscientific' (Cremaschi and Dascal 1996: 479). Like Smith, Malthus was doubtful of the accuracy of measures of value, for example, as well as the dangers of premature generalisation.

Malthus did allow for some laws of human nature (e.g. the need for food and shelter and attraction between the sexes) and of the natural sciences, but otherwise the laws of political economy are only probable and open to exceptions, given the complexity of social systems. He pursued a Newtonian *via media* in his political economy, between the extremes of oversimplifying the subject matter by mathematising political economy with inattention to evidence, on the one hand, and assuming that surface appearances are causes, on the other. He also pursued a middle way with respect to language, criticising Ricardo for an undue separation between ordinary language and scientific language, while at the same time allowing for some specialist language to be developed with care in the interests of clarity. Here Malthus is seen to pursue the realist Newtonian/Humean agenda of reconciling specialist with non-specialist understanding, while Ricardo pursued a rationalist interpretation of Newton (Cremaschi and Dascal 1996).

Meanwhile John Stuart Mill was coming to dominate the agenda for Classical economics, adopting a methodology which is characterised both as deductivist (for discovery) and inductivist (for justification); each operation required the 'atomic hypothesis', so that each was the logical counterpart of the other (Carabelli 1988: 77, 239). He was challenged in this by the Cambridge polymath, William Whewell, who developed a philosophy of science along the lines of a middle way between continental deductivism and English empiricism. Whewell's inductivism involved innate ideas, or 'conceptions', and thus the operation of the mind, being applied to observation. He was a realist in that observation was an essential element of discovery, and theory was provisional: the conceptions themselves required checking against further observation. Among the areas of application of his philosophy of science was political economy. Whewell is notable for reformulating Ricardian theory by developing the 'earliest *systematic* application of mathematical symbols of political economy in England', seeing algebra as a preferable 'language' to the arithmetic of classical economics (Campanelli 2008: 741, emphasis in original). Nevertheless he

⁸ However Olson (1971) argues that analytical mathematics were increasingly influencing thinking at Cambridge by the second half of the eighteenth century.

criticised the departure of Ricardo's deductivist theorising from real experience, which for Whewell was the proper starting point for 'conceptions' and reasoning; he also doubted the capacity of mathematics to deal with humanity in the round, including the moral dimension (see further Snyder 2006: 279-85 and Harcourt and Kriesler forthcoming). Others at Cambridge who were concerned with political economy, such as Sidgwick, also engaged in methodological debate, seeking a balance between the deductive and inductive approaches (Schultz 2008), although Edgeworth promoted the deductivist approach as being more akin to the methodology of the physical sciences (Creedy 2008).

While there was thus debate in Britain concerning the nature and role of deduction and induction, with Cambridge playing an important part in attempts to promote a Newtonian middle way, the methodological debate on the continent was more polarised in terms of a dualistic understanding of deduction and induction. The arguments between the Austrian pure theorists and the German historical school became known as the *Methodenstreit*, or methodological struggle. Alfred Marshall sought to defuse the struggle in order to enhance the standing of economics as a discipline. For Harcourt ([2003]2012: 201), Marshall is the initiator of the political economy tradition.

The Cambridge resolution of the *Methodenstreit*

Marshall was not inclined to engage in methodological debate, and yet his methodological approach arguably had a great impact. This impact is divided between those (non-mainstream) economists who focus on his professed methodology and his analysis of evolutionary contexts (as in industrial districts for example), on the one hand, and those (mainstream) economists who have pursued the deductivist methodology he used in his formal theoretical marginal analysis, on the other. Groenewegen (1995: 415) quotes Marshall, in a letter to J N Keynes, as follows: 'I take an extreme position as to the *method & scope* of economics. In my new book I say of *methods* simply that economics has to use every method known to science' (emphasis in original). This pluralist methodology included a particular view of mathematics which followed in the Newtonian-Scottish-Malthusian methodological tradition. First, the emphasis was on geometry rather than algebra or calculus. Second, mathematics was not to be used as an engine of enquiry, but rather as a substitute for verbal argument to be set aside when communicating theories with the aid of real-life examples. This reflected both that, like Hume, he sought to make connections across the learned-vulgar divide and his view that political economy had a human and concrete nature.

Marshall's evolutionary view of the subject matter limited the scope for general laws arrived at either by pure deduction or pure induction. Marshall explicitly argued against 'economic man' as an appropriate basis on which to build theory, on the grounds of its contradiction by observation. Deductivists in contrast proceeded by accepting the concept of economic man as 'self-evident', and as fruitful given the scope for application of marginalist analysis on the basis of this conception. Marshall's evolutionary view required him to engage in detailed study of real social contexts in order to grasp the nature of particular evolutions. Yet, for all his use of historical evidence, Marshall was critical of the English historical school's empiricism (pure inductivism) on the grounds that the evolutionary nature of the subject matter precluded identification of

permanent uniformities (Groenewegen 1995: 310). It was rather Hegelian analytical history⁹ which he saw as playing an important methodological role, whereby the operation of the mind was brought to the identification of conjectural patterns in history. From Hegel too he absorbed the organicist idea of the whole being more than the sum of the parts.

The presentation of the *Principles* thus involved a methodology which differed in important respects from the other builders of the marginalist revolution. Yet it was those elements of the content of the *Principles* which were most consistent with the development of marginalism elsewhere, rather than Marshall's professed methodology, which had the greatest impact on economics as a whole. Indeed Whitaker (2008: 364) argues that 'his method was in the general deductive tradition of John Stuart Mill'. His key theoretical contributions as far as most economists are concerned were the conceptual framework he developed for marginalist comparative static analysis of exchange, which spawned theoretical developments, generating law-like conclusions about the consequences of atomistic individual behaviour. For Marshall, perfect competition and laissez-faire were intended simply as starting points for the analysis, but that became the benchmark for the bulk of mainstream analysis.

The fact that Marshall's methodology has been open to conflicting interpretations is due in large part to the conflict between the methodology implicit in much of his theorising and the methodology he professed (Pratten 1998). But, whatever his impact on methodology (intended or unintended), Marshall is also important for his *indirect* methodological contributions. First is the part he played in establishing the Economics and Politics Tripos at Cambridge and of moving economics from the Moral Sciences Board, with profound effects on the future development of economics at Cambridge. In promoting the idea of economics as a mature discipline, Marshall put great emphasis on continuity of ideas (as in the first Preface to the *Principles*), rather than discontinuities. As a result he distracted attention from the ways in which his own methodology differed from the other approaches in Britain and further afield.

It was in this respect that Marshall is also important for promoting his protégé, John Neville Keynes, the father of John Maynard Keynes. Keynes's methodological treatise, *The Scope and Method of Political Economy*, served to support Marshall's efforts to establish economics as a discipline (Deane 1983)¹⁰ and has had an impact on the wider discipline which continues to this day. For J N Keynes, the subject matter of economics was wealth. 'By economic activities are meant those human activities that direct themselves towards the creation, appropriation, and accumulation of wealth; and by economic customs and institutions, the customs and institutions of human society in regard to wealth' (J N Keynes 1904: 2). This definition is not inconsistent with the Classical view of economics's scope as production, distribution and exchange, or Marshall's (1890: 14) more vague 'ordinary business of life'. But Keynes's definition was to be superseded by the Robbins definition in terms of scarcity, which diverted attention from customs and institutions to rational choice and deductivist methodology.

But a particular understanding of his methodology itself has had lasting impact. In fact to the extent that mainstream economics textbooks start with a methodological statement, it includes a version

⁹ There is a parallel with the Scottish analytical history tradition which can arguably traced through Hegel, but it was Hegel who was the direct influence on Marshall (Groenewegen 1995, Martins 2013).

¹⁰ Keynes has been seen as setting out a rationalisation of Marshall's methodology (Whitaker 2008).

of J N Keynes's position on method. Keynes set out a hypothetico-deductivist methodology, which seemed to reconcile the two opposing positions of deductivism and inductivism. This was achieved by treating each as the counterpart of the other, such that rational argument was used for discovery while empirical evidence was used for confirmation of conclusions. But for Keynes induction was not the logical process in the Newtonian tradition of applying the mind to experience, but rather the collection of evidence on repeated instances of constant conjunctions of events. Rather than the transcendent middle way of the Cambridge tradition, therefore, this was simply a synthesis of deductivism and inductivism within a positivist logical framework.

Keynes's methodological analysis was well-suited to seeking a synthetic solution to the *Methodenstreit*, being carefully worded and heavily qualified and thus open to a range of interpretations. But Keynes's emphasis was much more on the side of deductivism (Deane 1983, Moore 2003), not least because of his stated aim to identify uniformities (albeit with the *ceteris paribus* qualifier). Keynes did see evidence as having importance for confirming not only theoretical propositions but also the assumptions on which they are based. Like Marshall, Keynes had doubts about the concept of economic man. But the tendency was for this (realist, Cambridge) aspect of his methodology to be ignored. Once the rational choice assumptions were widely taken as uniformly supported by evidence (or self-evidently true), they seemed no longer to require confirmation; they could therefore provide a universal basis for hypotheses. By trying to set out a synthesis of competing methodological positions, Keynes ended up downplaying Marshall's emphasis on real evidence, encouraging the deductivist reading of Marshall and supporting the rising tide of deductivist marginal analysis. Inductive argument was effectively limited to testing theories. Although presented as a middle way, in fact Keynes's hypothetico-deductive methodology encouraged a deductivist approach to establishing hypotheses.

This influence was reinforced by J N Keynes's discussion of the distinction between positive, normative and applied economics (which he had earlier identified as characteristic of the deductivist position). While Hume had already distinguished the first two concepts, J N Keynes went much further in positing that a value-free economics was possible, to which values could later be added.¹¹ As Deane (2008) points out, this was a device to insulate the 'hard scientific core of economic theory ... from the charges of ideological bias, or immorality, or relativity, as well as from failures in practical economic policies'. But as a result Keynes provided a rationale for deductivist methodology which could be presented as if value-free.

By supporting Marshall's drive to establish economics as a mature discipline, with intellectual continuity and methodological consensus, J N Keynes had helped to suppress important methodological issues and provided a foundation for Mill's increasingly dominant approach. Indeed many at Cambridge proceeded within that framework. But, while it would seem that an important Cambridge contribution to economic methodology was to develop and promote a methodology which had emerged elsewhere, the next generation of Cambridge economists

¹¹ Colander (1992) has revived this framework in order to argue for a pluralist methodology for applied economics, but where the theory to be applied is positive, and derived by means of deductive logic. 'The art of economics is applied economics. It relates the lessons learned in positive economics to the normative goals determined in normative economics' (Colander 1992: 192).

departed from the apparent consensus and made a series of influential contributions to methodology which can be traced back to the older Cambridge tradition.¹²

J M Keynes and methodology in twentieth-century Cambridge

The leading figure of this new generation was J N Keynes's son, J M Keynes, who came to economics from the philosophy of mathematics. His explicit contributions to economic methodology were, as for Marshall, spasmodic rather than the kind of focused study his father undertook. Yet his distinctive methodology, as set out by Shackle (1974), Chick (1983: ch. 2) and Harcourt (1987), has had a profound influence on Post Keynesian economics. The philosophical foundations of this methodology became a significant field of study, beginning with the path-breaking work of Meeks (1976), Carabelli (1988) and O'Donnell (1989). As Runde (1997: 240) points out, Keynes's methodological position fell outside the positivist tradition which, as we have seen, was encouraged (however inadvertently) by his father. Nevertheless many of his methodological statements were expressed in the process of criticising the positivist mainstream, a phenomenon which has carried forward to modern-day heterodox economics.¹³

Keynes's earlier work on probability allows us to infer his philosophical approach when he came to economics, where his stated aim was not just methodological but epistemological: to 'revolutionise ... the way the world thinks about economic problems' (Keynes 1935). In *A Treatise on Probability*, Keynes explored the grounds for belief as the basis for action under the general conditions of uncertainty which followed from his organicism. Where structures evolve and the interactions between their components evolve (i.e. the atomic principle does not hold and the physical or social system is open), probabilities cannot be quantified. But rather than falling into the philosophical dual of certainty/ignorance, Keynes explored the realm of uncertainty, outlining the mechanisms by which more or less reliable knowledge may be established with more or less confidence. Keynes was thus updating Hume's epistemology as a resolution to scepticism with respect to reason on the one hand and the problem of induction with respect to an organic system on the other. This was Keynes's own version of the middle way, in the tradition of Newton (and Hume and Smith), whereby the mind identified patterns from experience; the resulting generalisations were provisional in the face of an organic system and, for application (the purpose of theory), required close reference to that evolving reality (Carabelli 1988: ch. 4, 5). These generalisations about tendencies were to be reasonable even if they could not be demonstrated to be true.

Keynes explicitly challenged the prevailing positivist view of induction which involved gathering data on repeated instances ('pure' induction) as requiring empirical uniformity of nature. Rather he understood induction as being a logical process of employing negative analogy in order to uncover persistence in spite of difference. But Keynes departed from classical logic (which required certainty as to the truth of premises) and empirical logic (which required unambiguous

¹² While Weintraub (2005) challenges the idea of a continuing Cambridge tradition stemming from Marshall, given the diversity of approaches within Cambridge, our focus here is on *distinctive* Cambridge contributions. What is emerging is that one such contribution is the continuing thread of a distinctive methodological approach stemming from Newton.

¹³ See Gerrard (1997) for a comprehensive review of Keynes's methodology.

facts). Keynes was thus diverging from the endeavours of Russell and (the early) Whitehead to build a complete mathematical system based on classical logic. His (human, or ordinary) logic was more suited to conditions of uncertainty. As with Hume's epistemology, Keynes founded his logic on common sense and convention and he employed ordinary language.¹⁴

Just as the scientist organises observations according to prior conceptualisations and patterns, so the individual or group in society has to apply judgement to observation. Keynes was quite explicit about the ambiguity of evidence this entails. He referred to direct knowledge based on experience in the following terms: 'Sensations which we may be said to *experience*, the ideas of meanings, about which we have thoughts which we may be said to *understand*, and facts and characteristics or relations of sense-data, or meanings which we may be said to *perceive*' (Keynes 1921, 12, emphasis in original). The theory of probability was thus subjective in the sense that the evidence brought to bear and its assessment in relation to other sources of knowledge involved judgement. But it was objective in the sense that anyone in the same circumstances and with the same understandings of the evidence would arrive at the same judgement.¹⁵

When Keynes turned to economics, this epistemology had strong methodological implications (Chick 2003). First he regarded economics as an art. While the father had privileged deductive theory as the core of the discipline, with values imported later and 'unscientific' methods only introduced at the stage of policy application, the son privileged the art of application at the core. For him, the requirements of practical application determine the methodology of theory development and, given the open-system nature of the subject matter, that methodology was pluralist. Ordinary logic required multiple strands of reasoning and evidence which could lend weight to argument, for economists as well as economic agents. Keynes was therefore highly critical of the monist methodology of positivism (O'Donnell 1989: ch. 9).

As with Marshall, Keynes's ideas were then reduced by mainstream interpreters to their mathematical versions within a static equilibrium framework. Also like Marshall, Keynes himself used mathematical formulations, but only as a contributor to the overall argument. Keynes applied the same logic to the testing of theory by means of econometrics, a logic which he made explicit in his critique of Tinbergen. His primary critique was of econometric analysis which requires an invariant structure; he argued that the *onus* should be on the econometrician to demonstrate that a particular case reasonably approximated a fixed structure, so that regression analysis was warranted. O'Donnell (1997) shows that, as with his objections to mathematics, Keynes's objections were to Tinbergen's specific techniques in relation to the subject matter, not to econometrics *per se*.

While rational economic man had increasingly taken hold as the axiomatic foundation of deductivist theory, Keynes was particularly critical of the fictional nature of the concept. In line with his organicist view of society, Keynes rejected an atomistic representation of economic agents. Rather he emphasised man's social aspect, not least when it comes to epistemology and

¹⁴ This theme was developed by Shackle (1983: 116) for whom mathematics was insufficient, being too restrictive a language compared to verbal argument: 'language at its full compass, where words are fingers touching the keyboard of a hearer's mind'.

¹⁵ On Keynes's debate with Ramsey over subjectivity see Carabelli (1989: 96-7).

the reliance on social conventional knowledge. Here again Keynes pursues a middle way, made explicit in his movement away from the reason-emotion dual represented by Russell and Lawrence respectively (Keynes 1938). The methodological implications of this epistemology are most evident in Chapter 12 of *The General Theory*, where he analyses the determinants of the macroeconomic variable which was central to his theory of effective demand: investment (Runde 1997). His objections to the rationality assumptions arose from philosophical argument rather than explicit evidence; consistent with his theory of probability, Keynes's methodology centred on logic. Nevertheless his philosophy was founded in turn on an organicist ontology which arose in an inchoate way from 'deep background' experience (Searle 1995). While Keynes did not seek out evidence to the same systematic extent as Marshall, his human logic was informed by experience.

Chick (2003) spells out further the connections between Keynes's ontology and epistemology and his methodology.¹⁶ From the former he set out to develop an open theoretical system which was general in its openness; the certainty of the closed mainstream system was a special case of the more general open system, characterised by uncertainty. This system therefore had at its heart a 'method of expectations', formed under uncertainty, within different time-frames. Time played a crucial role, understood in logical terms, referring to causal sequence, or in historical terms, both of which gave equilibrium meanings beyond the limited mainstream meaning of a solution to simultaneous equations. Further, because money had a special role in decision-making with respect to an uncertain future, monetary and real factors were to be treated in an integrated way. But, contrary to the reductionism of the mainstream approach, some of the analysis was to be conducted at aggregative levels without an explicit derivation from individual decision-making. In any case, again like Marshall, Keynes was conscious of the important role of the evolution (in historical time) of the social conventions and institutions which provide the framework for decision-making. Like Marshall too he was motivated to improve society. While he apparently separated off his social philosophy (consistent with J N Keynes's normative-positive distinction) in advocating that the 'economic problem' be addressed first in order then to promote the Good Life, solving the economic problem itself involved moral judgements, e.g. about the need to prevent unemployment and the need for institutions to promote the public interest (Chick and Dow 2013). Economics was a moral science.

Even though Keynes's methodology was misunderstood when interpreted from the prevailing positivist standpoint of the mainstream, there was nevertheless a Keynesian methodological revolution from that perspective (i.e. within a narrow understanding of methodology) (Dow 2010). On the one hand Keynes sparked off the development of macroeconomic theory as a field distinct from microeconomics. On the other hand he provided the related impetus to the development of large data bases and econometric techniques to analyse them, and indeed provided an agenda for the development of econometrics in attempting to deal with the problems raised in his debate with Tinbergen. But Keynes had a more enduring impact among those who took his alternative methodology seriously, forming under the banner of Post Keynesianism with its distinctive methodology (Chick 1995). This approach includes Keynes's typically Cambridge requirement for abstractions to take the form of simplification rather than fiction, with a view to allowing application to the more complex reality; for a focus on the passage of historical time with its implications for the uncertain basis for decision-making; and for aggregation to allow

¹⁶ Consistent with our characterisation of a Cambridge methodological tradition, Chick (2003: 311) characterises his theory of rational belief under uncertainty in terms of a 'third way'.

macroeconomic analysis distinct from microeconomics, paving the way for analysis of growth and distribution.

The literature on the Cambridge figures who contributed to this development is vast. Here we pick out just some of the important contributions specifically on methodology rather than theory of Keynes's followers at Cambridge (the 'Circus') who perpetuated and developed aspects of his methodological legacy. Robinson (1962: ch. 4) pinpointed Keynes's departure from the mainstream approach in terms of a shift in the subject matter to the capitalist system as a phase in history, bringing to the surface moral issues (with respect to the free operation of markets) and time. Keynes's followers added to this a shift away from concern with the short period, where income distribution and power relations could be taken as given. Many of his followers in Cambridge were influenced also by Marx and his classical concern with distribution and economic processes over the long period analysed in class terms.

Among the Circus, Joan Robinson made the most explicit methodological contribution. Her early book, *Economics and Philosophy*, had a particular impact in the 1960s when there was a receptive audience for a reflection on the foundations of economics. Her methodological stance shifted somewhat over her career (Harcourt 1996a, Salanti 1996). But, like Keynes, Robinson was concerned that economics address real issues, and take account of institutions (the 'rules of the game'), and therefore that theoretical assumptions be simplifications rather than fictions. Like Keynes, too, her challenge to apparently false assumptions came more from her ontology than from specific empirical study. She also shared Keynes's views about the uncertainty of knowledge and thus the impossibility of establishing economic laws. She made a particular contribution in her clear distinction between a logical-time framework, which aims to establish causal mechanisms, and an historical-time framework, which aims to establish irreversible processes such that equilibrium is a position to which a process tends in the long run.

While Kaldor (1972) too criticised the ahistorical mainstream version of equilibrium, he also contributed to the methodological approach to evidence, developing the notion of stylised facts (as clarified and extended by Lawson 1989). Given the open nature of the economic system, detailed facts reflect a variety of tendencies at work under particular circumstances. By abstracting from this detail, stylised facts can form the basis of hypotheses. Here we see a version of the interaction of the mind with observed experience as a way of addressing the problem of induction, in the Newtonian/Smithian tradition. The Department of Applied Economics was established at Cambridge in 1945 to provide the empirical material on which such abductive reasoning could build.

In some respects Robinson arguably at times adopted a position similar to that of J N Keynes: what Salanti (1996) refers to as 'empirical apriorism'.¹⁷ To the extent that she aimed her critique of the mainstream at the realism of assumptions and the internal consistency of its logic, she was implicitly accepting the underlying positivist methodology. This was perhaps most evident in the 'capital controversies', where Robinson challenged mainstream marginalist analysis of value and production, such that the controversy came to be epitomised for many by the 'reswitching' problem which demonstrated that capital and its return need not be inversely related (Harcourt 1972). The

¹⁷ The continuing influence of J N Keynes may have been due in part to the fact the J M Keynes never produced a systematic account of his position on methodology.

fact that the force of this critique seemed not to be felt by the mainstream illustrates well the insufficiency of empirical apriorism as a methodology. In fact, while the debate was widely interpreted in the terms of the mainstream approach, the differences over capital theory arose from different ontologies and epistemologies. Robinson's views on method were in fact changing as she moved away from Marshall's influence and pursued the methodological implications of analysing a dynamic process over time. Robinson argued further that ideology was embedded in mainstream theory, contrary to professed mainstream methodology. While her efforts to strip it out have been seen by some to reflect a J N Keynesian view that ideology-free theory was indeed possible, Pasinetti (2008: 218) rather emphasises her position simply that ideological views need to be made explicit since economics was ideologically non-neutral.

Other key contemporary figures in Cambridge were Michal Kalecki and Piero Sraffa, who both came to Cambridge from different methodological traditions. Both influenced others at Cambridge and spawned schools of thought developing their ideas within their distinctive methodological frameworks. Both focused on issues of production and distribution in historical time, influenced by Marx. Kalecki drew on empirical evidence, filtered through his careful conceptual classification of variables, in order to establish stylised facts with respect to the short period (such as all wages begin used up in consumption). Sraffa differed from Keynes and Kalecki in focussing on the long period and in presenting a formal mathematical *system* (rather than partial mathematical arguments). But, since the content was not marginalist, Sraffa's mathematics were different from the mainstream calculus, employing the mathematics of the Classical period (Velupillai 2008). While the Ricardian tradition might seem to depart from both Malthusian and Post Keynesian methodology, Sraffa traced his concern with struggle over the surplus in historical time back to both Ricardo and Malthus (via Marx).¹⁸ This interpretation of Ricardo as not being so different from Malthus was distinguished by Dobb (1931, 1959) from Marshall's version, which was arrived at through Mill (see further Harcourt and Kriesler forthcoming).

The resulting strands of Post Keynesianism differ in part in terms of how much of the analysis was amenable to formal mathematical expression (echoing the debates between Malthus and Ricardo). But others have used formal mathematical models of the long-period which are more in the Marshallian tradition of specifying equilibrium in gravitational terms.¹⁹ There are nevertheless common elements to the methodologies emanating from the key Cambridge figures which are in accord with what we have identified as a Cambridge methodological tradition. Thus Pasinetti (1974: 43-4) identified common features between the Ricardian approach and J M Keynes's methodology, while Dutt and Amadeo (1990) set out the common methodological ground between Post Keynesians and the neo-Ricardians who followed the Sraffian approach.²⁰ Arestis, Dunn and Sawyer (1999) likewise identified the coherence of Post Keynesianism, in spite of its different strands, in terms of methodological approach. The rather vexed question of assessing differences relative to commonalities needs to be considered in terms of a pluralist, non-dualistic approach to epistemology. Phyllis Deane (1983) criticised Marshall and J N Keynes's search for synthesis, advocating instead methodological pluralism. Her history of economic thought followed the

¹⁸ This reading of Ricardo implies that the methodological differences between him and Malthus were less marked than is implied by their own debate, or that the differences were more of degree than of kind, where the latter might characterise the differences between marginalist economics and Cambridge political economy.

¹⁹ See for example Harcourt's (2006: ch. 5) discussion of Marglin (1984).

²⁰ Note that their title is *Keynes's Third Alternative*.

Cambridge tradition we have identified by focusing on methodology from the perspective of (analytical) economic history (Deane 1978). Like Robinson, she kept philosophical issues to the fore at a time when it reached a receptive audience.

Geoff Harcourt's history of economic thought also took a methodological perspective, charting the contributions of the 'Circus' (see e.g. Harcourt 2006 and Harcourt and Kerr 2009, and Harcourt 1972 on the capital controversy). His own work has employed a pluralist methodology to theory development, governed by a close understanding of real circumstances and by policy concerns. He has made a particular contribution to methodology by articulating and justifying his 'horses for courses' approach whereby selections are made from a plurality of methods according to the problem at hand, rather than according to some internal requirement (Harcourt 1976b). In particular it involves a continuation of the Cambridge critique of the mainstream requirement to express all arguments in terms of formal deductive mathematics. The 'horses for courses' approach contributes to the increasing focus in heterodox economics on pluralist methodology, not as anything goes, but as an ontologically-grounded selection of methods (Lawson 1997b, King 2002).

Cambridge contributions in the 21st century

Many of the current strands of heterodox thought can be traced back in one way or another to Cambridge. Now heterodox economics involves a large world-wide community bound by a critique of monist adherence to mainstream methodology and the promotion instead of methodological pluralism. Although the Faculty of Economics and Politics at Cambridge is now almost exclusively mainstream, Cambridge has again been making a distinctive methodological contribution to heterodox economics in the form of critical realism as spearheaded by Tony Lawson (1997b, 2003) and developed by the Cambridge Social Ontology group.²¹ Critical realism encapsulates much of the Cambridge middle way tradition (while also, like earlier Cambridge contributions following J M Keynes, drawing on elements of the Marxian tradition).

Critical realism is primarily a philosophical position, introduced by Lawson (1997b) as drawing on the philosophy of Roy Bhaskar, countering enlightenment (especially Humean) philosophy according to a positivist reading of it. But a reading of Scottish philosophy as providing a philosophical foundation for the Newtonian tradition, and developing it for the social sciences, in fact shows that it provides an alternative foundation for critical realism, and one which accords with the Cambridge tradition (Dow 2002). Critical realist philosophy puts the focus on the ontological level, on the grounds that any epistemic question requires reference to some position or other as to the nature of the subject matter; the focus is on devising theory by a methodology which best allows practical questions to be addressed, rather than by any internal criteria. One of the major achievements of critical realism is to have made this so explicit, such that it has become increasingly commonplace in heterodox economics to spell out the underlying ontological position.

²¹ Amartya Sen can also be interpreted as contributing to methodology in line with the predominant Cambridge tradition, with significant influence on current developments in economics. While his methodology is too large a subject to include here, see Martins's (2013) detailed treatment.

The argument in favour of making ontology explicit is aimed at bringing to the surface the contradiction between the closed-system ontology implied by mainstream methodology and the common understanding of the economic system as being open – a modern version of the Cambridge position. For critical realists, a closed system ontology is defined in terms of event regularities which allow for identification of economic laws, which in turn allow prediction. An open system ontology refers to a subject matter which is evolving, including evolving internal relations, such that there are no uniformities to uncover and little scope for precise prediction. Real social systems are seen as being structured according to three levels: the actual, the empirical and the real. The aim of economic enquiry is to build up understanding of causal mechanisms operating at the (unobserved) real level, but if the system is open, this understanding takes the form of identifying tendencies which may or may not be operating, singly or together, in any one set of circumstances.

The methodology for identifying tendencies is a development of the Cambridge middle way, eschewing the deduction/induction duality. Rather than seeking evidence in the form of repeated instances, critical realists seek to identify patterns, in the form of stylised facts, or partial regularities, or ‘demi-regularities’. This involves an application of the mind, employing for example metaphor, in order to ‘see’ patterns which might be indications of causal mechanisms for further investigation. Particularly revealing are contrastive demi-regularities, which suggest the presence of a causal mechanism in some circumstances but not in others. These mechanisms are to be investigated by means of methods suited to the subject area; this may include *some type* of formal mathematics if it can be justified as contributing to the analysis – a pluralist methodology. But the plurality *of* methodologies is seen as being limited to different research interests, while united by a shared open-system ontology and epistemology (Lawson 2003). Thus different schools of thought are distinguished by their particular subject matter of interest: gender, institutions, class, etc. Since social systems involve both power relations and moral conventions, ideology and moral judgements are part of the reality which economists analyse. Further, the purpose of critical realist economics is given as social transformation as a moral imperative.

The presentation here of the contributions to methodology emanating from Cambridge has in fact been an exercise in the Cambridge methodological tradition that we have drawn out from the historical account. The topic was approached with some idea of the conceptual issues, and a pattern was then identified from general reading, in the form of the middle way methodological approach. But the expression of that approach differed between different circumstances, and continues to evolve. Also the consistency with which it has been applied was variable. In particular the influence of Marshall and J N Keynes (reflecting the dominance then of the Millian approach) constituted a divergence from the posited Cambridge tradition, and served to confuse the evolution of the revived tradition in Cambridge. Further the influence of all the major figures covered here is coloured by the different interpretations of them by readers coming from different methodological perspectives (including within Cambridge). While a tradition has been identified here as Cambridge’s important methodological contribution, this is inevitably a provisional judgement.

References

- Arestis, P, Dunn, S P and Sawyer, M (1999) 'On the coherence of Post Keynesian economics: a commentary on Walters and Young', *Scottish Journal of Political Economy*, 46: 339-45.
- Campanelli, G (2008) 'Whewell, William (1799-1866)', in S N Durlauf and L E Blume (eds), *The New Palgrave Dictionary of Economics*, vol. 8. London: Palgrave Macmillan, pp. 741-2.
- Carabelli, A (1988) *On Keynes's Method*. London: Macmillan.
- Chick, V (1983) *Macroeconomics After Keynes: A Reconsideration of The General Theory*. Oxford: Philip Allan.
- Chick, V (1995) 'Is there a case for Post Keynesian Economics?', *Scottish Journal of Political Economy* 42 (1): 20-36.
- Chick, V (2003) 'Theory, method and mode of thought in Keynes's *General Theory*', *Journal of Economic Methodology* 10 (3): 307-28.
- Chick, V and Dow, S C (2013) 'Keynes, the Long Run and the Present Crisis', *International Journal of Political Economy*, 42 (1): 13-25.
- Coates, J (1996) *The Claims of Common Sense: More, Wittgenstein, Keynes and the Social Sciences*. Cambridge: Cambridge University Press.
- Colander, D (1992) 'The Lost Art of Economics', *Journal of Economic Perspectives*, 6(3): 191-8.
- Comim, F (2002) 'The Scottish Tradition in Economics and the Role of Common Sense in Adam Smith's Thought', *Review of Political Economy* 14 (1): 91-114.
- Comim, F (2006) 'Adam Smith: Common Sense and Aesthetics in the Age of Experiments', in A Dow and S Dow (eds), *The History of Scottish Economic Thought*. London: Routledge.
- Creedy, J (2008) 'Edgeworth, Francis Ysidro (1845-1926)', in S N Durlauf and L E Blume (eds), *The New Palgrave Dictionary of Economics*, vol. 2. London: Palgrave Macmillan, pp. 733-47.
- Cremaschi, S and Dascal, M (1996) 'Malthus and Ricardo on Economic Methodology', *History of Political Economy* 28(3): 475-511.
- Deane, P (1978) *The Evolution of Economic Ideas*. Cambridge: Cambridge University Press.
- Deane, P (1983) 'The Scope and Method of Economic Science', *Economic Journal*, 93 (March): 1-12.
- Deane, P (2008) 'Keynes, John Neville (1852-1949)', in S N Durlauf and L E Blume (eds), *The New Palgrave Dictionary of Economics*, vol. 4. London: Palgrave Macmillan, pp. 725-6.

- Dobb, M H (1931) 'The Cambridge School', in E R A Seligman (ed.), *Encyclopaedia of the Social Sciences*, 5. New York: Macmillan, pp. 368–71.
- Dobb, M H (1959) *Wages* (6th ed.). Cambridge: Cambridge University Press
- Dow, A, Dow, S, Hutton, A and Keaney, M (1998) 'Traditions in Economics: The Case of Scottish Political Economy', *New Political Economy* 3 (1): 45-58.
- Dow, S C (2002) 'Historical Reference: Hume and Critical Realism', *Cambridge Journal of Economics* 26 (6): 683-97.
- Dow, S (2010) 'Was there a (Methodological) Keynesian Revolution?', in B Dimand, R Mundell and A Vercelli (eds), *Keynes's General Theory After Seventy Years*. London: Palgrave Macmillan for the International Economic Association, pp. 268-86.
- Dutt, A K and Amadeo, E J (1990) *Keynes's Third Alternative: The Neo-Ricardian Keynesians and the Post Keynesians*. Cheltenham: Edward Elgar.
- Gerrard, B (1997) 'Method and Methodology in Keynes's *General Theory*', in G C Harcourt and P Riach (eds), *A 'Second Edition' of The General Theory*, vol. 2. London: Routledge, pp. 166-202.
- Groenewegen, P (1995) *A Soaring Eagle: Alfred Marshall 1842-1924*. Cheltenham: Edward Elgar.
- Harcourt, G C (1972) *Some Cambridge Controversies in the Theory of Capital*. Cambridge: Cambridge University Press.
- Harcourt, G C ([1987]1992) 'The legacy of Keynes; theoretical methods and unfinished business', in D A Reese (ed.), *The Legacy of Keynes*. San Francisco: Harper & Row, pp. 1-22. Reprinted in C Sardonì (ed.), *On Political Economists and Modern Political Economy: Selected Essays of G. C. Harcourt*. London: Routledge, pp. 235-49.
- Harcourt, G C (1996a) 'Some Reflections on Joan Robinson's Changes of Mind and their Relationship to Post Keynesianism and the Economics Profession', in M C Marcuzzo, L L Pasinetti and A Roncaglia, eds, *The Economics of Joan Robinson*. London: Routledge, pp. 317-29.
- Harcourt, G C ([1996b]2001) 'How I Do Economics', in S G Medema and W J Samuels, eds, *How Do Economists Do Economics* Cheltenham: Edward Elgar, pp. 93-102. Reprinted in *50 Years a Keynesian and Other Essays*. London: Palgrave Macmillan, pp. 323-33.
- Harcourt, G C ([2003]2010) 'The Cambridge Economic Tradition', in J E King (ed.), *The Elgar Companion to Post Keynesian Economics*. Cheltenham: Edward Elgar, pp. 44-51. Reprinted in *The Making of a Post-Keynesian Economist*. London: Palgrave Macmillan, pp. 201-10.
- Harcourt, G C (2006) *The Structure of Post-Keynesian Economics. The Core Contributions of the Pioneers*. Cambridge: Cambridge University Press.

Harcourt, G C and Kerr, P (2009) *Joan Robinson*. Houndmills, Basingstoke, Hampshire: Palgrave Macmillan.

Harcourt, G C and Kriesler, P (forthcoming) 'Ricardo and Cambridge', in J Courvisanos, J Doughney and A Millmow (eds), *Heterodoxy in Economics: From History to Pluralism: Essays in honour of John E. King*.

Hartley, H (1931) 'Michael Faraday and the theory of electrolytic conduction', in *British Association for the Advancement of Sciences Centenary Meeting*. London: BAAS, pp. 3–21.

Kaldor, N (1972) 'The Irrelevance of Equilibrium Economics', *Economic Journal* 82 (December): 1237-55.

Keynes, J M (1921) *A Treatise on Probability*. Collected Writings Vol. VIII. London: Macmillan, 1973.

Keynes, J M ([1933]1972) 'Thomas Robert Malthus', *Essays in Biography. Collected Writings* vol. X. London: Macmillan, for the Royal Economic Society, pp. 71-108.

Keynes, J M ([1935]1973) Letter to G B Shaw, 1 January. *Collected Writings* Vol. XIII, *The General Theory and After Part I: Preparation*. London: Macmillan, pp. 492-3.

Keynes, J M ([1936]1973) *The General Theory of Employment, Interest and Money. Collected Writings* Vol. VII. London: Macmillan, for the Royal Economic Society.

Keynes, J M ([1938]1972) 'My Early Beliefs', *Essays in Biography. Collected Writings* vol. X. London: Macmillan, for the Royal Economic Society, pp. 433-50.

Keynes, J M ([1946]1972) 'Newton, The Man', *Essays in Biography. Collected Writings* vol. X. London: Macmillan, for the Royal Economic Society, pp. 363-74.

Keynes, J N (1904) *The Scope and Method of Political Economy*. London: Macmillan.

King, J E (2002) 'Three Arguments for Pluralism in Economics', *Journal of Australian Political Economy* 50 (December): 82-7. Reprinted in *post-autistic economic review* 23 (5), article 2, 2004.

Kuehn, D (2012) 'Keynes, Newton and the Royal Society: Events of 1942 and 1943', *Notes and Records: The Royal Society Journal of the History of Science*, doi: 10.1098.

Lawson, T (1989) 'Abstraction, tendencies and stylised facts: a realist approach to economic analysis', *Cambridge Journal of Economics* 13 (1): 59-78.

Lawson, T (1997a) 'Horses for Courses', in P Arestis, G Palma and M Sawyer (eds), *Markets, Unemployment and Economic Policy: Essays in honour of Geoff Harcourt*, vol. 2. London: Routledge, pp. 1-15.

- Lawson, T (1997b) *Economics and Reality*. London: Routledge.
- Lawson, T (2003) *Reorienting Economics*. London: Routledge.
- Loasby, B J (2003) 'Closed models and open systems', *Journal of Economic Methodology* 10 (3): 285-306.
- Marglin, S A (1984) 'Growth, distribution and inflation: a centennial synthesis', *Cambridge Journal of Economics*, 8: 115-44.
- Marshall, A N (1890) *Principles of Economics*. London: Macmillan.
- Martins, N (2013) *The Cambridge Revival of Political Economy*. London: Routledge.
- Meeks, J G T ([1976] 1991) 'Keynes on the Rationality of Decision Procedures under Uncertainty: the Investment Decision'. Marshall Library mimeo. Reprinted in J G T Meeks (ed.), *Thoughtful Economic Man: Essays on Rationality, Moral Rules and Benevolence*. Cambridge: Cambridge University Press, pp. 126-60.
- Moore, G (2003) 'John Neville Keynes's Solution to the English *Methodenstreit*', *Journal of the History of Economic Thought* 25 (1): 5-38.
- Moore, G E ([1925]1959) 'A Defense of Common Sense', in J H Muirhead (ed.), *Contemporary British Philosophy* (2nd series). Reprinted in G E Moore, *Philosophical Papers*. London: George Allen & Unwin.
- Montes, L (2006) 'Adam Smith: Real Newtonian', in A Dow and S Dow (eds), *The History of Scottish Economic Thought*. London: Routledge.
- O'Donnell, R (1989) *Keynes: Philosophy, Economics and Politics*. London: Macmillan.
- Olson, R (1971) 'Scottish philosophy and mathematics, 1750-1830', *Journal of the History of Ideas*, 32 (1): 29-44.
- Pasinetti, L L (1974) *Growth and Income Distribution: Essays in Economic Theory*. Cambridge: Cambridge University Press.
- Pasinetti, L L (2008) 'Robinson, Joan Violet (1903-1983)', in S N Durlauf and L E Blume (eds), *The New Palgrave Dictionary of Economics*, vol. 7. London: Palgrave Macmillan, pp. 213-20.
- Pratten, S (1998) 'Marshall on Tendencies, Equilibrium, and the State of Method', *History of Political Economy* 30 (1): 121-64.
- Robinson, J (1962) *Economic Philosophy*. Harmondsworth: Penguin.
- Runde, J (1997) 'Keynesian Methodology', in G C Harcourt and P Riach (eds), *A 'Second Edition' of The General Theory*, vol. 2. London: Routledge, pp. 222-43.

- Salanti, A (1996) 'Joan Robinson's Changing Views on Method: A Tentative Appraisal', in M C Marcuzzo, L L Pasinetti and A Roncaglia, eds, *The Economics of Joan Robinson*. London: Routledge, pp. 285-99.
- Schultz, B (2008) 'Sidgwick, Henry (1838-1900)', in S N Durlauf and L E Blume (eds), *The New Palgrave Dictionary of Economics*, vol. 7. London: Palgrave Macmillan, pp. 467-70.
- Searle, J R (1995) *The Construction of Social Reality*. Harmondsworth: Penguin.
- Shackle, G L S (1974) *Keynesian Kaleidics*, Edinburgh, Edinburgh University Press.
- Shackle, G L S (1983) 'A Student's Pilgrimage', *Banca Nazionale del Lavoro Quarterly Review*, 145: 107-16.
- Smith LRBL Smith, A ([1762-63] 1983) *Lectures on Rhetoric and Belles Lettres*, edited by J C Bryce. Oxford: Oxford University Press.
- Snyder, A J (2006) *Reforming Philosophy: A Victorian Debate on Science and Society*. Chicago: Chicago University Press.
- Velupillai, K V (2008) 'Sraffa's mathematical economics: a *constructive* interpretation', *Journal of Economic Methodology*, 15 (4): 325-42.
- Waterman, A M C (1996) 'Why William Paley was the "first of the Cambridge economists"', *Cambridge Journal of Economics*, 20: 673-86.
- Weintraub, E R (2005) 'Roy Harrod: The Interwar Years', *History of Political Economy*, 37 (1): 133-55.
- Whitaker, J K (2008) 'Marshall, Alfred (1842-1924)', in S N Durlauf and L E Blume (eds), *The New Palgrave Dictionary of Economics*, vol. 5. London: Palgrave Macmillan, pp. 360-79.